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EDITORIAL

It is my proud privilege to welcome you all to the Researchfora International Conference at Marrkech, Morocco. I am happy to see the papers from all part of the world and some of the best paper published in this proceedings. This proceeding brings out the various Research papers from diverse areas of Science, Engineering, Technology and Management. This platform is intended to provide a platform for researchers, educators and professionals to present their discoveries and innovative practice and to explore future trends and applications in the field Science and Engineering. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Thus the forum accelerates the trend of development of technology for next generation. Our goal is to make the Conference proceedings useful and interesting to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve the goal.

I once again give thanks to the Institute of Research and Journals, Researchfora & The IIER for organizing this event in Marrkech, Morocco. I am sure the contributions by the authors shall add value to the research community. I also thank all the International Advisory members and Reviewers for making this event a Successful one.

Editor-In-Chief

Dr. P. Suresh
M.E, Ph.D. Professor and Controller of Examinations,
Karpagam College of Engineering,
Coimbatore, India

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A FUZZY LOGIC APPROACH FOR MEASURING INTERNET PERFORMANCE SATISFACTION USING MULTIPLE DIMENSIONS

MEMBER OJEBODE

University of Ibadan School of Business(UISB), Nigeria
E-mail: mojebode@gmail.com

Abstract - Most of the Internet users within the University provide internet service for themselves. This has been a measure of concern for the researcher. The focus is on measurement of performance based on user's satisfaction because of the issue above. Different studies have tried to measure the Internet performance addressing user's satisfaction, but very few have used the method of using fuzzy logic with users' log. To serve human reason reality, fuzzy logic was used to test each performance indicator of each user's log dimensions as a co-intensive model. The key performance indicators for dimensions used for analysis were network, distance, upload and sessiontime. The General Linear Model (GLM) at p=0.05 was used in modelling the logs. Internet performance was grouped into Very satisfied, Satisfied, Very dissatisfied and Dissatisfied. The GLM procedure showed that the significant interaction of the indicators was distance, network, upload and session time. The application of fuzzy logic on performance dimensions measured Internet performance through user's satisfaction was appreciate.

Keywords - Fuzzy Logic, Internet Performance, Internet Users' Satisfaction, Performance Indicators

I. INTRODUCTION

Many fields of study use Fuzzy logic, but few in the area of Internet performance focusing on user's satisfaction. Though many frameworks for monitoring Internet performance exist, none specifically addresses user's satisfaction that the researcher is aware of, while measuring internet performance with several key performance indicators. A method of drawing out user's satisfaction measures at the core of the measure of performance from hard metrics was proposed. These include a decision support system incorporated with multiple performance dimensions. (Hamidi, (2009); Liston, (2004) and Smith, (2003)).

Shrout& Fleiss (1979) used fuzzy logic to measure performance bringing out human reasoning and satisfaction. The world is full of perception and conceptions; hence this had made it difficult to measure the immeasurable by hard metric alone. A fuzzy logic rule such as human-readable rule allows the connection of a meaningful strategic plan to a performance measurement of satisfaction for a useful decision support making.

The domain knowledge of experts based on measurement of satisfaction was modelled using fuzzy logic. Besides the satisfaction measurement method developed, quantitative metrics method was also added. Precisely, a modern approach to performance measurement using fuzzy logic is the main objective of this study. (Ahmad & Asri 2013). The model captures the satisfaction measures and all the multiple dimensions' measurement. The focus was to measure internet users' satisfaction performance. (Schochet& Chiang, 2010). The ultimate objective measured performance satisfaction using fuzzy logic.

II. RELATED WORKS

The decision-making process associated with Internet Performance satisfaction, using a fuzzy logic model as a need for measuring the Internet can improve the system. This method focused on users' satisfaction perspective. Several authors had made use of the fuzzy logic model to evaluate performance (Semerci, (2004); Mahfouf, (2001); Yilmaz, Eyercioglu&Gindy (2006); Yadav and Singh (2012)).

In Yadav & Singh (2011), built performance indicators by capturing a performance dimension using soft measures extracted from the database. (Srour, Mahr and Weerdt, 2006). Soft computing techniques provided useful solutions to the problem of uncertainties and vagueness. (Kumar, 2013; Yandav and Singh, 2012; Singh, Gupta, Meitzler, Hou, Garg, Solo, & Zadeh, 2013). This led to the satisfaction for each performance indicator extracted from the database using fuzzy logic.

Moran, (2015) used the fuzzy logic model to handle the academic qualitative uncertainty of fine distinctions among teachers whose performance falls in a broad middle range. While in a supply chain, Gilberto, Ganga and Capinetti, (2011) used Supply Council Operations Reference (SCOR) model to predicts performance based on fuzzy logic. Shanthi, Bogale, & Ali, (2018) confirmed that in a supply chain management, the fuzzy logic technique is another influential technique to assess subjective parts of execution.

In this paper, the performance was measured using a fuzzy logic controller model as a robust in a supply chain performance. The quantitative variable was transformed into linguistic terms for vendors for easy understanding approach. The model was used to solve a difficult problem using quantitative approaches. Applying the fuzzy logic approach, vendors' performance was measured by the gathered data

created on the five proportions of Service Quality model through a checklist. Gurrea, Alfaro-saiz, Rodríguez, &Verdecho, (2014) (Gurrea et al., 2014) surveyed on subjective performance measurement and discovered the most covered area is uncertainty bounding. Other scholars made good use of fuzzy logic rules to define their interface of choice. Mitra, (2008) define the rules as control rule of a database of a system while Banks and Hayward (2001), providing isolation and further parallelism using the rules as membership functions. The fuzzified inputs that took place at the inference engine were used to calculate consequent form the premises. (Wang, 1997).

ingpurwala& Booker (2004), introduce the rules of dealing with the uncertainty associated with classification to forego form. Imprecise concepts are present in fuzzy logic such as "slow", "quiet" and "very" set as values in linguistic form and assessed by value in the unit interval (0 1) described with the aid of a membership function. (Dadone (1997), Sharma, (2010) and Jang and Gulley (1997)).

For the rapid transit system, Control, Raghunath, &Thirukumaran, (2019) specifically used the instantly synchronized routing technique with a novel fuzzy logic-based fault tolerance. The discussion on the result stored was based on traditional and groundbreaking teaching methods. While, Martinez-Vazquez (2019) using fuzzy logic, developed a graduate profile benchmark by collecting parameterization of text using surveys information technology concepts. The paper showed how the professional outputs preconceived correlates to the degree to which established academic practice at the host institution.

(Naji& Ahmed 2018) through multiple-criteria, decision-making method used an aggregated elementary measurement to measure maintenance performance correctly and identify suitable performance indicator. Kesarwani and Khilar (2019) used fuzzy C-means cluster to calculate the trust values of cloud users and cloud environment service providers based on the behaviour to evaluate instruments such as total requests, bad requests, unauthorized requests, and bogus requests. The access permission of users and the trust values of service users' control was controlled by cloud access service. Association of Job satisfaction of bank employees (n¼300) with the quality of work-life factors was explored by Dhamija, Gupta and Bag (2019) using Multi-stage sampling technique to collect primary data. The unconducive work environment confirmed the negative association. With Srour et al. (2006), the satisfaction of employee, customer and society was measured by incorporating fuzzy logic. The model showed the potential for a universal evaluation applied to a freight logistic environment to measure the performance of disparate decision support systems. The researcher observed that there was a limitation with the existing domain, hence multiple performance dimensions using fuzzy logic as a significant implication for the evaluation framework for measuring Internet performance. The focus on users' perception of measuring user satisfaction was missing at the core of the model (Baldo and Zorzi, 2009). Therefore, the proposed model draws out the users' satisfaction measures from hard metrics into the method.

Even though, Baldo and Zorzi, (2009) proposed a method that drew out users' satisfaction measures from hard metrics of the core model, while the limitation was on not measuring user satisfaction from users' perception.

III. METHODOLOGY

A fuzzy model was used to measure the Internet performance based on the users' satisfaction. while the General Liner Model (GLM), was used for univariate procedure interaction of the performance indicator. Each of the five performance indicators rated its experience with one performance indicator when considering satisfaction, and carefully considering fuzzy set for both. To merge all the multiple fuzzy measures, fuzzy rules were defined as "fuzzified" metrics after fuzzy set into a single fuzzy measure of satisfaction. The aggregate score was measured and the fuzzy result was translated into a quantifiable score using the fuzzy logic process, defuzzification as the final stage. The quantifiable representation of satisfaction moved from perception of satisfaction was enabled for internet users. The two membership functions method used were gaussmf and Sugeno fuzzy inference. The Sugeno membership functions output is linear or constant. While Sugeno fuzzy a demonstrative model rules have the form, While the representative form for a Sugeno fuzzy model rule has final Output = $\frac{\sum_{i=1}^{N} wizi}{\sum_{i=1}^{N} wi}$

This computes all rule outputs of the weighted average. N is the number of rules Sugeno model has an output of a zero-order level(a=b=0) constant z. where z = ax + by + c as output, if input 1and 2 is = to x and y respectively, where Wi = F1(x)F2(y) Add Method, the membership functions is $F_{1,2}(.)$

The overall internet performance made use of trapezoidal (trapmf) membership function with a truncated triangle curve that had a flat top. The advantage of a simplicity straight membership functions is;

$$\mu_i(x) = \begin{cases} 0, & x<a \\ \frac{x-a}{b-a} & a \le x \le b \\ 1 & b \le x \le c \\ \frac{d-a}{d-c} & c \le x \le d \\ 0, & x> d \end{cases}$$

A popular method for specifying fuzzy sets gave advantage of gaussmf membership function curve being smooth and nonzero at all points. (Matlab, 2009, 15, 3). The architecture of the fuzzy model is shown in Figure 1.

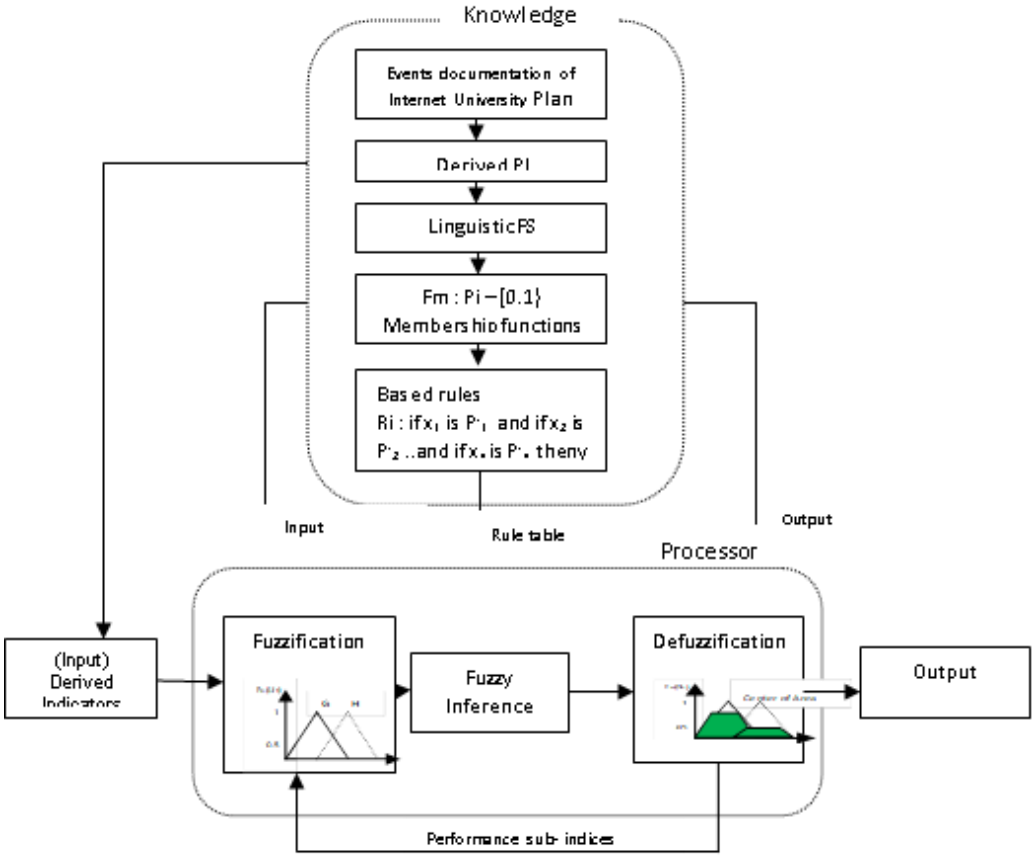

Figure 1: The architecture of the fuzzy model

A linguistic variable is given to each membership function for the translations. Satisfaction was verbally descripted as a quantified hard metric that captured each dimension/indicator in a unique manner due to the translation. Very Good (VG)", "Good (G)", "Average (AV)", "Bad (B)", "Very Bad (VB) were the state of input described to help in expressing its relationship. The assumption set was based on very bad was worse than bad, average was better than bad, good was better quality than average and very good was preferable than good. The linguistic variable could help users to rate their satisfaction based on the Internet's performance.

IV. RESULTS

The modelling of value of a scale predictor of a dependent was done by GLM univariate procedure. This modelling was based on its relationship to categorical of the scale variable.

Distance (Binned)	Cluster Number	Upload (Binned)	Cluster Number	SessionTime (Binned)	Cluster Number
5(VB)	11013	<= 223786(VB)	8563	<= 851(VB)	11666
4(B)	11284	223787 - 1025370(B)	12305	852 - 1931(B)	11705
3(AV)	10460	1025371 - 2670096(AV)	12341	1932 - 3505(AV)	11658
2(G)	7277	2670097 - 7202424(G)	12407	3506 - 6293(G)	11496
1(VG)	17880	7202425+(VG)	12298	6294+(VG)	11389

Table 1: Two-step Cluster Number of Factors Between-Subjects

The users among the wireless network were 39891and for fibre optics network was 18023. The distribution of users within a quality of the network based on the distance, upload and sessiontime is shown in Table 1.

Types	Df	Mean Square	Sum of Squares of type III	F	Significant.
SessionTime	4	24.930	99.720	104.599	.000
Distance	4	.319	1.277	1.339	.253
Upload	4	943.332	3773.329	3957.945	.000
Network	1	.295	.295	1.236	.266
Network * distance	4	.936	3.742	3.925	.003
Network * Upload	4	.541	2.163	2.269	.059
Network * SessionTime	4	1.320	5.280	5.539	.000
Network * distanceb * Upload	4	1.337	5.349	5.610	.000
Network * distanceb * SessionTime	4	.888	3.551	3.725	.005
Network * Upload * SessionTime	16	.496	7.940	2.082	.007
Network * distanceb * Upload * SessionTime	16	.494	7.907	2.073	.007
distanceb * Upload	16	.643	10.289	2.698	.000
distanceb * SessionTime	16	.782	12.515	3.282	.000
distanceb * Upload * SessionTime	64	.525	33.569	2.201	.000
Upload * SessionTime	16	17.109	273.751	71.786	.000
Error	57736	.238	13760.733		
Total	57914		3001997.751		

Table 2: Dependent Variable, Log Download, Tests of Between-Subjects Effects

The effect of download log test between subjects: Adjusted R Squared = .786 (R Squared = .787)

The Table 2 showed that network and distance on download (output) had no significant effect while the main significant effect on output was input and time.
It was observed that when the four variables were combined, it had effects on the output. While the internet satisfaction output was not affected by the standalone, network and distance. Above all, apart from interactions of network and input, all interactions of the independent variables were significant.

Network	Distance (Binned)	AcctInputOctets (Binned)	AcctSessionTime (Binned)	Mean	Std. Deviation	N
Fiber	1(VG)	7202425+(VG)	6294+(VG)	8.5710	.60317	943
		<= 223786(VB)	3506 - 6293(G)	4.6942	1.23762	13
	5(VB)	<= 223786(VB)	6294+(VG)	5.6374	.49612	11
		<= 223786(VB)	<= 851(VB)	5.3853	.72687	1748
Wireless	1(VG)	7202425+VG	6294+(VG)	8.4766	.56384	2110
		223786(VB)	<= 851(VB)	5.3890	.76244	1836
	5(VB)	7202425+VG	6294+(VG)	8.4614	.60002	1115
		<= 223786(VB)	<= 851(VB)	5.3721	.66148	1656

Table 3: Interaction between dependent variable and independent variable

Table 3 shows the condition when the network strength is very good (VG) and when the network strength is very bad (VB) for fiber optics and wireless network. The means and the standard deviation showed the efficiency of the network during these conditions.Table 3 also shows the summary for good network strength.
The Performance indicators, (maintenance) the five constructed functions were N1, vg(x), N1, g(x), N1, av(x), N1, b(x), N1, vb(x). The total hours the functions took for network administrator's maintenance time, normalized by the total number of hours the network administrator's maintained, (x), and returned the value of the function: N1, vg, N1, g, N1, av, N1, b, N1, vb. This value Very good", "good", "Average", "Bad" or "very bad", represents the degree that x falls into the verbal categories, respectively. Similarly, the membership functions, N2(x) and N3(X), were created for the rest of the two network administrator Performance indicators: the problem and the solution of network administrator, respectively. The rules were constructed as follows shadows:

1. If (maintenance is VG AND problem is VG AND solution is G) OR (maintenance is AV AND problem is G AND solution is good) OR (problem is G AND solution is good), then the user is satisfied.
2. If (maintenance is B OR solution is B OR problem is VB) OR (problem is B OR solution is bad) then the user is unsatisfied.

Mathematically, these rules become:

1) Satisfied: = max {min {N1, b(x), N2, b(x), N3, g(x)}, min {N1, b(x), N2, b(x), N3, o(x)}, min {N1, b(x), N2, b(x)}}
2) Unsatisfied: = max {max {N1, g(x), N2, g(x), N3, b(x)}, min {N1, g(x), N2, gx)}}

To define a level of contentment with the system's performance, the users' experience is map with the chosen performance indicators into two sets.

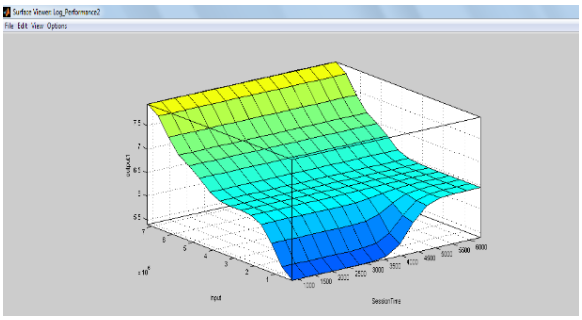

Figure 2:Input and Sessiontime variables of Surface viewer

In figure 2, the effect on the download was the distance. The surface view gave a clear picture of how the performance indicator represents the users' satisfaction. The blue represents very dissatisfactory (5); the light blue represents dissatisfactory (6); the light green represents satisfactory value (7); while the yellow colour represents very satisfactory (8). As the download increases, the upload increases. At a very bad download from a distance above 6, there was a rapid increase in download from a distance below 6. This suggests the download improves when the distance is closer. The download could be very good even when the upload was very bad.

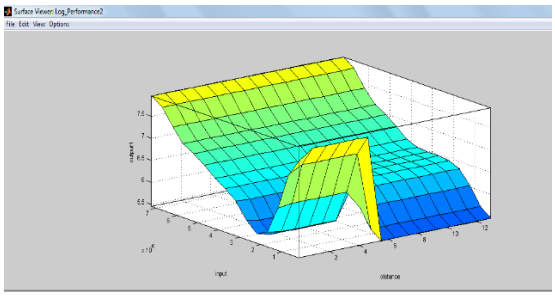

Figure 3: Input and distance variables on Surface viewer

In figure 3, Even when the distance was not okay, the download could be very good but at good distance (0-4) with low sessiontime, download was very bad. Users are more satisfied across download because of the satisfactory (7) level at the higher sessiontime. Hence, the sessiontime increased as the download increased. While session time had no significant effect on the distance. When the download is satisfactory, its possible users have been spending more time browsing and they have longer sessiontime. This also suggests that the download would be very dissatisfactory (5) despite the fact that distance is good and, the sessiontime is not satisfactory,

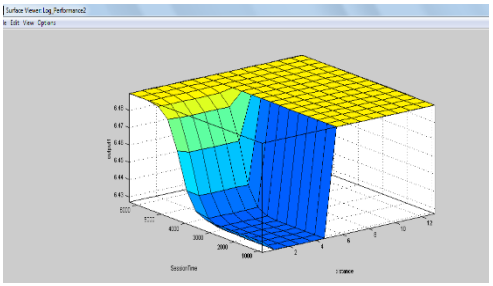

Figure 4 Sessiontime and distance variablesof a Surface viewer

In figure 4 the download dissatisfactory (6) revealedat sessiontime above 4000 and the download increase to a very satisfactory level (8), and at below 4000, the download was very dissatisfactory (5). The upload started increasing at 2 x 10^6even when the download was satisfactory (6 -8) the upload was very good, but the sessiontime was very bad.

The paper's focus was to examine the effect of distance on the internet performance from user's satisfaction. The data analysis presented that the performance of the internet can be affected by the location of the nodes but from the different analysis of the surface view of the fuzzy logic it was discovered that the performance was poor. The download was very satisfactory at the very good distance, even when the sessiontime was low, when considering the view of distance and upload. This was in agreement with Joumblatt (2012), who examined the relationship between networking environments and network performance by comparing the data rate across pairs of environments and the distributions of RTTS. It is good to know that it was possible that user population has different environments such as work, coffee shop or home to connect from different networking environments.

For a single user in a network performance, Statistical differences showed that network performance degradation do not always show the cause of user dissatisfaction but basically the presence of different networking environments or application mixes.

These outcomes demonstrated that Statistical differences of a user in network performance indicate the networking environments and different mixture of applications. The user dissatisfaction caused by degradations is not always indicated in the presence of network performance.

V. CONCLUSION

The four independent variables (performance indicators, network, distance, input and sessiontime) showed they were all significant variables using the univariate procedure interaction of the General Liner Model (GLM). The population of users had a significant effect on the internet performance even location of the nodes also has an effect on Internet performance from the discovery. The highest effect

on sessiontime was loss of service that cause termination. Moreover, the result proved that download is satisfactory, when users spend more time browsing it results to longer sessiontime. The performance indicators with multiple performance dimensions related to users' satisfaction were identified based on the findings.

Users' satisfaction was derived by utilizing fuzzy logic as a means, and it generated a highly manageable technique for measuring the indicators affecting performance. The research findings have far-reaching implications for the University of Ibadan's internet performance improvement. The study recommends; quarterly client survey should be conducted by the University IT unit to determine users' satisfaction with their services. While the internet users should have participated in monitoring the performance of the internet and in return provide feedback. Hence service quality can be improved following constant adjustment. If the specific recommendations are adopted, improvement of internet performance will increase users' satisfaction. The study used fuzzy logic based on multiple performance dimensions and considered users' satisfaction to model and measure Internet performance. A benchmarking model of a University suggested for a future research.

REFERENCES

[1] Ahmad, H. & Asri, N. "In pursuing better academic result in university: A case of fuzzy logic analysis". In proceeding of the 2013 International Conference on Education and Modern Educational Technologies, 98-102.2013.

[2] Baldo, N. and Zorzi M. " Cognitive network access using fuzzy decision making", IEEE Transactions on Wireless Communications, Vol. 8, Issue 7, pp 3523-3535.2009.

[3] Banks W. and Hayward G. "Fuzzy Logic in Embedded Microcomputers and control systems", Byte Craft Limited, Waterloo, Ontario, 2001.

[4] Control, J., Raghunath, K. M. K., &Thirukumaran, S. "Fuzzy-based fault-tolerant and instant synchronization routing technique in wireless sensor network for rapid transit system", 1144. https://doi.org/10.1080/00051144.2019.1643963.2019.

[5] Dadone P. "Design optimization of fuzzy logic systems". Ph. D thesis, Virginia Polytechnic institute and state University.2001.

[6] Dhamija P., Gupta S., and Bag S. Measuring of job satisfaction: the use of quality of work life factors. https://doi.org/10.1108/BIJ-06-2018-0155, 2019.

[7] Gilberto Miller Devo´ s Ganga G. M.D. and L. C. R. Carpinetti"A fuzzy logic approach to supply chain performance management". ScienceDirect journal homepage: www.elsevier.com/locate/ijpe Int. J. Production Economics 134 (2011) 177–187 Received 27 August 2010 Accepted 17 June 2011 Available online 20 July 2011

[8] Gurrea, V., Alfaro-saiz, J., Rodríguez, R., &Verdecho, M. "Application of fuzzy logic in performance management": a literature review, 2, 93–100.2014.

[9] Hamidi. J. K. "Application of Fuzzy Set Theory to Rock Engineering Classification Systems: An Illustration of the Rock Mass Excavability Index". Rock Mechanics and Rock Engineering. Vol. 42, Issue 6. 2009.

[10] Jang J.S. R. and Gulley N. "Matlab Fuzzy logic toolbox Fuzzy Logic Toolbox User's Guide", The MathWorks, Inc. Publisher.1997.

[11] Joumblatt D. Z. "Prediction of User Dissatisfaction with Internet: A Performance at End-Hosta" submitted in partial fulfilment of the requirements for the degree of Doctor of Science of the University Pierre et Marie Curie.2012.

[12] Kesarwani, A., &Khilar, P. M. "Development of trust-based access control models using fuzzy logic in cloud computing". Journal of King Saud University - Computer and Information Sciences, (xxxx).https://doi.org/10.1016/j.jksuci.2019.11.00. 2019.

[13] Kumar, O.S. "A fuzzy based comprehensive study of factors affecting teacher's performance in higher technical education". International Journal of Modern Education & Computer Science, 5(3), 26-34. doi:10.5815/ijmecs.2013.03.04.2013.

[14] Liston J.R. "Measuring User-Perceived Internet Performance in Multiple Locations". A Thesis Presented to the Academic Faculty in Partial Fulfilment of the Requirements for the Degree Doctor of Philosophy College of Computing Georgia Institute of Technology July 2004

[15] Ojebode M. "An Intelligent Benchmarking tool for Measuring Users' Satisfaction with the Internet Performance", a Ph. D Thesis in the Department of Computer Science, University of Ibadan. 2014.

[16] Mahfouf, M. "A survey of fuzzy logic monitoring and control utilization in medicine", Artificial Intelligence in Medicine. Volume 21, pp. 27-42. 2001.

[17] Mitra. A. K., "Fog forecasting using rule-based fuzzy inference system", Journal of the Indian Society of Remote Sensing. Volume 36, Issue 3, pp. 243-253. 2008.

[18] Moran A.J. "A fuzzy logic approach to teacher performance measured by principal evaluations", A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education in Curriculum and Instruction Columbus State University Columbus, GA.2015.

[19] Naji, M. A. & Ahmed M. "Fuzzy Performance Measurement System for the Maintenance Function". Matec-Conferences.Org, 00012, 10–13. 2018.https://doi.org/10.1051/matecconf/201820000012

[20] Martinez-Vazquez, P. "Critical analysis of a higher education benchmark via fuzzy logic". Higher Education Pedagogies, 4(1), 119–135. 2019. https://doi.org/10.1080/23752696.2019.1640630.

[21] Schochet, P.Z. & Chiang, H.S. "Error rates in measuring teacher and school performance based on student test score gains". Retrieved from http://ies.ed.gov/ncee/pubs/20104004/.2010.

[22] Semerci, Ç. "The influence of fuzzy logic theory on students' achievement". Turkish Online Journal of Educational Technology, 3(2), 56-61.2004.

[23] Shanthi, L., Bogale, B., & Ali, M. "Survey on Fuzzy Logic and Subjective Performance Evaluation of Supply Chain Management", 3(3), 636–642.2018.

[24] Sharma, V. "Optimized Fuzzy Logic Based Framework for Effort Estimation in Software Development", International Journal of Computer Science Issues (IJCSI). Volume 7, Issue 2, Number 2, March 2010. ISSN1694-0784

[25] Shrout, P. & Fleiss, J. "Intraclass correlations: Uses in assessing rater reliability". Psychological Bulletin, 86(2), 420-428.1979.

[26] Smith, P. "Network Monitoring: A Practical Approach IT Services", University of Windsor,2003. download March 21, 2010

[27] Srour J., Mahr T. And Weerdt M. D. "Performance Evaluation within a Networked Enterprise: Balancing Local Objectives and Network Relations", 2006. http://www.st.ewi.tudelft.nl/~mathijs/publications/srour06.pdf download 13 October, 2012

[28] Wang L. "A course in Fuzzy systems and control", Prentice-Hall, Englewood Cliffs, New Jersey, ISBN 0 13 (540882), 2. 1997.

[29] Yadav R.S. and Singh V. P. "Modeling Academic Performance Evaluation Using Fuzzy C-Means Clustering Techniques", International Journal of Computer Application (0975 – 8887) Volume 60 – No 8. December 2012

[30] Yadav, R. S. & Singh V. P. "Modeling Academic Performance Evaluation Using Soft Computing Techniques: A Fuzzy Logic Approach", International Journal on Computer Science & Engineering (IJCSE). ISSN: 0975-3397. Vol. 3 No. 2, February 2011. 676

[31] Yilmaz, O., Eyercioglu O. &GindyNNZ"A user-friendly fuzzy-based system for the selection of electro discharge machining process parameters", Journal of Materials Processing Tech., Journal of Materials Processing Technology 172 (3), 363-371. 2006.

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STUDY OF PROBLEMS IN THE OPERATION OF THE AGRICULTURAL MACHINERY PARTS MANUFACTURING INDUSTRY (SME_S) OF THAILAND DURING THE ECONOMIC RECESSION

[1]WEERAKARJ DOKCHAN, [2]PANICHA DOKCHAN, [3]THEPNARINTRA PRAPHANPHAT

[1]Lecturer ,Master of Engineering Program (Engineering Management) Siam University ,
[2] World pumps (Thailand) Co., Ltd.[3] Lecturer, Head of Program Industrial Education (Industrial Engineering) RMUTSB Nonthaburi Centre,
E-mail: [1]wee@wpthai.com ,Email: [2]pump@wpthai.com, [3]thepnarintrap@gmail.com ,

Abstract - The purposes of this research were : 1)to study in the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession and ,2) to study the problems in the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession. Population in this study consisted of 115 company managers or managing directors, of which 88 were from the small size and 27 were from the medium size industry. The data were analyzed to find percentage, arithmetic mean, and standard deviation with independent sample T-test at the statistical significance .05. The results showed that the SMEs agricultural machinery manufacturers of Thailand reported high problems in every aspect. When compared the problems on basic factors in running the business, it was found that there was no statistically difference at .05 in managing of the SMEs agricultural machinery manufacturers. However, there was a statistically significant difference between the SMEs agricultural machinery manufacturers on the aspect of policy and services of the government. The problems reported by the SMEs agricultural machinery manufacturers were the services on public tap water and the problem on the services on public tap water,factory power system and the problem on politic , stability of the country and stability of the countrywith the economic recession.

Keywords - Study of Problems, Agricultural Machinery, Parts Manufacturers, Industry(Sme_s), The Economic Recession

I. INTRODUCTION

The main strategy of the Department of Industrial Promotion during 2018-2019 consists of :1) the strategy on the development of SMEs potential ,2) the strategy on the development of the community enterprise potential, 3) the strategy on the enterprise promotion and, 4) the strategy on creating factors and system supporting the industrial business [1]. The main policy of the government is to drive the economy of the country by developing the SMEs. As a result, over 95 % of the economic development fund was put on the development of SMEs. With the high competition in business world, Thailand has to change its industrial structure in order to increase the potential on products and services.

This study focused on the problem of the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand to suggest some guidelines for the solution.[5]-[6]-[7]-[8], and [9]. Some problems can be defined as follows: 1) the lack of cash flow in producing machinery part or the whole product during waiting for selling season or distributors ,2) agricultural machinery is seasonal ,3) lack of suitable machinery design ,4) lack of production standard, e.g. the spare part needs adjustment before replacing , 5) lack of staff morale, i.e. the entrepreneurs do not pay the importance on their staffs and , 6) lack of production information, e.g. most factories do not realize their production cost[10]-[11]-[12]-[13], and [14]. With the problems and the condition of the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand mentioned above, the researcher had an idea to investigate on in-depth problems to find guidelines for the solution on running the business.

II. METHODOLOGY

A. Purpose of the research –

1) to study in the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession and ,2) to study the problems in the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession.

B. The study variables-

1. Independent Variables , including conditions in the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession and ,2.dependent Variables the problems and needs in the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recession.

C. Population/Sample-

The population in this study is that the operator or manager of the establishment of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand During the Economic Recessionconsisted of 115 company managers or managing directors, of which 88 were from the small size and 27 were from the medium size.

D. Data collection-

1.Researchers sent questionnaires by mail. And electronic mail Attach the requested cooperation from respondents to the Managing Director or Managing Director in the manufacture of 115 company managers or managing directors, of which 88 were from the small size and 27 were from the medium sizeand ,2.Brings a questionnaire that was returned for a total of 89cases (77.39per cent) to analyze the data. statistical computer program[15].

E. Data analysis-

1.Analysis on the general state of the industry to produce the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand Styles Questionnaire, a checklist will be used for frequency and then summed up as the percentage [2]-[3], and [4].

2.Analysis on operating results of the business of the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand. The appearance of a questionnaire checklist will be used for frequency (Frequency) and then summed up the percentage [4].

III. RESULTS

According to the general information of thethe business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand , it was found that most of them were small size industry operated by male entrepreneurs with the age between 30-50 years old and bachelor degree education or over. Most of their products included wheel ploughing machines and mini tractors. They had produced the products for about 3-10 years to market in the country. The business tendency in 3-5 years was declining. Most business running depended on loaning. Other problems in running the business were presented in Table I.

Problems in running of the the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry.	Mean	S.D.	Level
1. Raw materials	3.99	0.59	High
2. Production management	3.98	0.58	High
3. Policy and services of the government	3.95	0.49	High
Total	3.97	0.52	High

Table I : Problems in running of thethe business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand.

It could be seen from Table I , that the overall problems were in high level. When considered in details, the highest problem was on raw materials , followed by production management and then policy and services of the government.

Table II The level problem in the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand as a whole ,the size of enterprises, parts and equipment all sorts of benefits in the plant.

The level problem in the the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand	small size		medium size		t	p
	μ	σ	μ	σ		
1. Raw materials	3.98	0.57	4.01	0.62	10.002	0.000*
2. Production management	3.97	0.64	4.00	0.67	10.777	0.000*
3. Policy and services of the government	3.94	0.79	3.97	0.78	9.998	0.000*
Total	**3.9**6	**0.**65	3.99	**0.7**0	**1**0.250	**0.000***

It could be seen from Table II,when compared the problems on basic factors in running the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand , it was found that there was no statistically difference at .05 in managing of the small and medium size agricultural machinery manufacturers. However, there was a statistically significant difference between the small and medium size agricultural machinery manufacturers on the aspect of policy and services of the government. The problems reported by the small and medium size agricultural machinery manufacturers were the services on public tap water,factory power system and the problem on politic , stability of the country and stability of the country with the economic recession.

When compared the problems on basic factors in running the business in Table II , it was found that there was no statistically difference at .05 in managing of the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand . However, there was a statistically significant difference between the small and medium size on the aspect of policy and services of the government. The problems reported by the small and medium size were the services on public tap water,factory power system and the problem on politic , stability of the country and stability of the country with the economic recession.

IV.DISCUSSION &CONCLUSION

1. Raw materials

The finding on this aspect was on raw material quality inspection which supported the report by the Journal of Economic Industry mentioned the

production standard or good manufacturing practice (GMP) including decision process and assessment on product hazards starting from raw materials, production process, transportation till reaching the consumers as well as the production process to reduce or get rid of the cause of consumer hazards such as sanitation of factory location and production plant 1) Production machine 2) production process control 3) sanitation 4)maintenance and cleanliness[19]-[20]-[21]-[22] and ,[23].

2 Production management

Problems were on the development of the workers' skills, lack of experience workers, workers' turnover, efficiency of the machine, production steps, product quality control, machine maintenance, and cost of the machine. The findings were congruent with the work [1] and, [18].

3. Policy and services of the government

The problems were on the promotion and financial support from the government, public water, and information provided by the government sector. They were congruent with the report on the bull economic challenge, market opportunity: Trend of Economy and Industry mentioned that Thai SMEs faced several problems especially good governance, lack of business knowledge including management, marketing, product development and vision. To support SMEs, the government should firstly focus on the country's strategy to increase the total competitive potential. In addition, the government should help by reducing work redundancy with the continuing follow-up evaluation [24]-[25]-[26]-[27] and ,[28].

SUGGESTION

1. The government should provide low interest loan with longer term of payment and more easy and flexible loan conditions. This can help liquidity of the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailand in particular investment such as machine, raw materials, and production management.
2. The government should support the business of manufacturing the Agricultural Machinery Parts Manufacturing Industry (SMEs) of Thailandby providing more information about the industry to create competitiveness by improving the product quality to compete in the global market for immediately.

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REFERENCES

[1] Trade Policy and Strategy Office Ministry of Commerce, Ministry of Commerce.2019. "Export in first half (January - June)".
[2] Tanin Slapacharu.2017. "Research and statistical analysis with SPSS and AMOS". 17th. Nonthaburi: S. R. Mass Printing Products Co., Ltd., BKK.
[3] Best, John W.1981. "Research in Education".NewJerey :prenice-Hall,.
[4] Likert,Rensis. 1999."The Method of Construction and AttituteScale ,ReadinginAttituterk". Wiley &Son.Theory and Measurement. New York,.
[5] Abhisek Pansuwan.2003. "SMEs in the western region". Lecture notes,pp.28-30.
[6] Alek SandarKaraev, S.C.LennyKoh and Leslie T.Szamosi.2007. "The Cluster approach and SME Competitiveness" : a Review.Journal of Manufacturing Technology Management,pp.14-19.
[7] AyseSaka-Helmhout and Elif Karabulut.2006. "Institutional Barriers to Entrepreneurship in Clusters.Evidence" : from the Turkish Textile. Sector.International Journal of Emerging Market, ,pp.27-29.
[8] PreechaThivashut.2002."Intelligence activities inspired recipes".Guide small business owners. Bangkok :JareonwitPrinting,THA ,p. 49.
[9] "The challenge of rising economic and business opportunities". 2004. : 133.Economic and Industrial Trends in THA,pp.45-46.
[10] "The Office of Factory Registration" . 2018.Departmentof Industrial Works, Ministryof Industry,.
[11] "The Office of shrimp Economics".2018.Incooperation with the Customs Department,THA,.
[12] "The Office of Industrial Economics".2017. Ministry of Industry,THA,.
[13] "TheOffice of frozen shrimp Economics Incooperation with the Customs Department".2019 [Online]. Retrieved from http / / www.oae.go.th.[15 Aug],THA,.
[14] "The Office of Industrial Economics Ministryof Industry".2016.Economic Activity Report - 1st Quarter labor Jan- Mar,.
[15] W. Paul Vogt.2005. "Dictionnary of Statistics &Methodology".3rd ed..London : SAGEPublications, pp.10-27.
[16] K.M.Bartol, and A.Srivastava. 2002."Encouraging Knowledge Sharing :The Role of Organizational Studies",vol. 9,no.1,pp.64-76".[.L.P.Victoria.2011. "Community based disaster management in the Philippines : Making a difference in people's lives". Retrieved November 21,, from http //www.preventionweb.net/files/773_8363.pdfE.Kharaishvili, M.Chavleishvili, Hazelnut.2008.
[17] "Business Development Possibilities and Perspectives in Georgia", Agroinfo (supported by USAID), # 1, Tbilisi,pp.20-21.
[18] Office of International Trade StrategyDepartment of Export Promotion. 2014. Thai exports during the 5 months of 2014. [Online]. Accessed from https: // www.thailandexhibition.com. Retrieved on 27 June.
[19] Office of Industrial Economics. 2014. Summary of Industrial Economics Quarter 1 (January - March 2014). [Online]. Access from https: // www.oie.go.th. Retrieved on 18 March 2014.
[20] Journal of Mold. 2014. Move the army "high mold" to strengthen the hub 7 industry. Year 26, No. 3 July - September.
[21] Department of Industrial Promotion. 2017. Mold Technology Mold Industry Articles. [Online]. Accessed from http // www.ryt9.com. Retrieved on 5 April 2017.

[22] Industry Information Group Office of Information and Communication Technology Ministry of Industry. 2015. Thai mold direction. [Online]. Accessed from http // www.ocsb.go.th. Retrieved on 15 February 2015.
[23] PisalMingmalaiRak. 2010. Development of competitiveness and capability of the plastics industry: a case study of connector manufacturing companies. Master of Science Program Industrial Competitiveness Development Program, King Mongkut's University of Technology Thonburi.
[24] WorawutChiranurangsi. 2010. Developing strategies to increase value in the plastics industry. Master of Science Program Industrial Competitiveness Development Program King Mongkut's University of Technology ThonburiPhisanMingmalaiRak. 2010. Developing the potential and competitiveness of the plastic industry: a case study of connector manufacturing companies. Master of Science Program Industrial Competitiveness Development Program, King Mongkut's University of Technology Thonburi.
[25] PhetRungsawang. 2010. Enhancement of plastic injection molding efficiency Case study: PB Pipe (Thailand) Company Limited. Master of Industrial Program Department of Industrial Management King Mongkut's University of Technology North Bangkok
[26] InthanonSiokesapruk. 2009. Improving overall efficiency of machinery in the plastic sheet manufacturing industry. Master of Science Program Industrial Management Program, Chiang Mai University.

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DISAGGREGATION ESTIMATES OF LAND AREA FOR AGRICULTURAL USE AND THE VARYING MARGINAL EFFECT OF ITS AUXILIARY INFORMATION, AN IMPLEMENTATION OF ENTROPY BASED – DISTRIBUTIONALLY WEIGHTED REGRESSION ON BODETABEK'S LAND USE

[1]RAHMA FITRIANI, [2]ENI SUMARMININGSIH

[1,2]Department of Statistics University of Brawijaya, Department of Statistics University of Brawijaya
E-mail: [1]rahmafitriani@ub.ac.id, [2]eni_stat@ub.ac.id

Abstract - Analysis on the driving factor of land use change must be based on the individual level data, which are rarely available. An ecological fallacy would be made if an inference is made based on the highly aggregate land use data. Disaggregation technique to estimate the data at the lower/individual level must be implemented.Among many developed techniques, the study uses the GCE - DWR technique.It is chosen for its high accuracy and its capability of accommodating the heterogenous nature of land use.The objective of this study is to estimate, and to mapdistrict level land area of agricultural use based on regional data, using GCR - DWR technique.The analysis regarding the varying marginal effect of the distance to the central Jakarta on the agricultural land use is made afterwards. The disaggregation estimates are relevant to the reality of land use data in the area. The varying marginal effect indicates less domination of central Jakarta on the land use of districts in the proximity of other (smaller) urban centrals.

Keywords - Ecological Fallacy; Land Use; Entropy Based; Disaggregation Technique.

I. INTRODUCTION

Land use is the product of individual's or landowner's decision [1]–[5]. Therefore, studies regarding the driving factors of agricultural land conversion must be conducted at the individual level. However the information at the level is rarely available, mostly due to the high cost of data collection [6]. The data is commonly presented as aggregation of several individual data within the same administrative region. This situation has been observed in Indonesia. Studies about BoDeTaBek's (the fringe regions of Jakarta, the capital city) land use and land value [7], [8] are based on the aggregated regional level data provided by Government agencies such as Indonesian Central Bureau of Statistics (Biro Pusat Statistik - BPS).

When the nature of the individual unit is inferred based on the aggregate data, researcher has made an Ecological Inference [9], [10]. It leads to an Ecological Fallacy [10] due to the mismatch between the available data and the target unit. Spatial disaggregation techniques have been developed to anticipate this issue. The technique applies certain algorithm on the aggregate data to estimate the data on the disaggregated level. There are various techniques which depend on the assumptions, methods and data demand[11].

Among the available techniques, Peeters and Chasco[10], Papalia[12] and Papalia and Fernandez-Vazquez[9] propose the use of auxiliary variable(s) at each level, by assuming linear dependence of the target variable on the chosen auxiliary variable. Both studies, propose a "Distributionally Weighted Regression (DWR)" concept, by applying some weight to the unobserved disaggregated level variable. It is defined as a function of the auxiliary variable(s), and the sum of the weighted variables at the disaggregated level must equal to the observed corresponding aggregate variable. This concept accommodates the spatial dependence and heterogeneity. It is a Geographically Weighted type of regression (GWR), in which the parameter value of the functional form of the auxiliary variable varies for each aggregate or each disaggregate unit. It suffers a problem when there are more unknown parameters than the available data. But it provides more informative since the marginal effect of the auxiliary variable on the response variable is location specific. Common estimation methods (e.g. MLE or GLS) are no longer appropriate. They use the Generalized Cross Entropy (GCE) instead.

Fitriani and Sumarminingsih[13] modified the GCE technique in the context of DWR, proposed by Papalia and Fernandez-Vazquez[9], and Peeters and Chasco's [10]. In their paper, the technique is specifically defined for disaggregating land area for agricultural use. They modify the initial value of the entropy maximization procedure and use a simulation study to confirm the accuracy of the technique, especially when the available weight variable is negatively correlated with the agriculture use.

The application of the GCE – DWR technique to disaggregate land area for agricultural use is the focus of this study. In addition to the accuracy, the highlight of this study is the structure of DWR which provides additional information regarding the varying marginal effect of the available auxiliary information on the land area for agricultural use. Therefore, the following objectives of this study are formulated:

- To apply the GCE – DWR technique to disaggregate land area for agricultural use in BoDeTaBek - Indonesia, at the district level based on the information at the regency/municipality level.
- To map the disaggregate land area for agricultural use for BoDeTaBek's case, at the district level.
- To estimate the varying marginal effect of the distance to central Jakarta on the land area for agricultural use, at the district level.

II. MATERIAL AND METHOD

The following notations are used for the specific application of GCE – DWR to disaggregate the land area for agricultural use:

- The first-level spatial unit is the administrative unit where the aggregate land area for agricultural use is observed. Index $i = 1, \dots, T$ is used to define each unit at this level, given there are T first-level spatial units.
- The second-level spatial unit is the lower level administrative unit, where the unobserved disaggregate land area for agricultural use belongs to. The number of this unit varies from one first-level unit to another first-level unit, index $j = 1, \dots, n_i$ is used to define each unit at this level.
- $y_{i.}$ is the observed aggregate land area for agricultural use at the unit $i = 1, \dots, T$
- y_{ij} is the unobserved/latent land area for agricultural use at the unit $j = 1, \dots, n_i$ that belong to the administrative unit $i = 1, \dots, T$. N_{ij} is the available information (i.e. population) at the unit $j = 1, \dots, n_i$ that belong to the administrative unit $i = 1, \dots, T$, which is used to form the weight.
- $z_{ij,k}, k = 1, \dots, K$ is the k^{th} auxiliary information which is observed at the unit $j = 1, \dots, n_i$ that belong to the administrative unit $i = 1, \dots, T$,
- $x_{i,h}, h = 1, \dots, H$ is the h^{th} auxiliary information which is only observed at the first-level spatial unit $i = 1, \dots, T$.

A. Material

Land use data for BoDeTaBek at 2017 are used in this study. The study area covers 8 regencies/municipalities, as the first level spatial unit. The index of this unit is: $i = 1, \dots, 8$. Within each regency/municipality i, $i = 1, \dots, 8$, there are different number of districts.

For each district, as the second level spatial unit, in a regency/municipality, the index $j = 1, \dots, n_i$, is used. There are 139 districts ($\sum_{i=1}^{8} n_i = 139$) in total. The map of the study area is depicted in Fig 1. The data at those two levels are extracted from Regions by Number, which is one of the BPS publications. Detail regarding the variables used in this study is depicted in Table 1.

Variable	Definition (all of them are observed in 2017)
$y_{i.}, i = 1, \dots, 8$	Proportion of land area for agricultural use of regency/municipality $i, i = 1, \dots, 8$
$N_{ij}, i = 1, \dots, 8,$ $j = 1, \dots, n_i$	Population density (people/km^2) of district j which belongs to the regency/municipality i , $i = 1, \dots, 8, j = 1, \dots, n_i$
$z_{ij}, i = 1, \dots, 8,$ $j = 1, \dots, n_i$	The distance of district j which belongs to the regency/municipality i to central Jakarta, $i = 1, \dots, 8$, $j = 1, \dots, n_i$
$x_i, i = 1, \dots, 8$	Share of GDP of agricultural sector (%) of regency/municipality $i, i = 1, \dots, 8$

Table 1 Variables used in this study and their definitions

It is assumed that the closer of a district from Jakarta, the smaller proportion of land area for agricultural use of that district will be. Or in other words, the proportion of land area for agricultural use in district j which belongs to the regency/municipality i(y_{ij}) is a positive function of the distance from Jakarta (z_{ij}),$i = 1, \dots, 8, j = 1, \dots, n_i$. It is also assumed that the agricultural land area positively depends on its productivity. The productivity is proxied by the share of GDP of agricultural sector, which is available only at the aggregate level (region/municipality). The notation for this variabel is $x_i, i = 1, \dots, 8$. The weight $\eta_{ij}, i = 1, \dots, 8$, $j = 1, \dots, n_i$ is calculated using the population density of each district, $N_{ij}, i = 1, \dots, 8$, $j = 1, \dots, n_i$, based on the following relation:

$$\eta_{ij} = \frac{N_{ij}}{N_{i.}} \quad (1)$$

The population density is negatively related to the proportion of land area for agriculturaluse.

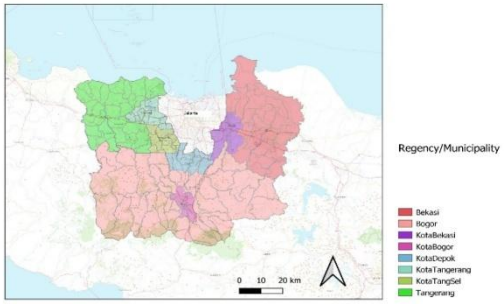

Fig. 1 The Map of BoDeTaBek

B. Method: Generalized Cross Entropy – Distributionally Weighted Regression

The following relation must hold in the DWR setting: $y_{i.} = \sum_{j=1}^{n_i} y_{ij}\,\eta_{ij}\,; \forall i = 1, \dots, 8$ (2)

It is assumed that the unobserved land area for agricultural use linearly depends on the auxiliary

information at both levels of spatial unit, such that:

$$y_{ij} = \alpha_{ij} + \beta_{ij} z_{ij} + \gamma_{ij,h} x_{i,h} + u_{ij},\ i = 1, \dots, 8; j = 1, \dots, n_i \quad (3)$$

By substitution, the functional relationship between the aggregate and the disaggregate land area for agriculture use in (1) can be redefined as:

$$y_i = \sum_{j=1}^{n_i} (\alpha_{ij} + + \beta_{ij} z_{ij} + \gamma_{ij,h} x_{i,h}) \eta_{ij} + \varepsilon_i,\ i = 1, \dots, 8 \quad (4)$$

in which the error terms $\varepsilon_i = \sum_{i=1}^{n_i} u_{ij} \eta_{ij}$ is a composite error term.

In (3) and (4) the parameter value varies across spatial units to accommodate the spatial heterogeneity. Consequently, there will be more unknown parameters than the available data. In this case, an entropy maximization technique is more appropriate to estimate the model's parameters.

The formulation of GCE optimization that corresponds to DWR in (2) or (3) is:

$$\min_{p_\alpha p_\beta, p_\gamma} D\left((p_\alpha, p_\beta, p_\gamma, p_u || q_\alpha, q_\beta, q_\gamma, q_u)\right) = \sum_{j=1}^{n_i} \sum_{i=1}^{8} \sum_{m=1}^{Q} p_{ij,m}^{\alpha} \ln\left(\frac{p_{ij,m}^{\alpha}}{q_{ij,m}^{\alpha}}\right) + \sum_{j=1}^{n_i} \sum_{i=1}^{8} \sum_{m=1}^{Q} p_{ij,m}^{\beta} \ln\left(\frac{p_{ij,m}^{\beta}}{q_{ij,m}^{\beta}}\right) + \sum_{j=1}^{n_i} \sum_{i=1}^{8} \sum_{m=1}^{Q} p_{ij,m}^{\gamma} \ln\left(\frac{p_{ij,m}^{\gamma}}{q_{ij,m}^{\gamma}}\right) + \sum_{j=1}^{n_i} \sum_{i=1}^{T} \sum_{m=1}^{L} p_{ij,m}^{u} \ln\left(\frac{p_{ij,m}^{u}}{q_{ij,m}^{u}}\right)$$

Subject to probability constraints:

$$\sum_{m=1}^{Q} p_{ij,m}^{\beta} = \sum_{m=1}^{Q} p_{ij,m}^{\gamma} = \sum_{l=1}^{L} p_{ij,m}^{u} = 1 \quad \forall i = 1, \dots, 8; \forall j = 1, \dots, n_i$$

and data constraint:

$$y_{i.} = \sum_{j=1}^{n_i} \left[\sum_{i=1}^{8} \sum_{m=1}^{Q} p_{ij,m}^{\alpha} s_m^{\alpha} + \sum_{m=1}^{Q} p_{ij,m}^{\beta} s_m^{\beta} z_{ij} + \sum_{m=1}^{Q} p_{ij,m}^{\gamma} s_m^{\gamma} x_i + \sum_{l=1}^{L} p_{ij,l}^{u} s_l^{u} \right] \eta_{ij} \quad \forall i = 1, \dots, 8 \quad (5)$$

In the optimization model, the parameters are set as discrete random variables with some possible values ($Q \geq 2$). They are defined as the supporting vectors and their respective unknown probabilities, as the following:

- The unknown probability vector $p_{\alpha,ij} = \left[p_{ij,1}^{\alpha}, \cdots, p_{ij,Q}^{\alpha}\right]'$ is the defined probability distribution for α_{ij}, with the supporting vector $s_\alpha = \left[s_1^{\alpha}, \cdots, s_Q^{\alpha}\right]'$
- The unknown probability vector $p_{\beta,ij} = \left[p_{ij,1}^{\beta}, \cdots, p_{ij,Q}^{\beta}\right]'$ is the defined probability distribution for $\beta_{ij,k}$, with the supporting vector $s_\beta = \left[s_1^{\beta}, \cdots, s_Q^{\beta}\right]'$
- The unknown probability vector $p_{\gamma,ij} = \left[p_{ij,1}^{\gamma}, \cdots, p_{ij,Q}^{\gamma}\right]'$ is the defined probability distribution for $\gamma_{ij,h}$, with the supporting vector $s_\gamma = \left[s_1^{\gamma}, \cdots, s_Q^{\gamma}\right]'$

The error term u_{ij} are also presented in terms of a discrete random variable with more than two possible values. The range of the supporting vector for the error term is symmetric around zero, and it is defined as $s_u = [s_1^u, \cdots, 0, \cdots, s_L^u]'$, in which $-s_1^u = s_L^u$, with its respective probability distribution, $p_{u,ij} = \left[p_{ij,1}^{u}, \cdots, p_{ij,L}^{u}\right]'$. The supporting vector of each parameter and its respective probability distribution define each parameter of DWR:

$$\alpha_{ij} = s_\alpha' p_{\alpha,ij},\ \beta_{ij} = s_\beta' p_{\beta,ij},\ \gamma_{ij} = s_\gamma' p_{\gamma,ij},\ \text{and} u_{ij} = s_u' p_{u,ij}. \quad (6)$$

In (5) a uniform priori distribution is defined respectively for $\alpha_{ij}, \beta_{ij}, \gamma_{ij}$ (the parameters of GWR) and u_{ij}, $i = 1, \dots, 8$, $j = 1, \dots, n_i$ as follows:

$$q_{\alpha,ij} = \left[q_{ij,1}^{\alpha}, \cdots, q_{ij,Q}^{\alpha}\right]',\ q_{\beta,ij} = \left[q_{ij,1}^{\beta}, \cdots, q_{ij,Q}^{\beta}\right]',$$

$$q_{\gamma,ij} = \left[q_{ij,1}^{\gamma}, \cdots, q_{ij,Q}^{\gamma}\right]',\ q_{u,ij} = \left[q_{ij,1}^{u}, \cdots, q_{ij,L}^{u}\right]'$$

The optimal solution of the maximization problem is the vector of the probability distribution for each parameter. The estimated parameters are calculated based on equation (6), using the optimal solution and the defined support-vector.

This study uses the initial range of the support vector of each parameter, defined in [13]. It is each of the OLS estimates of the following model:

$$y_i = \sum_{j=1}^{n_i} (\alpha + \beta z_{ij} + \gamma x_i) \eta_{ij} + \varepsilon_i = \alpha + \beta z_i^* + \gamma x_i + \varepsilon_i,\ i = 1, \dots, 8 \quad (7)$$

in which $z_i^* = \sum_{j=1}^{n_i} z_{ij} \eta_{ij}$, and $\sum_{j=1}^{n_i} \eta_{ij} = 1$, plus and minus its standard error of the estimate. For example, the range of the support vector for α is $[\hat{\alpha}_{OLS} - s.e(\hat{\alpha}_{OLS}), \hat{\alpha}_{OLS} + s.e(\hat{\alpha}_{OLS})] = \left[s_1^{\alpha}, s_1^{Q}\right]$. The range is discretized based on the defined Q such that the supporting vector is:

$$s_\alpha = \left[s_1^{\alpha}, \cdots, s_Q^{\alpha}\right]'$$

with the same initial/prior probability for each element of the vector. The same holds for the other model's parameters.

The estimated parameters are then used to estimate the land area for agriculture use at the disaggregate level, based on the following:

$$\hat{y}_{ij} = \hat{\alpha}_{ij} + \hat{\beta}_{ij} z_{ij} + \hat{\gamma}_{ij} x_i,\ i = 1, \dots, 8; j = 1, \dots, n_i \quad (8)$$

The estimated parameters are also useful to derive the marginal effect of the available auxiliary variable (e.g. distance to central Jakarta) on the land are for

agricultural use at the district level. The notation in (8) indicates that the marginal effect varies with location.

III. RESULTS AND DISCUSSION

The implementation of the GCE – GWR disaggregation technique requires the definition of $Q \geq 2$, the number of possible values of discrete random variable within the supporting vector of each parameter. The choice of Q plays an important role in the entropy optimization procedure. The small Q speeds up the rate of convergence with the risk of getting biased estimate of parameters. In this case the disaggregation estimate will be less accurate. On the other hand, big Q corresponds to slow rate of convergence. But the big Qwill define almost infinite numbers within the supporting vector of the parameter, leading to good approximation true distribution of the parameters. Consequently, the bias will be smaller, the accuracy will be higher. A simulation study based on the same BoDeTaBek's land use data, conducted by Fitriani and Sumarminingsih [14], shows that Q above 6 yields high accuracy of disaggregation estimate.

Based on the information in Table 1, the observed variable in this study is the proportion of land area for agricultural use of each regency/municipality $i, i = 1, \dots, 8$. Using the distance from the central Jakarta as the auxiliary variable at the district level, the share of GDP of agricultural sector (%) of regency/municipality as the auxiliary at the aggregate level, and $Q = 8$, the GCE – DWR technique is implemented following equation (2) until (8). The map of the disaggregation estimates for all districts is presented Fig 2.

The map in Fig 2 shows that the district percentage of land area for agricultural use increases the further the location of the district from the central Jakarta. This result is in accordance with the reality of land use practice in the region under study.

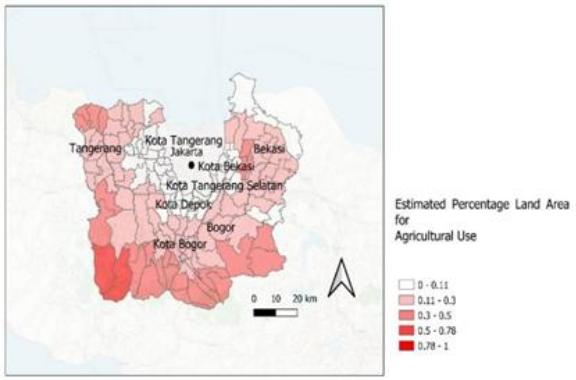

Fig. 2 The Map of Disaggregate Estimates, The Proportion of District Land Area for Agricultural Use

Other than estimating the district percentage of land area for agricultural use, based on the DWR setting, it is possible to have additional information regarding the location specific marginal effect of the distance on the percentage of land area for agricultural use. The effect for each district is represented by $\hat{\beta}_{ij}$ for $i = 1, \dots, 8; j = 1, \dots, n_i$. The estimated parameter varies by district, the summary is presented in Table 2. The result indicates it is estimated that 1 km further the district from the central Jakarta, the district proportion of land area for agricultural use increases on average by 0.0072. The varied marginal effect is presented on the map on Fig 3. Some districts which are located closer to other urban centrals than Jakarta are predicted to have smaller marginal effects. It Is an indication that those districts do not solely depend on the central Jakarta. They start to utilize the amenities provided by the closer urban central.

	$\hat{\beta}_{ij}$
Mean	0.007191
Stdev	0.000214
CV	2.98%
min	0.00523
max	0.007299

Table 2 The Summary of the Marginal effect of Distance to Central Jakarta on the Percentage Land Area for Agricultural Use

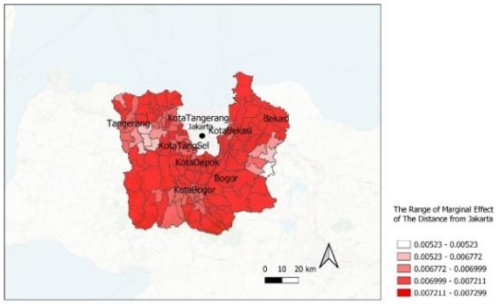

Fig. 3 The Map of Disaggregate Estimates, The Proportion of Land Area for Agricultural use of Each District

IV. CONCLUSION

The implementation of GCE – DWR disaggregation technique on BoDeTaBek's land use data provide a reasonable result. The varying marginal effect of distance from central Jakarta on the district proportion of land area for agricultural use, give additional information which match the unique characteristic of each district. The marginal effect indicates less domination of central Jakarta on the land use of the districts which are in proximity of other urban centrals.

REFERENCES

[1] W. Alonso, "Location and land use : toward a general theory of land rent," Harvard University Press, Cambridge, 1964.

[2] J. K. Brueckner, "Growth controls and land values in an open city. (Land-Use Controls)," Land Econ., vol. 66, no. 3, pp. 237–249, 1990.

[3] J. Platinga and D. J. Miller, "Agricultural Land Values and the Value of Rights to Future Land Development," Land Econ., vol. 77, 2001.

[4] E. G. Irwin and J. Geoghegan, "Theory, data, methods: developing spatially explicit economic models of land use change," Agric. Ecosyst. Environ., vol. 85, no. 1–3, pp. 7–24, 2001, [Online]. Available: http://www.sciencedirect.com/science/article/B6T3Y-433P6Y4-G/2/ed5ee2e013165e1eecc5cb4163066c4b.

[5] E. G. I. Carmen Carrión-Flores, "Determinants of Residential Land-Use Conversion and Sprawl at the Rural-Urban Fringe," Am. J. Agric. Econ., vol. 86, no. 4, pp. 889–904, 2004, [Online]. Available: http://dx.doi.org/10.1111/j.0002-9092.2004.00641.x.

[6] R. Howitt and A. Reynaud, "Spatial disaggregation of agricultural production data using maximum entropy," Eur. Rev. Agric. Econ., vol. 30, no. 3, pp. 359–387, 2003.

[7] R. Fitriani and E. Sumarminingsih, "Spatial Extent of Land Use Externalities in the Jakarta Fringe: Spatial Econometric Analysis," Rev. Urban Reg. Dev. Stud., vol. 27, no. 3, pp. 230–242, 2015, doi: 10.1111/rurd.12041.

[8] R. Fitriani and M. Harris, "The Extent Of Sprawl In The Fringe Of Jakarta Metropolitan Area From The Perspective Of Externalities," in 2011 Conference (55th), February 8-11, 2011, Melbourne, Australia, 2011.

[9] R. B. Papalia and E. Fernandez-Vazquez, "Predicting Indicators at Small Scale Using Entropy Econometrics," J. Econ. Soc. Dev., vol. 2, no. 1, pp. 66–74, 2015.

[10] L. Peeters and C. Chasco, "Ecological inference and spatial heterogeneity: an entropy-based distributionally weighted regression approach," Pap. Reg. Sci., vol. 85, no. 2, pp. 257–276, 2006.

[11] T. Li, D. Pullar, J. Corcoran, and R. Stimson, "A comparison of spatial disaggregation techniques as applied to population estimation for South East Queensland (SEQ), Australia," Appl. GIS, vol. 3, no. 9, pp. 1–16, 2007.

[12] R. B. Papalia, "Incorporating Spatial Structures in Ecological Inference: An Information Theory Approach," Entropy, vol. 12, no. 10, pp. 2171–2185, 2010.

[13] R. Fitriani and E. Sumarminingsih, "The Accuracy of Entropy-Based Distributionally Weighted Regression Spatial Disaggregation Technique for Several Types of Predictor and Weight Variable," Int. J. Agric. Stat. Sci., vol. 16, no. 1, pp. 35–41, 2020.

[14] R. Fitriani and E. Sumarminingsih, "Generalized Cross Entropy – Distributionally Weighted Regression , A Spatial Disaggregation Technique , Case Study of BoDeTaBek ' s Land Area for Agricultural Use," 2020.

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CROSS-CULTURAL ANALYSIS OF DECISION-MAKING BETWEEN THAI AND CHINESE CONSUMERS

[1]QINGYAN LI, [2]ROSECHONGPORN KOMOLSEVIN

Bangkok University, Bangkok, Thailand
E-mail: [1]601889510@qq.com, [2]rosechongporn.k@bu.ac.th

Abstract - This paper presented a case study of the purchasing decision of Bird's Nest products as implemented by Thai and Chinese customers through social media, WeChat, by using Hofstede's cultural dimension theory of long-term orientation versus short-term orientation (LTO) to make a cross-cultural comparison regarding their perception and decision making about Bird's Nest products. The findings revealed a significant difference of the LTO on decision-making regarding their purchasing of Bird's Nest products between the Thai and Chinese customers. However, there was no significant interaction effect between nationality and the LTO on the customers' decision-making regarding the purchasing of Bird's Nest products. Moreover, most respondents agreed that Bird's Nest products were good for health and immunity systems in the long run, and the price was not considered an important factor of decision-making.

Keywords - Bird's Nest Products, Consumer Perception, Cultural Analysis, Purchase Decision

I. INTRODUCTION

Bird's Nest products have been around for hundreds of years and popular in many countries. People in China have been eating Bird's Nest for over 500 years [1]. The first person in China taking Bird's Nest product was known to be the explorer called "He Zheng" in Ming Dynasty. In Qing Dynasty, the Bird's Nest product has become a luxurious dish as royal treats. The dish was the breakfast for many emperors and royal families. In Thailand, people often received the Bird's Nest drinks as gifts for special occasions [2]. They bought Bird's Nest drinks less than one time per month at supermarkets and department stores considering brand reputation when purchasing.

There were hundreds of different marketing strategies, but only one could bring in consistent sales from day one, which was the social media advertising [3]. Social media advertising posted advertisements served to users on social media platforms. Social networks utilize user information to serve highly relevant advertisements based on interactions within a specific platform. The following lists some types of social media platforms that may serve ads [3]: (a) Social networking (Facebook, LinkedIn, Google+). (b) Microblogging (Twitter, Tumblr). (c) Photo sharing (Instagram, Snapchat, Pinterest). (d) Video sharing (YouTube, Facebook Live, Periscope, Vimeo). However, there is another social networking called "WeChat", which has gained popularity recently in Asia, particularly in China [4].

WeChat is a Chinese multi-purpose app developed by a Chinese company called Tencent in 2011. Its purposes are to exchange messages, provide social media, and mobile payment applications. It became one of the world's largest standalone mobile apps in 2018, with over one billion monthly active users [4][5]. The popularity of WeChat is partially fueled and engaged by Chinese governments because of censorship of political topics in China [4].

WeChat may contact so-called "friends" and the pages may be posted on the social media for sales, marketing, promotion, and communications purpose. Certain groups of friends may be created to avoid the privacy of pages exposed to the general public. Users may also post "events" which describe their current activities with photos or videos in the time lime. Such a structure of friendships is the foundation of interactive communications in WeChat [4].

In terms of communication tools used in WeChat, the service may enable companies to display promotional messages on users' timeline or at the bottom of WeChat official account articles [6]. WeChat ads enable brands to grow and WeChat official account followers may drive traffic to website and generate app downloads. There are three major types of WeChat advertising [6]: (a) WeChat moments advertising, (b) WeChat banner adverting, and (c) WeChat key opinion leader advertising. All these communication tools may have effects on product promotion and decision making of the customers. Naturally the purchasing decision made by Thai and Chinese should be different due to cultural differences. As Bird's Nest products have received much attention because of its significance, popularity, and recent promotion from a range of marketing channels, the researcher intends to focus on the modern social media, WeChat, as the marketing tool to study the purchasing decision of Bird's Nest products based on cultural differences using Hofstede's cultural dimensions [7].

It is imperative to understand the following research questions: What are the perceptions and purchasing decisions of the consumers in China and Thailand and the effectiveness of promoting Bird's Nest products through the communication tool, WeChat?

Intuitively, the purchasing decision of Bird's Nest product may depend on various cultural factors, such as Individualism versus Collectivism (IDV), Masculinity versus Femininity (MAS), Power Distance Index (PDI), Uncertainty Avoidance Index (UAI), Indulgence versus Restraint (IND), and Long-term Orientation versus Short-term Orientation (LTO). However, since both Thailand and China are located in Asia, it is likely that both countries have similar cultures in terms of IDV, MAS, PDI, UAI, and IND. Therefore, the researcher intends to focus on the LTO which is the newest cultural dimension in this research [8].

In general, a short-term oriented customer values traditional methods for his or her health solution. The health of the customer may be improved after taking Bird's Nest products regardless the previous health condition. In contrast, a long-term oriented customer considers time as linear, so that the health is unable to improve even taking Bird's Nest Products if the individual misses the timeframe of taking it. If the individual has taken Bird's Nest products previously, most likely he or she will be a repeated customer.

Therefore, it is hoped that understanding and analyzing the cultural differences between Thailand and China may increase the effectiveness of WeChat marketing of Bird's Nest products. It may further broaden our knowledge of cultures, so that the similar rules may be applied to other products in different countries with different social media.

In summary, the research questions are listed below:

1) What are the perceptions and purchasing decisions of the consumers in China and Thailand?
2) What is the effectiveness of promoting Bird's Nest products through the communication tool, WeChat?

II. LITERATURE REVIEW

A. Related Literature Review and Previous Studies

In modern society, there have been concerns regarding obesity, health conditions, and overall quality of life. This health awareness has led to strong development of the health and wellness trend among consumers in developed countries, including Thailand. It means that the issue of the nutritional benefits of drinks should be addressed [9]. The results of the analysis showed that there were some clear distinctions in attitude and expectation among genders, ages and customers in urban and suburb communities [9].

Based on another study [10], the researcher aimed to understand the possible factors regarding the purchasing decision of ready-to-drink green tea in Bangkok. It identified several main factors affecting the purchasing decision, including demographic and consumer behavior, brand, product, price, promotion, and present trend of health consciousness [10]. The results were able to apply in developing marketing strategies in the beverage industry [10].

In another study related to bird's nest drinks, the researcher studied the positive influence of knowledge about functional foods, health awareness and confidence in terms of society and public policy that affect consumption intentions of the bird's nest drinks in Thailand [2]. The researcher revealed that producers of bird's nest drink should emphasize on communicating benefits of providing more nutrition than other drinks, as well as reducing risks in health problems for consumers in various gender and age groups to increase the intention to consume the product [2].

Based on the recent research above, it implied that there has been a strong correlation between the types of functional drinks and the health concerns of consumers. "How to market the product to potential customers?" has become an interesting and essential topic in the modern society. In this study, the researcher intends to address these issues by focusing on WeChat as the marketing tool between Thai and Chinese communities.

The WeChat marketing tool has been popular lately [4]. Some researchers used the Theory of Planned Behavior to study the relationship among attitude, subjective norm, perceived behavior control and behavioral intention [11]. Some researchers tried to identify the factors, including perceived enjoyment, perceived usefulness, perceived ease of use, trust, brand image and the attitude, that affect customers' purchasing intention using WeChat as the marketing tool [12][13]. The result showed that aforementioned factors have higher positive and strong correlation with the purchase decision of customers [11]-[13].

In terms of product images in WeChat, the previous study aimed to examine the types of image-text and creative strategies presented in real estate official account articles [14]. The findings suggested that WeChat articles played a major role in releasing product information [14]. Regarding the execution style, the use of images with different appeals was the most common strategy. Managerial implications were provided for brand managers or marketers who were using social media, such as WeChat, to promote their products among foreign target consumers [14]. This finding suggests that the choice of WeChat as the marketing tool in this study should be practical and meaningful for Thai and Chinese consumers.

B. Related Theories

The core theory and the framework of this research are based on "Hofstede's Cultural Dimensions Theory." The survey of the research were designed and performed by applying the theory to explore and understand the effectiveness of the cross-cultural communications. The following describes the theory based on Berlitz [15].

1) Hofstede's Dimensions Theory

Hofstede's cultural dimensions theory was created by Geert Hofstede. It was a framework for cross-cultural communications [7][16]. It examined the impacts of the culture of the society on the values of the members, and how these values correlated to behavior by using a structure derived from the factor analysis. Based on [7][16], the theory included the following six dimensions, i.e. Individualism versus Collectivism (IDV), Masculinity versus Femininity (MAS), Power Distance Index (PDI), Uncertainty Avoidance Index (UAI), Indulgence versus Restraint (IND), Long-term Orientation versus Short-term Orientation (LTO). In this study, the focus will be the dimension of the LTO.

2) LTO Dimension

The LTO dimension describes the time horizon of the society. Short-term oriented cultures value traditional methods, take a considerable amount of time to build relationships, and in general view time as circular [8]. This means the past and the present are interconnected and that which cannot be done today can be done tomorrow. The opposite of this is long-term orientation, which sees time as linear and looks to the future rather than the present or the past. It is goal-oriented and values-rewarded.

This study mainly focuses on this dimension (LTO) and analyzes the results after the survey. As an example for illustration purpose, Thai consumers may simply follow others in making purchasing decision, while Chinese may focus more on improving the health condition of consumers in the long run. These findings may be used as marketing strategies in communicating benefits for consumers in various gender and age groups to increase the intention to consume the product.

C. Consumer's Perception and Decision-Making

The theoretical framework of this research is based on "Hofstede's Cultural Dimensions Theory" [8]. As described earlier, this study intends to focus on the LTO which is the newest cultural dimension in this research. The survey of the research will be designed and performed by applying the theory to explore and understand the purchasing decision of Bird's Nest products using WeChat between Thai and Chinese customers. The conceptual model in terms of perceptions, factors in purchasing decisions, and personal characteristics between Thai and Chinese, are described below.

1) Nature of Perception

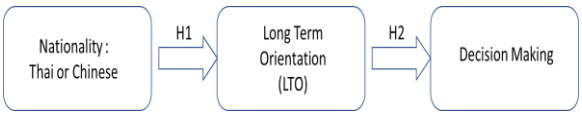
The perception of consumers towards Bird's Nest products may or may not be the same in terms of cultural differences. These perceptions may include perceived enjoyment, perceived usefulness, ease-of-use, trust, brand images, and the perceived attitude [9][14]. They may have an impact on customers' purchase decision of Bird's Nest products using WeChat as the marketing tool, but may or may not differ between Thai and Chinese communities. In this study, the researcher intends to reveal such findings after the survey.

2) Factors Affecting Decision-Making and Cultural Dimensions

There are many factors that may potentially affect consumers in making purchasing decision of Bird's Nest Products. The decision-making in this research means that the consumer intends to purchase the product within a given timeframe in the survey. In this study, the researcher intends to find out the factors that may affect purchasing decision, such as demographics and consumer behavior, differences in pricing, the discount and promotion, consumer's health awareness, etc. The purpose is to understand these factors if there exists any strong or weak correlations in term of LTO cultural differences between Thailand and China.

3) Personal Characteristics

There are certain cultural differences between Thai and Chinese in general. These differences exist regardless of other factors, such as ages, demographics, and others. Thus, the consumers may behave differently in reading marketing tool, such as WeChat, in making purchasing decision of Bird's Nest Products simply because of personal characteristics. In this study, the researcher intends to find out the factors that may affect purchasing decision because of personal characteristics regardless of other factors aforementioned. Understanding cultural differences between two nationalities in general may provide useful in-depth information to reach out target audiences without wasting resources on meaningless advertisements for marketing purpose. The conceptual model is depicted below.



D. Hypothesis

This study makes the following two-step hypotheses in terms of the dimension of Long-term Orientation versus Short-term Orientation (LTO). It is first assumed that there exist cultural differences in terms of LTO between Thai and Chinese customers. Under this hypothesis, the researcher will further assume that the purchasing decision of Bird's Nest products may vary by Thai or Chinese customers with different LTO. The hypotheses will be verified and evaluated by the survey performed.

H1: Thai and Chinese customers will perceive different long-term and short-term orientations in terms of cultural dimensions when they purchase Bird's Nest products.

H2: Thai or Chinese customers with different perception regarding LTO will have different decision-making in purchasing Bird's Nest products.

The results of the survey will be analyzed to understand the perceptions of consumers, such as perceived enjoyment, perceived usefulness, perceived ease of use, trust, brand image and the attitude of the consumers, as well as personal characteristics between China and Thailand. Moreover, this study will find out the factors that may affect purchasing decision, such as demographics and consumer behavior, differences in pricing, the discount and promotion, consumer's health consciousness, etc., in term of LTO cultural differences between Thailand and China. The results may be analyzed to measure the effectiveness of promoting Bird's Nest products through the marketing tool, WeChat.

III. RESEARCH METHODOLOGIES

A. Research Design

In this study, the quantitative research, i.e. a survey design, was adopted to test the relationship between Thai and Chinese customers regarding their purchasing decision of Bird's Nest products. Hofstede's dimensions focusing particularly on the long-term and short-term orientation (LTO) dimension through social media, WeChat, was applied as an analytical framework. The intention was to collect information from the sample by using a set of questionnaires as the tool. The researcher has performed the study in the following steps: (a) Using the survey method by posting a set of questionnaires on the WeChat group to collect information from respondents who may be interested in purchasing Bird's Nest products. (b) Using the sample survey method to collect the data. (c) Processing the data by using Statistical Package for the Social Sciences (SPSS) to interpret the results.

B. Populations and Sampling Methods

1) Targeted Populations

The targeted population was the total number of Thai and Chinese people who have used WeChat as their channel to purchase health, nutrition, or other similar products. To achieve the objectives of study, prior purchase of Bird's Nest products was preferred, but not required for this survey purpose. The targeted age group was between 18 and 60 years old. The proposed number of samplings was at least 192 Chinese and 192 Thai with the total of 384 samples. The reason of such numbers of sampling will be discussed in the following section.

2) Selection of Sampling

It is understood that non-probability sampling is the probability of the specific member of the population with unknown information to researchers, where purposive sampling and convenience sampling are used most frequently [17]. Purposive sampling involves choosing objects or samples that are believed to give the most accurate results. An experienced individual selects the sample based on his or her judgment about some appropriate characteristics required of the sample member. In contrast, the convenience sampling is the procedure of obtaining people or units who are conveniently available and ready to researchers [17].

In this study, the researcher has applied the non-probability sampling technique of convenience sampling. The selection of sample size is described below.

3) Krejcie and Morgan Sampling Method

In this study, the sample size was determined by using the Krejcie & Morgan table and formula [18]. The researcher has distributed questionnaires to conveniently selected at least 384 respondents categorized into 192 Thai and 192 Chinese.

C. Research Tool

The research tool was formulated based on "Hofstede's Cultural Dimensions Theory". As described previously, this research intended to compare the Chinese and Thai culture using Hofstede's cultural dimensions, focusing only on the long-term orientation versus short-term orientation.

The questionnaires consist of four (4) sections below.

Section 1 consists of questions asking about the respondent's personal information, including gender, age, educational level, and nationality.

Section 2 asks about the respondent's consumption behavior of Bird's Nest products in multiple-choice format.

Section 3 provides questionnaires regarding the LTO of Hofstede's cultural dimensions between Thai and Chinese consumers. The items are designed in a Likert-scale format ranging from "strongly agree" (5) to "strongly disagree" (1).

Section 4 identifies the perception and the decision-making among Thai and Chinese consumers. The items are designed in a Likert-scale format ranging from "strongly agree" (5) to "strongly disagree" (1).

D. Data Collection

The invitation for survey was posted on WeChat groups in Thailand and China. The survey was initially considered by using available online platforms, such as Pantip, Baidu, and Google. The researcher ended up collecting the data during the month of April in the year of 2020 using a popular Chinese survey tool called "Wenjuanxing" (meaning, "Survey Star"). In case there were fewer respondents than expected, more survey invitations would have been posted on additional WeChat groups for extended collection time.

Moreover, survey questionnaires were written in Thai and Chinese, respectively. Translations of questionnaires were reviewed by bilingual speakers to guarantee congruency between two versions.

IV. DESCRIPTIVE ANALYTICS

A. Demographic Data

There were 304 Thai and 239 Chinese respondents in the survey. The descriptive analysis revealed that a bit over half of the respondents were males (55.2%), while the rest were females (42.7%), aging between 26-35 years the most (41.1%), followed by 36-45 years (20.4%), less than 25 years (15.3%), and over 55 years (7.2%), respectively. Over half of them were studying in the Bachelor's level (58.6%), followed by the Master's level (9.8%), the high school or lower level (6.4%), and the doctoral level (0.6%), respectively. Please refer to Table I for demographic information.

Nationality

	Frequency	Percent	Valid Percent	Cumulative Percent
Thailand	304	56.0	56.0	56.0
Chinese	239	44.0	44.0	100.0
Total	543	100.0	100.0	

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	300	55.2	55.2	55.2
Female	232	42.7	42.7	98.0
No reply	11	2.0	2.0	100.0
Total	543	100.0	100.0	

Education

	Frequency	Percent	Valid Percent	Cumulative Percent
HS or below	35	6.4	6.4	6.4
Bachelor	318	58.6	58.6	65.0
Master	53	9.8	9.8	74.8
PhD	3	0.6	0.6	75.3
No reply	134	24.7	24.7	100.0
Total	543	100.0	100.0	

Table I: Demographic information

B. General Purchasing Behavior of Bird's Nest products

Regarding the general purchasing behavior of Bird's Nest products, about one half of the participants indicated that they have purchased Bird's Nest products (BNP) before. In terms of the brand of Bird's Nest product, the survey showed that they bought Brand's the most (22.5%), followed by Scotch (14.9%), while some of them (12.5%) purchased other brands, as described in Table II.

Brand

	Frequency	Percent	Valid Percent	Cumulative Percent
Brand's	122	22.5	22.5	22.5
Scotch	81	14.9	14.9	37.4
Other	68	12.5	12.5	49.9
N/A	272	50.1	50.1	100.0
Total	543	100.0	100.0	

Table II: General Purchasing Behavior – Brand

The respondents stated that they spent ¥100 (ß400) (21.2%) per purchase to buy the Bird's Nest product, followed by ¥101-¥500 (ß401-ß2,000) (17.9%), and over ¥500 (ß2,000) (11.2%). Regarding the place to purchase, however, only 8.1% of the total participants purchased the products through WeChat or other online tools. Almost half of the participants (42.0%) purchased the product directly from non-online stores, as described in Table III and IV.

Amount

	Frequency	Percent	Valid Percent	Cumulative Percent
< Y100 (B400)	115	21.2	21.2	21.2
Y101-Y500 (B401-B2000)	97	17.9	17.9	39.0
> Y500 (B2000)	61	11.2	11.2	50.3
N/A	270	49.7	49.7	100.0
Total	543	100.0	100.0	

Table III: General Purchasing Behavior – Purchasing Amount

Where

	Frequency	Percent	Valid Percent	Cumulative Percent
WeChat	26	4.8	4.8	4.8
Online	18	3.3	3.3	8.1
Direct	228	42.0	42.0	50.1
N/A	271	49.9	49.9	100.0
Total	543	100.0	100.0	

Table IV: General Purchasing Behavior - Location

C. Cultural Dimensions

The respondents slightly agreed with the overall opinions regarding the cultural dimensions of long-term orientation versus short-term orientation (LTO). However, their purchase was interchangeably back and forth between the short-term and long-term orientations - That is, they purchased Bird's Nest products initially for the short-term orientation, indicating that they purchased Bird's Nest products as a gift for their friends or relatives (mean=3.38). Later, they aimed at obtaining good health in the long run (mean=3.29), and hoped that the product may improve their immunity systems in the long run (mean=3.18), or may ease symptoms of common colds or flu (mean=2.82). Buying Bird's Nest products to improve their social status in general was ranked as the last opinion (mean=2.72), as described in Table V.

Questions	SA [a] (%)	SLA [a] (%)	M [a] (%)	SLD [a] (%)	SD [a] (%)	Mean (St. Div [b])	Meaning
Bird's Nest products are good for my health in the long run.	12.9	27.6	43.5	7.2	8.8	3.29 (0.154)	Slightly Agree
Bird's Nest products may improve my immunity system in the long run.	10.5	24.9	46.2	9.2	9.2	3.18 (0.161)	Slightly Agree
Bird's Nest products may ease symptoms of common colds or flu.	7.9	12.0	48.1	17.7	14.4	2.82 (0.161)	Slightly Disagree
I may purchase Bird's Nest products as a gift for my friends or relatives.	16.6	30.2	36.5	7.7	9.0	3.38 (0.128)	Slightly Agree
Bird's Nest products may improve my social status in general.	7.4	15.3	40.3	20.6	16.4	2.77 (0.123)	Slightly Disagree

a. SA = strongly agree (5), SLA = slightly agree (4), M = moderate (3), SLD = slightly disagree (2), SD = strongly disagree (1)

b. St. Div = Standard Deviations

Table V: Results in terms of Cultural Dimensions

D. Decision-making to purchase via WeChat

The respondents indicated they slightly agreed on the decision-making to purchase via WeChat - That is,

they regarded that their decision-making was based on the importance of the following elements of Bird's Nest products: price (mean=2.81), attitude of salespersons (mean=2.73), the ingredient (mean=2.68), the packaging (mean=2.64), and the advertisements (mean=2.59), respectively, as described in Table VI.

Questions	SA [a] (%)	SLA [a] (%)	M [a] (%)	SLD [a] (%)	SD [a] (%)	Mean (St. Div [b])	Meaning
The ingredient of Bird's Nest products is important.	7.7	13.1	39.2	19.2	20.8	2.68 (0.119)	Slightly Disagree
The packaging of Bird's Nest products is important.	6.3	13.6	37.8	22.7	19.7	2.64 (0.118)	Slightly Disagree
The advertisements of Bird's Nest products shown on WeChat are important.	4.8	12.5	39.4	23.2	20.1	2.59 (0.130)	Slightly Disagree
The attitude of salespersons of Bird's Nest products on WeChat is important	7.2	16.4	36.6	22.1	17.7	2.73 (0.107)	Slightly Disagree
The price of Bird's Nest products is important.	8.8	17.5	36.5	19.9	17.3	2.81 (0.101)	Slightly Disagree

a. SA = strongly agree (5), SLA = slightly agree (4), M = moderate (3), SLD = slightly disagree (2), SD = strongly disagree (1)

b. St. Div = Standard Deviations

Table VI: Results in terms of Decision Making

E. Hypothesis Test

H1: Thai and Chinese customers will perceive different long-term and short-term orientations in terms of cultural dimensions when they purchase Bird's Nest products.

Independent sample t-test was used to test Hypothesis 1. The result revealed that there was a significant different perception between Thai and Chinese customers regarding their long-term and short-term orientation levels in terms of cultural dimensions ($t_{540.770} = -5.764$, $p < .001$) when they purchase Bird's Nest products. That is, although both groups reported a moderate opinion about the long-term and short-term orientation when they purchase Bird's Nest products, Chinese customers reported a significantly higher opinion (mean= 3.3314, SD = .79281) towards their long-term and short-term orientation levels than Thai customers (mean= 2.8908, SD=.98820). Therefore, Hypothesis 1 was supported.

The pairwise-comparisons revealed that there was a significant difference among Low, Middle, and High LTO groups. The absolute values of the mean differences between Low-Middle, Middle-High, and Low-High were 1.0923, 1.0991, and 2.1914, respectively, as described in the Post-hoc analysis.

However, the analysis showed no significant effect of nationality on decision-making regarding the purchase of Bird's Nest products ($F=.006$, $p>.05$). That is, both Thai and Chinese customers have a moderate level of decision-making regarding their purchase of Bird's Nest products. Moreover, there was no significant interaction effect between nationality and the LTO on decision-making regarding their purchase of Bird's Nest products ($F=1.707$, $p>.05$), as shown in the Tests of Between-Subjects Effects. The results are shown in Table VII.

Group Statistics

	Nationality	N	Mean	Std. Deviation	Std. Error Mean
LTO	Thailand	304	2.8908	.98820	.05668
	China	239	3.3314	.79281	.05128

Independent Samples Test:

Levene's Test for Equality of Variances

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
LTO	Equal variances assumed	7.264	.007	-5.616	541	.000	-.44059
	Equal variances not assumed			-5.764	540.770	.000	-.44059

t-test for Equality of Means

Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
.07845	-.59469	-.28649
.07643	-.59074	-.29045

Tests of Between-Subjects Effects

Dependent Variable: DM

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	255.754[a]	5	51.151	79.550	.000
Intercept	2143.067	1	2143.067	3332.915	.000
Nationality	.004	1	.004	.006	.936
LTO_group	196.359	2	98.180	152.690	.000
Nationality * LTO_group	2.196	2	1.098	1.707	.182
Error	345.291	537	.643		
Total	4527.720	543			
Corrected Total	601.046	542			

a. R Squared = .426 (Adjusted R Squared = .420)

Nationality Estimates

Dependent Variable: DM

Nationality	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
Thailand	2.655	.052	2.552	2.758
China	2.647	.075	2.499	2.795

LTO_group Estimates

Dependent Variable: DM

LTO_group	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
Low	1.592	.108	1.380	1.804
Middle	2.622	.044	2.535	2.709
High	3.739	.073	3.595	3.882

Mean differences among LTO_groups (pairwise-comparisons)

LTO_groups	Low	Middle	High
Low	-	-1.0923	-2.1914
Middle	1.0923	-	-1.0991
High	2.1914	1.0991	-

Table VII: Hypothesis Tests and Results

V. CONCLUSION

In this study, the result revealed that there was a significant difference between Thai and Chinese customers regarding their perceived long-term and short-term orientation levels in terms of cultural dimensions when purchasing Bird's Nest products. Chinese customers reported a significantly higher opinion towards their long-term and short-term orientation levels than Thai customers did. Most respondents have agreed that Bird's Nest products

were good for health and immunity systems and relatives.

REFERENCES

[1] Yan, D. (2018), 燕窝的历史文化 [History and culture of Bird's Nest]. Retrieved from http://www.sohu.com/a/272828733_99915497

[2] Sirimahatham, S. (2016). Factors Positively Affecting Consumption Intentions of Bird's Nest Drink of Consumers in Thonglor Street and Siam Square Areas in Bangkok. Bangkok University.

[3] Jolly, W. (2020). The 6 Most Effective Types of Social Media Advertising in 2020. Retrieved from https://www.bigcommerce.com/blog/social-media-advertising/#what-are-the-benefits-of-advertising-on-social-media-channels

[4] TechNode (2018). WeChat now has over 1 billion active monthly users worldwide - TechNode. Retrieved from https://technode.com

[5] Millward, S. (2014). It's time for messaging apps to quit the bullshit numbers and tell us how many users are active. Retrieved from http://www.techinasia.com

[6] Chen, T. (2017). Advertising on WeChat: a Step by Step Guide. Retrieved from https://walkthechat.com/advertising-on-wechat-moment

[7] Hofstede, G. (1991). Cultures and Organizations: Software of the Mind. London, UK: McGraw-Hill.

[8] Hofstede, G., & Minkov, M. (2010). Long-versus short-term orientation: new perspectives. Asia Pacific Business Review, 16(4), 493-504.

[9] Nakmongkol, A. (2009). The study of consumer's attitudes and behaviors towards carbonate soft drinks. Bangkok University.

[10] Tangtienchai, G. (2015). A study of the factors influencing purchase decision of ready to drink green tea in Bangkok. Bangkok University.

[11] Jing, L. (2015) The Factors that Affect Customers Purchase Intention whilst Using WeChat as A Marketing Tool. Bangkok University.

[12] Blackwell, R., Miniard, P., & Engel, J. (2001). Consumer behavior (9th ed.). Bmason, Ohio: South-Western Thomson Learning

[13] Dellarocas, C., Zhang, X., & Awad, N. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. Journal of Interactive marketing, 21(4), 23-45.

[14] Chang, X. (2018). Types of WeChat Image-text, Advertising Appeals, and Execution Styles in WeChat Official Account Articles: A Case Study of Ananda Condo Brand in Thailand. Bangkok University.

[15] WorldSpeaking (2011). Geert Hofstede and cultural-dimensions theory—an overview. Retrieved from http://news.telelangue.com/en/2011/09/cultural-theory

[16] Hofstede, G. (1980). Culture's consequences: International differences in work-related values. CA: Sage.

[17] Mo, W. (2015). A cross-cultural analysis of Disney Mulan film and Chinese Mulan drama impacts on Chinese audience's attitude. Bangkok University.

[18] Krejcie, R., & Morgan, D. (1970). Determining Sample Size for Research Activities, Educational and Psychological measurement, vol. 30, issue: 3, pp. 607-610, September 1, 1970

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A COMPREHENSIVE STUDY ON FIREWALL FOR IOT DEVICES, POLICIES, AND SECURITY ISSUES

[1]KALUKHE SIDDHESH VIKAS SUSMITA, [2]KAILAS, [3]DEVASIS PRADHAN

[1,2]Final Year Students, [3]Assistant Professor
Department of Electronics & Communication Engineering, Acharya Institute of Technology
Dr. Sarvepalli RadhaKrishnan Road, Soladevanahalli, Bengaluru -560107
Email: - devasispradhan@acharya.ac.in

Abstract - As networked communications continue to expand and grow in complexity, the network has increasingly moved to include more forms of communication. The fourth industrial revolution is creating an environment in which everything will be interconnected and intelligent. Internet Of Things is the cornerstone of this new era. With the advent of the internet of things, privacy and security of sensitive data has become a major concern. As the tools used for an attack become more sophisticated with the use of Artificial Intelligence and Machine Learning. According to Threatpost, this year has seen a 100 percent surge in IoT infections observed over wireless networks. IoT devices are now responsible for 32.72 percent of all infections observed in mobile and Wi-Fi networks – up from 16.17 percent in 2019. The usage of IoT in different applications is expected to rise rapidly in the coming years. The IoT allows billions of devices, peoples, and services to connect with others and exchange information. Due to the increased usage of IoT devices, the IoT networks are prone to various security attacks. The deployment of efficient security and privacy protocols in IoT networks is extremely needed to ensure confidentiality, authentication, access control, and integrity, among others. In this paper, an extensive comprehensive study on security and privacy issues related to Firewall for IoT Devices.

Keywords - Firewall; Firewalling; IoT; Network; Security; Policies

I. INTRODUCTION

IoT security is involved in Low Power Wide Area Network LPWAN, the IoV, wearable devices, and other industries. A wide range of devices are connected to the internet in a home-network scenario. These IoT devices are mostly sensors which are low powered, low compute and have limited resources. To assess the security properties of Smart Home installations, it is important to consider the basic security challenges that occur in installations of IoT devices. Some manufacturers have produced and sold IoT devices that do not include sufficient security features. This has resulted in serious harm, both economic and otherwise, to specific parties and to the general public. The Major security issues are Identity and Authentication, Access Control, Protocol and Network Security, Privacy, Trust and Governance, Fault Tolerance.

The main concept behind IoT is not only to integrate multiple appliances, device to one processing unit, but to also make the whole network portable. The present Firewalls have to connect the user Subnet through a wire and from the Firewall to the Default Gateway has to be a wired connection. Although some new Firewalls allow the Subnet to be WLAN but Firewall to Gateway connection has to be a wired connection. This makes the IoT structure static and the portability of IoT is reduced. Thus we came up with a Firewall Device which is portable, strong and cost efficient.

Nowadays the adoption rate of IoT devices is very high, more and more devices are connected via the internet. According to appraisal [3], there are 30 billion connected things with approximately 200 billion connections that will generate revenue of approximately 700 billion euros by the year 2020. Now in China, there are nine billion devices that are expected to reach 24 billion by the year 2020. In future, the IoT will completely change our living styles and business models. It will permit people and devices to communicate anytime, anyplace, with any device under ideal conditions using any network and any service [4]. The main goal of IoT is to create Superior world for human beings in the future. Fig. 1 shows the concept of IoT with their capabilities.

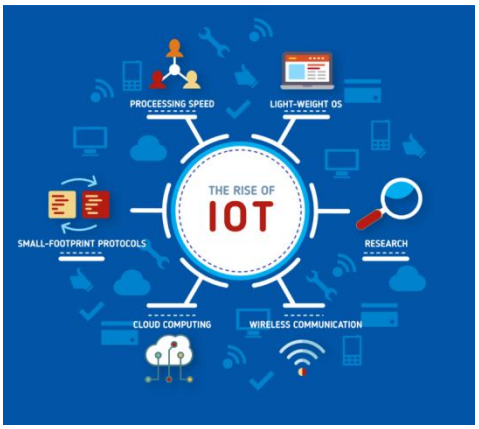

Figure 1. Concept of IoT

II. IOT ERA

The IoT era As networked communications continue to expand and grow in complexity, the network has increasingly moved to include more forms of communication. This has ushered in the era of the Internet of Things (IoT). No longer dependent upon person-to-person interaction, communications are made directly between simple devices, or between simple devices and complex systems. These connections between millions of IoT devices create demand for new services, unlocking new business opportunities to improve efficiency and quality of service. IoT technology is expected to spread

exponentially across many industries, with growth estimated to surpass 20 billion connected devices by 2021. 1 Within the Internet of Things, Communication Service Providers play an important role. This role can vary widely from, for example, a focus on offering IoT centric connectivity, like LoRA (long range) and LTE-M (Long Term Evolution (4G), category M1), to more advanced IoT services, including hosting IoT applications and offering IoT security services.

III. FIREWALL

Traditionally, the firewall was placed as a gatekeeper on the network edge. It acted as an all-encompassing control point, inspecting network traffic as it traveled across this perimeter. Sitting at the network's ingress/egress point, the firewall was responsible for validating communications: internal network traffic was considered inherently trustworthy, and external traffic was considered inherently untrustworthy. Rule sets and policies were created and enforced at this single point of control to ensure that desired traffic was allowed into and out of the network and undesirable traffic was prevented.Fig.2 shows traditional concept of Firewall.

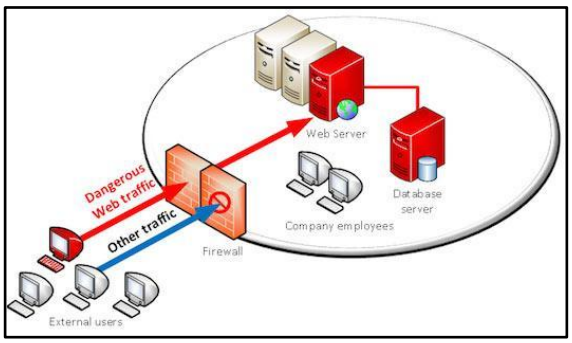

Figure2. Traditional network firewall approach

IV. WHY FIREWALLING?

As our networks evolve to accommodate new ways of doing business, so too must our network security. In the current world of distributed IT assets, the firewall is still central to a robust security posture. However, firewall requirements have increased significantly to protect the wide array of network infrastructures, connected devices, and operating systems from advanced threats. Consequently, our "traditional" firewall devices are being augmented by a mixture of physical and virtual appliances—some are embedded into the network while others are delivered as a service, are host-based, or are included within public cloud environments. Some are even taking on new form factors, such as clustered appliances that scale to large traffic requirements, software that runs on personal devices, SD-WAN routers, and secure Internet gateways.

The activity of sharing threat intelligence across all these disparate firewall devices, regardless of their location, is vital for uniform threat visibility and a strong security posture. To make the full shift and better secure today's networks, businesses must move away from the traditional "perimeter" approach. Instead they've got to establish strategic enforcement points across the entire network fabric, closer to the information or applications that need to be protected.

V. WHAT IS FIREWALLING?

Firewalling can provide an agile and integrated approach for centralizing policies, advanced security functionality, and consistent enforcement across your increasingly complex, heterogeneous networks. It should deliver comprehensive protections, visibility, policy harmonization, and stronger user and device authentication. Firewalling should also benefit from the sharing of threat intelligence across all control points to establish uniform threat visibility and control—dramatically cutting the time and effort needed to detect, investigate, and remediate threats.Enforcement points are everywhere across today's heterogeneous networks. Figure 3. shows Firewalling is delivering consistent threat prevention functionality with consistent policy and threat visibility so you can prevent, detect, and stop attacks faster and more accurately, everywhere.

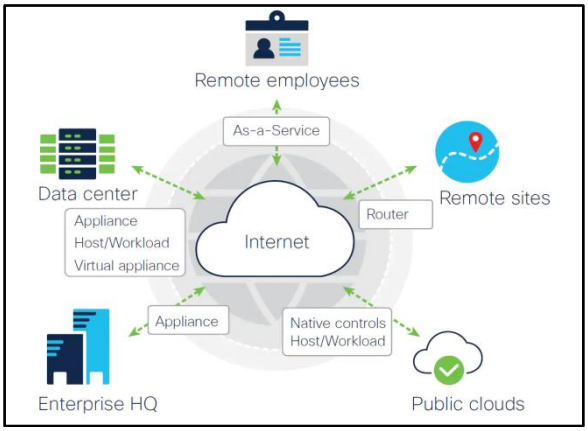

Figure3. The core tenants of firewalling as a means to address the security challenges of modern networks

VI. TYPES OF FIREWALL

6.1 Packet Filter Firewall

Packet filtering applies a set of rules to each packet and based on outcome, decides to either forward or discard the packet. A packet filtering router should be able to filter IP packets based on information included source IP address, destination IP address, TCP/UDP source port and TCP/UDP destination port. It is used to block connections from specific hosts or networks, block connections to specific hosts or networks, block connections to specific ports and block connections from specific ports. In Packet filtering IP packets are either forwarded or discarded without checking their contents . This type of firewall allows all traffic between "trusted" hosts. All the

packets that are incoming to the networks will be checked in detail by the packet filtering firewall. The firewall system checks basic information that resides in the packet such as source and destination address, source and destination port numbers, protocol and others that are related. Then, a comparison will be made between information on the packets with the rules, which had been configured on the firewall system.

6.2 Stateful Packet Inspection firewall

Stateful-inspection is an enhancement of the packet filter technology. Besides inspecting individual packet content, the Stateful-inspection also inspects the attributes of the multi-packet flows. A dynamic or "stateful packet inspection" also referred to as connection–state filtering packet in which firewall maintains a table of active TCP sessions and UDP sessions. Each entry in the state table records the sessions, source and destination IP address and port numbers and the current TCP sequence number. Entries are created only for those TCP connections or UDP streams that satisfy a defined security policy. The packets associated with these sessions are permitted to pass through the firewall. Sessions that do not match any policy or any packets received that do not match an existing table entry are denied [2]. It only allows packets belonging to an allowed session so it is more secure than packet filtering. A stateful inspection firewall ensures that packets belong to an existing session and it can authenticate the user when the session is established. Firewall system checks each field in the IP packet like the source address, destination address, protocol type(TCP, UDP and others), port number and service type(Telnet, FTP and others). It records all detailed information of each and every packet that passes through the network in a log file [4]. The rules that are used for filtering will be applying based on that information. In addition, it examines the packet header information from the network layer of the OSI model to the application layer to verify that the packet is part of a legitimate connection and the protocols are behaving as expected.

6.3 Application-gateway firewall

An application-gateway firewall [3] is simply a type of proxy server that provides proxies for specific applications. The most common implementations of application gateway firewalls provide proxy services, such as mail, file transfer protocol (FTP) and telnet, so that they do not run on the actual firewall, which increases security. The source or destination Internet protocol (IP) address, however, can be used to accept or reject incoming connections. Application Level firewalls also determine permissible conditions and events when a proxy connection has been established. An FTP proxy can restrict FTP access to one or more hosts by allowing the get command and at the same time, preventing the put command. A telnet proxy can terminate a connection if the user attempts to perform a shell escape or to gain root access. Application-gateway firewalls are not limited only to applications that support TCP/IP services, however. These tools can similarly govern conditions of usage for a variety of applications, such as financial or process control applications.

The two basic types of application-gateway firewalls are:

1) Application-generic firewalls
2) Application-specific firewalls.

The application-generic type provides a uniform method of connection for every application, regardless of type [5]. The application-specific firewall determines the nature of connections to applications on an application-by-application basis.

Application-gateway firewalls are the best-selling of all types of firewalls. Nevertheless, they have some notable limitations. Most significantly, for every TCP/IP client for which the firewall provides proxies, the client must be aware of the proxy that the firewall runs on its behalf. Therefore, each client must be modified accordingly. A second limitation is that, unless one uses a generic proxy mechanism, every application needs its own custom proxy.

6.4 Network Address Translation (NAT) Firewall

Network address translation allows a network to use one set of network addresses internally and a different set when dealing with external networks. Network address translation does not provide any security by itself but it helps to hide the internal network layout and to force connections to go through a choke point. The choke point does the translation. Like packet filtering, network address translation works by having a router do extra work. In this case, not only does the router send packets on, but it also modifies them. When an internal machine sends a packet to the outside, the network address translation system modifies the source address of the packet to make the packet look as if it is coming from a valid address. When an external machine sends a packet to the inside, the network address translation system modifies the destination address to turn the externally visible address into the correct internal address. The network address translation system can also modify the source and destination port numbers (this is sometimes called Port and Address Translation or PAT).

6.5 Proxy firewall

Application proxy firewalls are also more secure than packet filtering, but are generally slower than stateful inspection. Two TCP connections are established in an application proxy firewall: one between the packet source and the firewall, another between the firewall and the packet destination. Application proxies intercept arriving packets on behalf of the destination, examine application payload, and then relay permitted packets to the destination [3]. It is called a

proxy server, because it acts as a deputy or substitute and decides about flow of applications. Internal users contact the proxy server using HTTP or TELNET. The proxy servers ask the user about a remote host with which the user wants to set up a connection for actual communication. The proxy server now accesses the remote host on behalf of the user and passes the packet of the user to the remote host. The proxy changes the IP address in the packets from the end user's IP address to its own. Thus the IP address of the computer of the internal users is hidden from the outside world.

VII. EMBEDDED FIREWALL WITH IOT DEVICES

A firewall provides the missing layer of security for embedded devices, blocking attacks that authentication and encryption can't. The firewall must be efficient, consuming minimal system resources and scaling to a wide range of devices, from small 8-bit systems running a minimal or no operating system to a sophisticated multi-core system running a commercial real-time operating system (RTOS). Desktop firewalls don't meet the needs of embedded devices. Windows and Linux-based firewalls, while effective, are large and aren't easily portable to small embedded devices. They also include filtering that isn't relevant for embedded devices.

Most recent embedded systems include a network interface. Some provide password protection or encrypted protocols such as SSH or SSL, but they aren't enough. If they were, we wouldn't be reading about security breaches in the popular media. Older systems are even more vulnerable. Their original designers often assumed they were part of a closed "safe" network and omitted security, but many are now connected to a more open network with no protection at all.

These devices need a resource-friendly security solution specifically designed to provide sensible defensive capabilities against a variety of Internet-based attacks. Embedded firewalls provide an ideal solution. The firewall is integrated directly into the communication stack at the link layer of the supported protocol and configured with a set of rules specifying what communication is allowed.

VIII. EXTENDING SECURITY CONTROLS

Under the premise of a traditional firewall, since all internal traffic and authorized users were inherently trustworthy (and external traffic wasn't), protecting the entire organization was accomplished at the network perimeter. This network perimeter became the logical security control point to protect the entire organization. All network traffic, whether originating from the headquarters, a data center, or remote worker, was funneled through this single control point.

With a firewalling approach, consistent security controls are deployed to provide full visibility, unified policy, and comprehensive threat visibility. These security controls enable stronger user and device authentication across increasingly heterogeneous environments. They gather, share, and respond to context about users, locations, devices, and more to ensure devices meet defined security requirements. Using consistent security controls at every micro-perimeter, security teams can start to automate tasks (such as auto-quarantine out-of-compliance users and devices, block questionable domains across all security controls, and support effective microsegmentation). In firewalling, full visibility provides a holistic view of all security alerts and indicators of compromise, and shared threat intelligence delivers the most up-to-date threat detection to any connected device.

IX. CLOUD-BASED MANAGEMENT

Firewalling promotes a stronger security posture by supporting centralized, cloud-based management to help security teams cut through complexity and align policies throughout the organization. Templates can improve policy design and consistency by writing a policy once and scaling its enforcement across tens of thousands of security controls throughout a network. The use of standard policy templates to rapidly deploy new devices helps reduce configuration errors. As organizations grow, new deployments automatically inherit the latest policies. A scalable policy management system integrates multiple security features into a single access policy and optimizes policies across security devices to identify inconsistencies and quickly correct them.cloud-based management solution takes a team's capabilities to the next level. They can quickly identify risks across all devices, bringing them to a more consistent and secure state. With a single management console, objects can be compared across all devices to uncover inconsistencies and optimize the current security posture. Personnel can streamline policy management, improve efficiency, and achieve more consistent security while reducing complexity.

X. IOT SECURITY THROUGHOUT THE NETWORK

Interconnected networks of IoT devices include multiple points of vulnerability, each of which requires its own security solution. Most IoT security solutions focus on providing security within the device itself. Data centers create an additional point of vulnerability. Virtually all IoT devices communicate to applications via centralized or distributed data centers, creating a well recognized need to protect these servers against attacks and data

breaches. The IoT Firewall is a User-Plane firewall, deployed in the Service Provider's core network, that features key differences from traditional network firewalls to allow better efficiency when deployed within the IoT domain. The IoT Firewall provides device-aware, application-centric firewall policies. This allows Service Providers to offer IoT security services without the need to host the IoT application in their data centers, or directly manage the IoT application. The primary security threats mitigated by the IoT Firewall are:

1) Network threats: The IoT Firewall prevents DDoS (Distributed Denial of Service) and application-layer attacks which may disrupt the integrity and availability of the Service Provider's network.
2) Device threats: IoT Firewall ensures that devices are only connecting to 'safe' locations and prevents devices from connecting to unknown services. This reduces the chances of devices being compromised through malware and blocks malicious 'ThingBot' C&C (command and control) communication to stop devices from being exploited remotely.
3) Service abuse: This capability prevents IoT devices from being used unexpectedly, which can result in revenue leakage for the Service Provider or the application owner (for example, stopping a connected car SIM from being used in another device to stream Netflix).

XI. CHALLENGE

IoT is one of the biggest contributors to the rising importance of the network edge. As the number of network devices grows, so does network vulnerability—more devices represent a greater threat target. Most IoT devices are narrowly focused with limited power, memory, and bandwidth—they cannot prioritize security features or even allow for software patches. Once breached, an IoT device is one of the easiest ways for hackers to gain network access and move horizontally to launch a system-wide attack in search of sensitive and confidential data.

A quick glance at the latest headlines shows why dynamic security is more important than ever. IT teams are figuring out how to effectively create, enforce, and manage consistent security policies without adding complexity. Network segmentation is an old but reliable way to implement a security strategy that minimizes threats and protects valuable resources and data. And with an Ethernet VPN-Virtual Extensible LAN (EVPN-VXLAN) architecture, policies and workloads can move seamlessly across and within various enterprise sites.

XII. CONCLUSION

Applying IoT technology yields both opportunities and security risk, so the challenges with IoT devices in relation to security are huge. A careful assessment of security risk must precede any IoT implementation to ensure that all the relevant, underlying problems are discovered. Without sufficient data security and data protection, IoT will not be successful in the long run. Therefore, every IoT manufacturer is challenged to complement all phases of development processes through to the operation of the equipment with appropriate security measures. In future work, it is important to develop a framework for realizing and evaluating security risk within IoT to ensure confidentiality, integrity and availability.

REFERENCE

[1] D. J. Cook et al., "MavHome: An agent-based smart home," IEEE International Conference on Pervasive Computing and Communications, San Diego, CA, USA, pp. 521-524, 2003

[2] N. King, "Smart home - A Definition," Milton Keynes: Intertek Research and Testing Centre, 2003

[3] Statista, 2015 [Online]. Available: https://goo.gl/89rRIa

[4] August and Xfinity, "The Safe and Smart Home: Security in the Smart Home Era," 2016 [Online]. Available: http://goo.gl/UGWb5Z

[5] V. Srinivasan et al., "Protecting your daily in-home activity information from a wireless snooping attack," 10th international conference on Ubiquitous computing, pp. 202-211, 2008

[6] B. Ur et al., "The current state of access control for smart devices in homes," Workshop on Home Usable Privacy and Security, 2013

[7] S. Notra et al., "An experimental study of security and privacy risks with emerging household appliances," IEEE Conference on Communications and Network Security, pp. 79-84, 2014

[8] V. Sivaraman et al., "Network-level security and privacy control for smart-home IoT devices," Wireless and Mobile Computing, Networking and Communications, pp. 163-167, 2015 [9] T. D. P. Mendes et al., "Smart home communication technologies and applications: Wireless protocol assessment for home area network resources," Energies, vol. 8, no. 7, pp. 7279-7311, 2015

[9] C. Debes et al., "Monitoring Activities of Daily Living in Smart Homes: Understanding human behavior," IEEE Signal Processing Magazine, vol. 33, no. 2, pp. 81-94, 2016

[10] C. Lee et al., "Securing smart home: Technologies, security challenges, and security requirements," IEEE Conference on Communications and Network Security, pp. 67-72, 2014 [12] K. Islam et al., "Security and privacy considerations for wireless sensor networks in smart home environments," Computer Supported Cooperative Work in Design, IEEE 16th International Conference on, pp. 626- 633, 2012

[11] H. Chan and A. Perrig, "Security and privacy in sensor networks," Computer, vol. 36, no. 10, pp. 103-105, 2003

[12] M. Abdur Razzaq, R. A. Sheikh, A. Baig, and A. Ahmad, "Digital image security: Fusion of encryption, steganography and watermarking," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 8, no. 5, 2017.

[13] S. Singh and N. Singh, "Internet of things (iot): Security challenges, business opportunities & reference architecture for e-commerce," in Green Computing and Internet of Things (ICGCIoT), 2015 International Conference on. IEEE, 2015, pp. 1577–1581.

[14] K. Rose, S. Eldridge, and L. Chapin, "The internet of things: An overview," The Internet Society (ISOC), pp. 1–50, 2015.

[15] H. Ning, H. Liu, and L. T. Yang, "Cyberentity security in the internet of things," Computer, vol. 46, no. 4, pp. 46–53, 2013.

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A ROBUST FREQUENCY COMPENSATION TECHNIQUE FOR ON-CHIP OUTPUT CAPACITOR THREE STAGE LOW-DROP-OUT LINEAR REGULATOR

[1]ANASS SLAMTI, [2]YOUNESS MEHDAOUI, [3]DRISS CHENOUNI, [4]ZAKIA LAKHLIAI

[1,2,3,4]Computer and Interdisciplinary Physics Laboratory (L.I.P.I.), USMBA, Fez, Morocco
[2]Research team in Electronics, Instrumentation and Measurements, USMS, Beni-mellal, Morocco
E-mail: [1]anass.slamti@gmail.com, [2]youness.mehdaoui@gmail.com, [3]d_chenouni@yahoo.fr, [4]zlakhliai@hotmail.fr

Abstract - A novel compensation technique is proposed to improve the stability and transient response of the on-chip output capacitor three stage low-drop-out linear regulator (LDO). It exploits the current buffer and current amplifier circuits to multiply the classical Miller compensation effect by increasing the loop gain of the compensation bloc in order to guarantee the stability of the LDO regulator for all required range of the load current and especially for ultra light load current and also enhance the transient response in terms of speed. The proposed LDO regulator is analyzed, designed, and simulated in standard 0.18um low voltage CMOS process. The presented LDO regulator delivers a stable voltage of 1.2V for an input supply voltage range of 1.35-1.85V with a maximum line deviation of 4.68mV/V and can supply up to 150mA of the load current. The maximum transient variation of the output voltage is less than 65mV when the load current pulses from 150mA to 0mA during a fall time of 1us. The proposed LDO regulator has a low figure of merit compared with recent LDO regulators.

Keywords - LDO Regulator, Zero Load Current Stability, Current Buffer, Current Amplifier, Transient Load Regulation.

I. INTRODUCTION

Many system-on-a-chip (SoC) applications integrate circuit blocks, such as digital, analog, radio-frequency blocks [1]-[3]. Charge pump regulators are commonly used to generate high voltages for lighting or memory units [4], [5]; switching converters are employed to regulate digital blocks, due to their high power efficiency [6], [7]; and low-drop-out linear voltage regulators are used to provide low noise supply voltage with very low ripple for noise sensitive blocks, such as analog/RF circuits [8], [9]. An example that highlights the present-day importance of voltage regulators and power management blocks can be found in [10], [11], where the power supply requirements for a Code-Division Multiple Access (CDMA) modem of a mobile phone are described. LDO regulators play a very important role in the integrated power management unit in modern portable electronic devices [12], they scales down the supply voltage to provide for many various other blocks.

An important issue in LDO voltage regulator design is stability, which has a direct impact on the transient response of this system. In addition, the downscaling of the supply voltage and the decrease of the intrinsic gain of the MOS transistor for nanometric CMOS technologies [13], [14] requires the use of multiple stages in the implementation of the LDO regulator, this degrades the close-loop response (stability and transient response) by the presence of multiple poles, hence the need to develop a robust compensation method. Compensation can be external or internal. Generally, external compensation is achieved with a high value capacitor in the order of µF [15]. As for internal compensation, Miller compensation is one of the most widely used techniques [16], but other techniques and approaches can be found in literature [17]-[24]. Most of these techniques and approaches suffer from the instability problem at very low load current, while several applications need the LDO to hold the output and provide good performance under a no-load current condition such as CMOS RAM keep-alive applications [25].

In this work a novel frequency compensation technique based on current buffer/amplifier circuits is proposed to achieve the stability for all range of the load current for the LDO regulator and also enhance his transient response. In section II, the uncompensated frequency response of the proposed three stage LDO regulator is analyzed to show the instability of the circuit for medium and low load currents. In section III, the circuit of the proposed compensation method is given, the stability analysis is established and an explanation of our contribution is warranted. In section IV, the simulation results are given to show the performance of the proposed LDO regulator in terms of stability, transient response and others parameters accompanied by a comparison with previous related works. Finally, in section V, a conclusion is given to remind the contribution of this work.

II. UNCOMPENSATED ON-CHIP OUTPUT CAPACITOR LDO VOLTAGE REGULATOR

The simplified architecture of the proposed internally compensated LDO voltage regulator (IC-LDO) is shown in fig. 2, while fig. 3 gives the MOS transistor implementation of a three-stage LDO regulator without voltage reference which is considered ideal in this section. The compensation circuit is also omitted in this part.

A single-ended two-stage error amplifier is chosen [16], it consists of M_1-M_6 transistors, bias transistor M_B and common feedback resistor R_{CMFB}. A fully-differential PMOS M1 input stage is used to achieve high power supply noise rejection. The third stage or power stage is composed by the pass transistor M_P. The feedback network is composed by the resistors R_{FB1} and R_{FB2} and the load is formed by the

capacitor C_L and the resistor R_L. The circuit also contains a voltage reference which will be later discussed.

A. Stability analysis

Open loop non inverting input voltage v_i^+ to feedback voltage v_{fb} transfer function is defined by:

$$H_{OL,u}(s) = v_{fb}(s)/v_i^+(s) \quad (1)$$

Referred to the Fig. 4 and by applying the Kirchhoff current laws (KCLs), we obtain:

$$H_{OL,u}(s) = \frac{H_{0,u}.(1-\frac{s}{\omega_{z_{RHP}}})}{(1+\frac{s}{\omega_{p1}}).(1+\frac{s}{\omega_{p2}}).(1+\frac{s}{\omega_{p3}})} \quad (2)$$

Where

$$H_{0,u} = -\beta.g_{mA1}.g_{mA2}.g_{mp}.R_{OA1}.R_{OA2}.R_{out} \quad (3)$$

$$\beta = R_{FB2}/(R_{FB1}+R_{FB2}) \quad (4)$$

$$R_{OA1} = r_{o1}//r_{o2}//R_{CMFB} \quad (5)$$

$$R_{out} = r_{op}//(R_{FB1}+R_{FB2})//R_L \quad (6)$$

$$\omega_{z_{RHP}} = g_{mp}/C_{gdp} \quad (7)$$

$H_{0,u}$ is the DC gain of the uncompensated LDO regulator. $g_{mA1}=g_{m1}$, R_{OA1} and C_{OA1} represent the transconductance, the output resistance and the sum of the parasitic capacitance connected between the output node of the first stage of the error amplifier and the small signal ground, respectively. $g_{mA2}=g_{m2}$, $R_{OA2}\approx r_{o6}$ and C_{OA2} represent the transconductance, the output resistance and the sum of the parasitic capacitance connected between the output node and the small signal ground of the second stage of the error amplifier, respectively. $C_{Gp}=C_{OA2}+C_{gsp}$ is the total capacitance between the gate of the pass transistor M_P and the small signal ground. The capacitor C_{gsp} models the gate-to-source capacitance of M_P and C_{gdp} its gate-to-drain capacitance. g_{mp} and r_{op} represent the transconductance and the drain-to-source resistance of M_P, respectively. β is the feedback factor of the resistive network. ω_{zRHP} is the corresponding angular frequency to the right half plane (RHP) zero. ω_{p1}, ω_{p2} and ω_{p3} are the corresponding angular frequencies of the dominant pole p_1, the non-dominant pole p_2 and the high frequency pole p_3, respectively. The expressions of ω_{p1}, ω_{p2} and ω_{p3} are functions of terms R_{out} and $g_{mp}R_{out}$ which depend on the load current I_L or the value of the load resistor R_L. Consequently the frequency response depends on the load current.

Fig. 5.a and 5.b represent the zero-pole location in the Bode plan and in the complex s plane, respectively. For the sake of simplification, the corner frequencies are given in terms of ω.

It is clear that to stabilize the LDO regulator, it is necessary to separate the dominant and non-dominant poles while keeping a phase margin greater than 45 degree

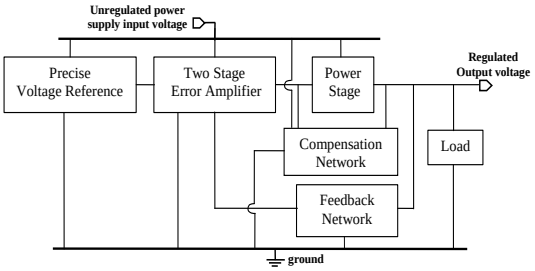

Fig. 1. Power management unit in modern portable devices.

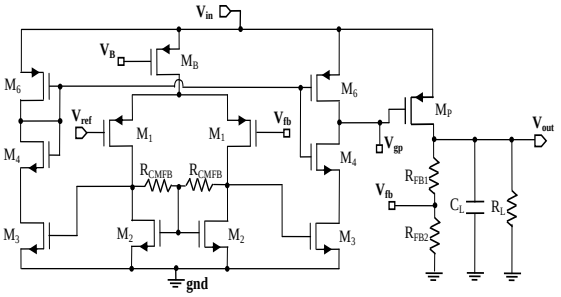

Fig. 2. Power management unit in modern portable devices.

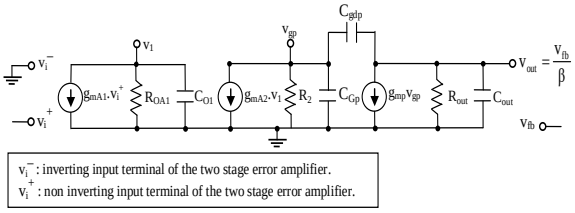

Fig. 3. Small signal model of the proposed uncompensated three stage LDO regulator.

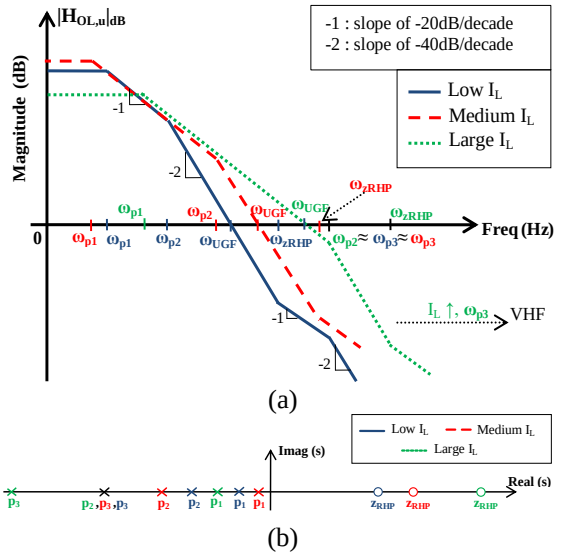

Fig. 4. Zero-pole locus for the proposed uncompensated LDO.
(a) Bode plan location, (b) s-plane location.

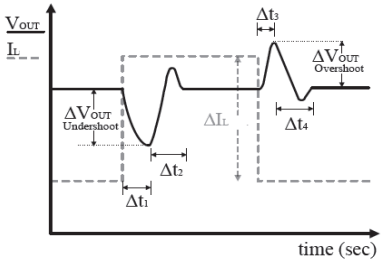

Fig. 6. Typical LDO Regulator Load Transient Response.

for the entire load current range required by the specifications and keeping higher the unity gain frequency to have a fast transient response, this is achieved by adding a left half plane (LHP) zeros well placed with respect to the poles.

B. Transient response

Transient response is the dynamic performance of linear regulator [9]. It can be separated into two parts, one is form load variation, named as load transient response, and the other is from line variation, named as line transient response. A typical LDO regulator transient response to load changes is shown in Figure 6. For an increase of load current by ΔI_L, the LDO output observes an undershoot ΔV_{out} for a response time duration of Δt_1. The loop reacts to this load change and the output voltage settles in a time duration defined by reaction time also known settling time Δt_2. Minimizing $\Delta t_1+\Delta t_2$ is a critical need for digital load applications. The LDO response time Δt_1 depends on undershoot ΔV_{out}, output capacitance C_{out} and load current change ΔI_L. The settling time, Δt_2 is determined by the open-loop bandwidth of the regulation loop and the slew-rate at the gate of pass transistor M_P.

III. PROPOSED FREQUENCY COMPENSATION CIRCUIT

A. Compensation network using current buffer/amplifier

The proposed compensation technique is based on previous work [19], [22] and [23]. It consists in the cancellation of RHP zero by creating a LHP zeros.

Fig. 7 gives a brief description of the two techniques introduced in the proposed compensation circuit. The voltage nodes X and Y are connected to the gate of M_P and to the output node of the LDO, respectively.

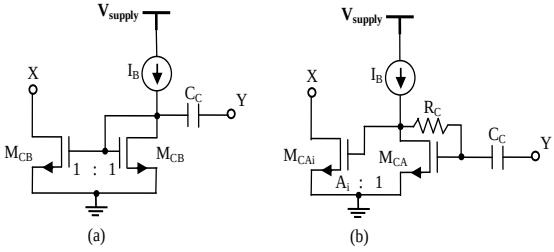

Fig. 7. Cancellation techniques for Miller RHP zero. (a) type-N current buffer, (b) type-N current amplifier with resistor.

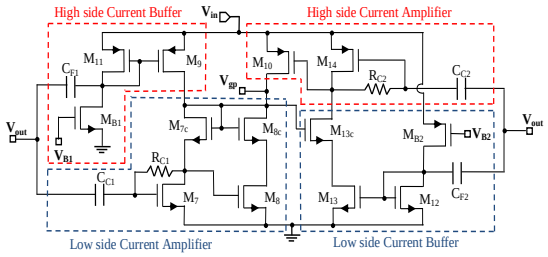

Fig. 8. Transistor MOS implementation of proposed frequency compensation.

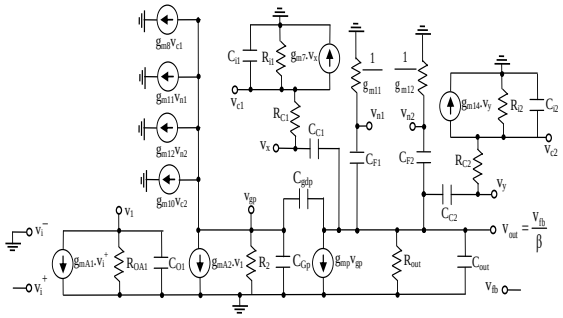

Fig. 9. Small signal model of the proposed IC-LDO linear voltage regulator.

The current buffer (Fig. 7.a) creates a LHP zero $z_{LHP} = -(g_{mCB}/C_C)$ where g_{mCB} is the transconductance of transistor M_{CB} and C_C is the compensation capacitor. The current amplifier with resistor (Fig. 7.b) creates a LHP zero $z_{LHP} \approx -1/(R_C C_C)$ if $R_C >> (1/g_{mCA})$, where g_{mCA} is the transconductance of the transistor M_{CA} and R_C is the compensation resistor. The current gain A_i is given by the size ratio of the two transistors M_{CAi} and M_{CA}.

B. Proposed frequency compensation circuit

The overall compensation circuit is given in fig. 8, it is composed of two complementary current buffers one is N-type named high side current buffer, the other is P-type called high side current buffer, it is also composed of two complementary current amplifiers one is N-type named low side current amplifier, the other is P-type called high side current amplifier. The proposed compensation circuit has a double benefit:

i. It allows to move the non-dominant pole away from the dominant pole towards the high frequencies and away from the unity gain frequency by creating a LHP zero located before the non-dominant pole, which allows to ensure sufficient phase margin for the entire load current range.
ii. It also makes it possible to reduce the maximum variation of V_{out} during overshoot when the load current pulses instantaneously from its maximum value to its minimum value, and to reduce the minimum variation of V_{out} during undershoot when the load current pulses instantaneously from its minimum value to its maximum value.

For a good understanding of the dynamic behavior of IC-LDO, the small-signal model is realized (Fig. 9) and frequency analysis is performed. Based on [26] and using KCL, we find that the open-loop transfer function of the compensated response has the expression:

$$H_{OL,c}(s) = \frac{H_{0,c}\left(1-\frac{s}{z_{RHP}}\right)\left(1+\frac{s}{z_{LHP1}}\right)\left(1+\frac{s}{z_{LHP2}}\right)\left(1+\frac{s}{z_{LHP3}}\right)\left(1+\frac{s}{z_{LHP4}}\right)}{\left(1+\frac{s}{p_d}\right)\left(1+\frac{s}{p_{nd}}\right)\left(1+\frac{s}{p_3}\right)\left(1+\frac{s}{p_4}\right)\left(1+\frac{s}{p_5}\right)\left(1+\frac{s}{p_6}\right)(1+as+bs^2)} \quad (8)$$

Where, $H_{0,c} = -\beta . g_{mA1} . g_{mA2} . g_{mp} . R_{OA1} . R_2 . R_{out}$ (9)

$$R_2 = R_{OA2} // R_{O1} // R_{O2} \quad (10)$$

$$z_{RHP} = g_{mp} / C_{gdp} \quad (11)$$

$$z_{LHP1} \approx -1/(R_C C_C) \quad (12)$$

$$z_{LHP2} = -(g_{m11}/C_F) \quad (13)$$

$$z_{LHP3} = -(g_{m12}/C_F) \quad (14)$$

$$z_{LHP4} \approx -1/(R_{i1} C_{i1}) \quad (15)$$

$$p_d \approx -\frac{1}{R_2[g_{mp} R_{out}(g_{m10} + \frac{g_{m8}}{2})R_C C_C + C_{Gp} + C_{gdp}]} \quad (16)$$

$$p_{nd} \approx -\left(R_2[g_{mp} R_{out}(g_{m10} + \frac{g_{m8}}{2})R_C C_C + C_{Gp} + C_{gdp}]\right) / \left(R_2 R_{out}(C_{out} + C_{Ce} + C_{gdp}).C_{Gp} + [R_2(C_{Gp} + C_{gdp}) + R_{out}(C_{out} + C_{Ce} + C_{gdp})].[R_C C_C + C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})]\right) \quad (17)$$

$$p_3 \approx -\left(R_2 R_{out}(C_{out} + C_{Ce} + C_{gdp}).C_{Gp} + [R_2(C_{Gp} + C_{gdp}) + R_{out}(C_{out} + C_{Ce} + C_{gdp})].[R_C C_C + C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})]\right) / \left(R_2[\frac{g_{mp} R_{out} R_C C_C C_F^2}{g_{m11} g_{m12}}(g_{m10} + \frac{g_{m8}}{2}) + R_C C_C C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})(C_{Gp} + C_{gdp}) + R_{out} C_{Gp}(C_{out} + C_{Ce} + C_{gdp})(R_C C_C + C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}}))]\right) \quad (18)$$

$$p_4 \approx -\left(R_2[\frac{g_{mp} R_{out} R_C C_C C_F^2}{g_{m11} g_{m12}}(g_{m10} + \frac{g_{m8}}{2}) + R_C C_C C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})(C_{Gp} + C_{gdp}) + R_{out} C_{Gp}(C_{out} + C_{Ce} + C_{gdp})(R_C C_C + C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}}))]\right) / \left(\frac{R_C C_C C_F^2}{g_{m11} g_{m12}}[R_2(g_{mp} R_{out} C_{gdp} + C_{Gp} + C_{gdp}) + R_{out}(C_{out} + C_{Ce} + C_{gdp})] + R_2 R_{out} C_{Gp}(C_{out} + C_{Ce} + C_{gdp})[\frac{C_F^2}{g_{m11} g_{m12}} + R_C C_C C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})]\right) \quad (19)$$

$$p_5 \approx -\left(\frac{R_C C_C C_F^2}{g_{m11} g_{m12}}[R_2(g_{mp} R_{out} C_{gdp} + C_{Gp} + C_{gdp}) + R_{out}(C_{out} + C_{Ce} + C_{gdp})] + R_2 R_{out} C_{Gp}(C_{out} + C_{Ce} + C_{gdp})[\frac{C_F^2}{g_{m11} g_{m12}} + R_C C_C C_F(\frac{1}{g_{m11}} + \frac{1}{g_{m12}})]\right) / \left(\frac{R_2 R_{out} R_C C_C C_F^2}{g_{m11} g_{m12}}[(C_{out} + C_{Ce} + C_{gdp}).C_{Gp} + g_{mp} C_{gdp}(R_{i1} C_{i1} + R_{i2} C_{i2})]\right) \quad (20)$$

$$p_6 = -1/(R_{OA1} C_{OA1}) \quad (21)$$

$$a \approx \frac{(R_{i1} C_{i1} + R_{i2} C_{i2})[C_{gdp}(C_{out} + C_{Ce}) + C_{Gp}(C_{Ce} + C_{gdp})]}{[(C_{out} + C_{Ce} + C_{gdp}).C_{Gp} + g_{mp} C_{gdp}(R_{i1} C_{i1} + R_{i2} C_{i2})]} \quad (22)$$

$$b \approx \frac{R_{i1} R_{i2} C_{i1} C_{i2} C_{Gp}(C_{out} + C_{Ce} + C_{gdp})}{[(C_{out} + C_{Ce} + C_{gdp}).C_{Gp} + g_{mp} C_{gdp}(R_{i1} C_{i1} + R_{i2} C_{i2})]} \quad (23)$$

$H_{0,c}$ is the DC gain of the compensated LDO regulator. R_2 represents the equivalent resistance connected between the gate node of M_P and the small signal ground, R_{O1} is the output resistance of the low side current amplifier expressed by $R_{O1} \approx g_{m8} r_{o8}^2$ and R_{O2} is the output resistance of the high side current buffer expressed by $R_{O2} \approx r_{o10}$. R_{i1} and C_{i1} represent the input resistance and the equivalent input capacitor of the low side current amplifier, respectively. Likewise, R_{i2} and C_{i2} represent the input resistance and the equivalent input capacitor of the high side current amplifier, respectively. C_{Ce} represents the total compensation capacitor which is equal to $C_{Ce}=2C_F + 2C_C$.

The compensated transfer function contains one RHP zero z_{RHP}, four LHP zeros (z_{LHP1}, z_{LHP2}, z_{LHP3} and z_{LHP4}) and six negative real poles where p_d represents the dominant pole who determines the compensated bandwidth. In addition, the analysis shows that there are two other complex conjugate poles p_{C1} and p_{C2}, which are the two solutions of the polynomial equation $1+a.s+b.s^2=0$, given by:

$$p_{C1,2} = -\zeta\omega_0 \mp j\omega_0\sqrt{1-\zeta^2} \quad (24)$$

Where,

$$\omega_0 = 1/\sqrt{b} \quad (25)$$

$$\zeta = a/(2.\sqrt{b}) \quad (26)$$

The parameters ω_0 and ζ represent the angular corner frequency and the damping factor, respectively. A resonance phenomenon occurs in the vicinity of ω_0, the angular resonant frequency ω_r is expressed by:

$$\omega_r = \omega_0.\sqrt{1-2\zeta^2} \quad (27)$$

To evaluate the phase margin of the open-loop frequency response, the transfer function in the vicinity of the unity gain frequency is approximated, and it is expressed by:

$$H_{OL,c}(j\omega_{UGF}) \approx \frac{H_{0,c}(1+\frac{j\omega_{UGF}}{\omega_{z_{LHP1}}})(1+\frac{j\omega_{UGF}}{\omega_{z_{LHP2}}})(1+\frac{j\omega_{UGF}}{\omega_{z_{LHP2}}})}{(1+\frac{j\omega_{UGF}}{\omega_{p_d}})(1+\frac{j\omega_{UGF}}{\omega_{p_{nd}}})} \quad (28)$$

Since $H_{0,c}$ is negative, the expression of the phase margin PM will be:

$$PM \approx \tan^{-1}\left(\frac{\omega_{UGF}}{\omega_{z_{LHP1}}}\right) + \tan^{-1}\left(\frac{\omega_{UGF}}{\omega_{z_{LHP1}}}\right) + \tan^{-1}\left(\frac{\omega_{UGF}}{\omega_{z_{LHP1}}}\right) - \tan^{-1}\left(\frac{\omega_{UGF}}{\omega_{p_d}}\right) - \tan^{-1}\left(\frac{\omega_{UGF}}{\omega_{p_{nd}}}\right) \quad (29)$$

The design of the proposed compensated LDO has been made so that the following conditions are met:

- the unity gain frequency is between 800kHz and 1MHz regardless of the load current value,
- the unity gain frequency is much higher than the dominant pole frequency (bandwidth), in other words $\omega_{UGF} >> \omega_{pd}$,
- the location of poles and zeros that are not very far from the unity gain frequency is as follows: $\omega_{UGF} < \omega_{zLHP1} < \omega_{zLHP2} < \omega_{zLHP3}$ and $\omega_{UGF} < \omega_{zLHP1} < \omega_{pnd}$

Therefore, the phase margin keeps a value close to 90 degrees regardless of the load current value, consequently the system is stable under all load current conditions.

C. Voltage reference

The LDO regulator proposed in this work also includes the voltage reference, which plays an important role in the accuracy of the feedback voltage V_{fb}, which is why this voltage reference V_{ref} must have a precise value and independent of the temperature, the supply voltage and the process of the technology used. The voltage reference designed for the LDO regulator was previously realized and published by the same authors [27].

IV. SIMULATION RESULTS AND DISCUSSION

The proposed LDO regulator was simulated in standard 0.18-µm CMOS process using Cadence Virtuoso Spectre Simulator.

As shown in Figure 10 in the AC simulation, the proposed LDO is stable for all current load I_L conditions and especially at zero load, the unity gain frequency is practically constant for any value of I_L in the required range

	[19]	[21]	[22]	[23]	[24]	This work
Process [µm]	0.35	0.18	0.35	0.5	0.18	0.18
Input supply voltage range V_{IN} [V]	3.0 - 4.0	1.1-1.5	1.2-1.5	1.4-4.2	1.1-1.5	1.35 - 1.85
Output voltage V_{OUT} [V]	2.8	1.0	1.0	1.21	1.0	1.2
Drop-Out voltage V_{DO} @ $I_{L,max}$ [mV]	200	100	200	200	114	153
Maximum load current $I_{L,max}$ [mA]	50	50	50	100	100	150
Quiescent current I_q [µm]	65	54	45	45	20	9.7 - 11.3
Current efficiency @ $I_{L,max}$ [%]	99.96	99.95	99.95	99.95	[a]	99.97
Power efficiency [%]	[a]	[a]	[a]	[a]	[a]	88.8-65.5
On-chip output capacitance C_L [pF]	100	100	1nF (Off-chip)	100nF(Off-chip)	100	100
Total compensation capacitance [pF]	23	5	41	67.2	12	5
Zero load current stability	No	No	No	No	No	Yes
Transient line regulation * [mV] ΔV_{OUT} varying V_{IN}						
✓ Maximum overshoot	90	[a]	[a]	23	55.66	36.7
✓ Minimum undershoot	-10	[a]	[a]	-12	-55.34	-37.5
Transient load regulation * [mV] ΔV_{OUT} varying I_L						
✓ Maximum overshoot	80	100	70	47	99.52	44.9
✓ Minimum undershoot	-80	-80	-70	-48	-591.1	-64.1
Time response [µs]	15	2	4	5	6.3	5.25 - 3.89
DC line regulation @ $I_{L,max}$ [mV/V]	[a]	[a]	0.098	[a]	2.3	4.68
DC load regulation [µV/mA]	[a]	[a]	250	408	1	24.7 – 24.9
FOM** [fs]	416	388.8	2520	42750	118.2	1.496

[a]Not available, *1µs of rise/fall times, ** $FOM = |\Delta V_{OUT}| \cdot \frac{C_L . I_q}{I_{L,max}^2}$

Table 1. Performance of the proposed LDO regulator and comparison with recently related works.

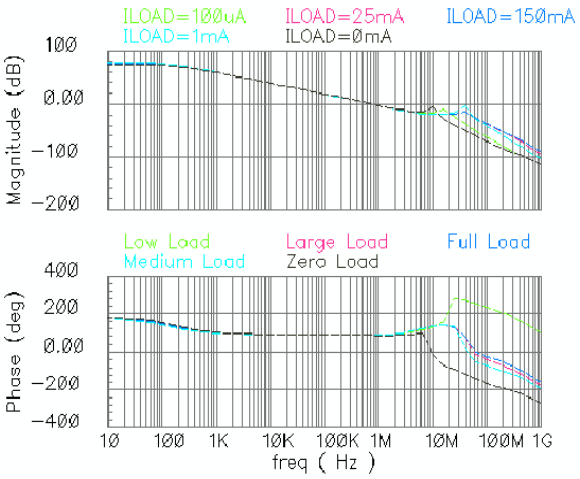

Fig. 10. Open-loop ac response simulation for full range of load current (V_{IN}=1.6V and C_L=100pF).

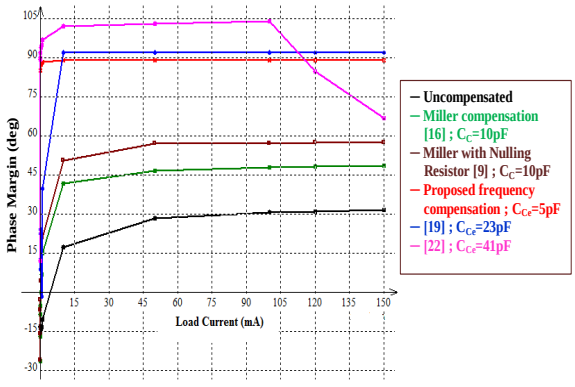

Fig. 11. Phase Margin versus Load Current.

and it is equal to 1 MHz, which presents a good erformance of the proposed compensation circuit. The AC magnitude exhibits a high frequency peak, its location depends on the

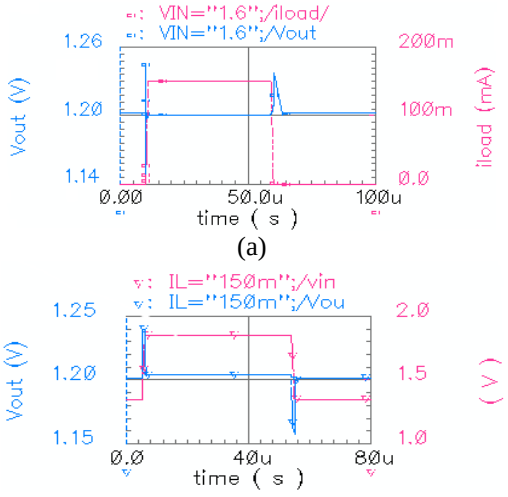

Fig. 12. Transient response simulation. (a) Transient load regulation at V_{IN}=1.6V; (b) Transient line regulation at full load.

value of the load current and this due to the presence of two complex conjugate poles as it has been proved is shown in section III.

Fig. 11 presents the results of the dependence of the phase margin PM as a function of the load current I_L for the proposed compensation method and for the other compensation methods cited in this work. For the proposed

frequency compensation technique, the phase margin is equal to 85.1 degree at zero load and it is 89.04 degree at full load. The robustness of the proposed compensation technique consists; on the one hand, in the stability of the LDO in the absence of a resistive load and does not require a minimum load current for proper operation which is not achieved by the compensation methods [19] and [22], and on the other

hand, it uses less compensation capacitors to reduce the surface area.

Fig. 12 presents the transient response at V_{IN}=1.6V for load regulation response (a). For load current pulse variation from 0mA up to 150mA, the output voltage vout presents an overshoot and undershoot of 44.9mV and -50.8mV, respectively. For load current pulse variation from 150mA down to 0mA, the output voltage v_{out} presents an overshoot of 34.1mV.

Table 1 summarizes performance characteristics of the proposed LDO regulator and comparison with related works is given. For comparison of the State of the Art, some

Figures of Merit (FOMs) is proposed [28]. Note that the smaller the FOM chosen for this work, the better the regulator.

V. CONCLUSION

In this paper, a novel internally frequency compensation technique is proposed to enhance stability and transient response of the on-chip output capacitor three stage low-drop-out linear voltage regulator. The proposed compensation technique guarantees the stability of the regulator for the whole range of the load current and especially at zero load current. Based on the calculated value of the FOM, the proposed LDO regulator exhibits good performance in terms of transient response compared with other related works.

REFERENCES

[1] J. Gjanci and M. H. Chowdhury, “A hybrid scheme for on-chip voltage regulation in system-on-a-chip (SOC),” IEEE Trans. VLSI Syst., vol. 19, no. 11, pp. 1949-1959, November 2011.

[2] C. Shi, B. C. Walker, E. Zeisel, B. Hu, and G. H. McAllister, “A highly integrated power management IC for advanced mobile applications,” IEEE J. Solid-State Circuits, vol. 42, no. 8, pp. 1723-1731, August 2007.

[3] Youness MEHDAOUI, Rachid EL ALAMI, ‘’DSP implementation of the Discrete Fourier Transform using the CORDIC algorithm on fixed point’’, Advances in Modelling and Analysis B, Vol. 61, No. 3, September, 2018, pp. 123-126.

[4] Anass SLAMTI, Hassan QJIDAA, ‘’A High Performance Regulated Charge Pump for USB-OTG Transceiver’’, 2011 International Conference on Multimedia Computing and Systems (ICMCS) - Ouarzazate, Morocco (2011.04.7-2011.04.9), published in IEEE Xplore Digital Library in12 July 2011.

[5] G. Palumbo, D. Pappalardo, ‘’Charge pump circuits: an overview on design strategies and topologies,’’ IEEE Circuits Syst. Mag. 10(1), 31–45 (2010).

[6] C. Zheng and D. Ma, "A 10MHz 92.1%-efficiency green-mode automatic reconfigurable switching converter with adaptively compensated single-bound hysteresis control," in 2010 IEEE International Solid-State Circuits Conference -(ISSCC), 2010, pp. 204-205.

[7] M. D. Mulligan, B. Broach, and T. H. Lee, "A 3MHz Low-Voltage Buck Converter with Improved Light Load Efficiency," in 2007 IEEE International Solid-State Circuits Conference. Digest of Technical Papers, 2007, pp. 528-620.

[8] Yongchun Hou, ‘’Design of conditioning circuit for weak signal in through-casing resistivity logging,’’ EJEE, pp. 75-89, 31 August 2017.

[9] G. Rincon-Mora, Analog IC Design with Low-Dropout Regulators (LDOs), 1st edn. (McGraw-Hill Inc, New York, NY, USA, 2009).

[10] G. Hurtz, D. Sugasawara, Cdma handset design challenge: 11 separate power supplies (2003),

[11] Youness Mehdaoui, Abdessamad Malaoui, Ahmed Gaga, Rachid El Alami, Mostafa Mrabti,‘’The Efficiency of the CORDIC Operator in the MIMO MC-CDMA receiver’’ Mathematical Modelling of Engineering Problems, pp. 99-104,31 March 2019.

[12] T. Simunic, L. Benini and P. Glynn, “Dynamic Power Management for Portable Systems”, Proceeding of the 6th annual international conference on Mobile Computing and networking”,New York, USA, 2000.

[13] A.J. Annema, B. Nauta, R. van Langevelde, H. Tuinhout, Analog circuits in ultra-deep submicron cmos. IEEE J. Solid-State Circuits 40(1), 132–143 (2005).

[14] 96. L.L. Lewyn, T. Ytterdal, C. Wulff, K. Martin, Analog circuit design in nanoscale cmos technologies. Proc. IEEE 97(10), 1687–1714 (2009).

[15] Amit P. Patel and Gabriel A. Rincón-Mora, ‘’High Power-Supply-Rejection (PSR) Current-Mode Low-Dropout (LDO) Regulator’’, IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS—II: EXPRESS BRIEFS, VOL. 57, NO. 11, NOVEMBER 2010.

[16] Behzad Razavi. Design Of Analog CMOS Integrated Circuit. Second Edition, 2017 by McGraw-Hill Education.

[17] K.N. Leung, P. Mok, A capacitor-free cmos low-dropout regulator with damping-factor control frequency compensation. IEEE J. Solid-State Circuits 38(10), 1691–1702 (2003).

[18] S.K. Lau, P. Mok, K.N. Leung, A low-dropout regulator for soc with q-reduction. IEEE J. Solid-State Circuits 42(3), 658–664 (2007)

[19] R. Milliken, J. Silva-Martinez, E. Sanchez-Sinencio, Full on-chip cmos low-dropout voltage regulator. IEEE Trans. Circuits Syst. I: Regul. Pap. 54(9), 1879–1890 (2007)

[20] G. Giustolisi, G. Palumbo, E. Spitale, Ldo compensation strategy based on current buffer/amplifiers, in 18th European Conference on Circuit Theory and Design, ECCTD (2007), pp. 116–119.

[21] L.-G. Shen, Z.-S. Yan, X. Zhang, Y.-F. Zhao, A capacitor-less low-dropout regulator for soc with bi- directional asymmetric buffer, in IEEE International Symposium on Circuits and Systems, ISCAS (2008), pp. 2677–2680.

[22] G. Giustolisi, G. Palumbo, E. Spitale,’’Robust miller compensation with current amplifiers applied to ldo voltage regulators’’, IEEE Trans. Circuits Syst. I: Regul. Pap. 59(9), 1880–1893 (2012).

[23] A. Garimella, M. Rashid, P. Furth,’’ Reverse nested miller compensation using current buffers in a three-stage ldo’’, IEEE Trans. Circuits Syst. II: Express Br. 57(4), 250–254 (2010).

[24] Fatemeh Abdi, Yasin Bastan, Parviz Amiri, ‘’Dynamic current-boosting based FVF for output-capacitor-less LDO Regulator’’, Analog Integrated Circuits and Signal Processing, 03 July 2019.

[25] Anand Veeravalli and Stephen M. Nolan,‘’Introduction to Low Dropout (LDO) Linear Voltage Regulators’’.

[26] Robert W. Erickson, Dragan Maksimovic, ‘’Fundamentals of Power Electronics SECOND EDITION’’, University of Colorado, Boulder, Colorado. KLUWER ACADEMIC PUBLISHERS, 2001.

[27] Anass SLAMTI, Youness MEHDAOUI, Driss CHENOUNI, Zakia LAKHLIAI, ‘’ A sub-1V high PSRR OpAmp based β-multiplier CMOS bandgap voltage reference with resistive division’’, Indonesian Journal of Electrical Engineering and Computer Science Vol. 15, No. 1, July 2019, pp. 155~167.

[28] P. Hazucha, T. Karnik, B. Bloechel, C. Parsons, D. Finan, S. Borkar, ‘’Area-efficient linear regulator with ultra-fast load regulation’’, IEEE J. Solid-State Circuits 40(4), 933–940 (2005).

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REAL TIME IMPLEMENTATION OF INVERTED PENDULUM STABILIZATION USING FUZZY GAIN-SCHEDULED PID CONTROLLER

[1]MOHAMMED ZINELAABIDINE GHELLAB, [2]SAMIR ZEGHLACHE

[1,2]LASS Laboratory, Department of Electrical Engineering, Faculty of Technology, University of Msila
E-mail: [1]mohamedzinelaabidine.ghellab@univ-msila.dz, [2]samir.zeghlache@univ-msila.dz

Abstract - The work has done in this paper concern a strategy of control based on gain adaptive proportional integral derivative (PID) using the fuzzy inference system and their application to the inverted pendulum, the PID controller with fixed parameters may fail to provide acceptable control performance. To improve the PID control effect, new designs of the fuzzy gain Scheduled PID controller (FGSPID) were presented in this paper. The parameters of PID controller were adjusted by a fuzzy system, used to tune in real-time the controller gain. The obtained experiment results confirm the effectiveness of the proposed method.

Keywords - PID Control; Fuzzy Logic; Inverted Pendulum; Gain- Scheduled

I. INTRODUCTION

Due to its simple structure, simplicity of implementation and satisfactory control performance, the PID (Proportional - Integral – Derivative) controller remains, until today, the most used regulator in industry. There are two main categories of this type of controller: fixed parameter and adaptive gains PID controllers. One of the most commonly used methods for determining the gains of a fixed parameter regulator is the Ziegler-Nichols method. This method has been addressed in many researches [1]. In most control applications, due to structural changes the controlled system may lose its effectiveness, therefore the PID gains need to be continuously retuned during the system life span. To reduce the effort of retuning the gains and also in order to increase system's performance, in the second group of controllers, the gains are adapted online. In [2] genetic algorithm based PID control has been utilized for the control of the TRMS, in [3] authors presented the evolutionary computation based on the genetic algorithm for the parameters optimization of the PID control to the inverted pendulum.

In some studies, the PID controller technique and fuzzy logic have been combined to develop effective control systems for uncertain nonlinear systems. The authors in [4]-[8] are proposed a new PID scheme in which the controller gains are scheduled by a fuzzy inference scheme, a comparison between classical control techniques and intelligent control based on fuzzy logic and genetic algorithm is presented in [9]. Authors in [10] have utilized genetic algorithm (GA) and an intelligent control scheme uses a fuzzy switching method, many gain scheduling methods have been studied and compared in [11]-[13]. In this work, adaptive fuzzy gain scheduled PID control approaches for an inverted pendulum system was proposed. A fuzzy inference scheme is used to tune in real-time the controller gains, where the tracking error and the change in tracking error are used in this fuzzy scheduler to make the system act faster and more effectively robust to the external disturbances. The proposed control laws are highlighted by simulations and real time implementation providing satisfactory results. Finally the proposed PID controller is compared with the conventional one through an experimental application to the inverted pendulum system. Compared to previous studies on PID control [2], [3], [14], [15], the proposed control approach increases the robustness of the controller with respect to external disturbances. Compared to sliding mode control [16, 17], the proposed control approach does not contain chattering phenomenon and obtained a good dynamic response. Compared to boundary layer sliding mode control [18, 19] and higher order sliding mode control, the control approach can schedule the control gains adaptively based on the tracking error and the change of the tracking error. The contributions of this paper could be briefly summarized as follows.

1. An effective and robust controller is developed for inverted pendulum system.
2. A fuzzy logic system is designed to schedule the switching gains adaptively according to the fuzzy rules based on tracking error and the change of the tracking error, which obtained a good dynamic response.

The rest of the paper is organized as follows. Section 2 focuses on the nonlinear dynamic model of the inverted pendulum system. Design of the fuzzy adaptive PID controller is highlighted in section 3. Simulation results and related discussions are given in section 4. The experimental results to validate the effectiveness of the proposed approach are presented in Section 5. Finally some conclusions are drawn in section 6.

II. MODEL DESCRIPTION OF THE INVERTED PENDULUM SYSTEM

The description of the pendulum setup in this section refers mainly to the control problems. For connection,

interface and an explanation of how the signals are measured and transferred to the PC.

As shown in Fig.1 the pendulum setup consists of a cart moving along the 1 meter length track. The cart has a shaft to which two pendulums are attached and are able to rotate freely. The cart can move back and forth causing the pendulums to swing.

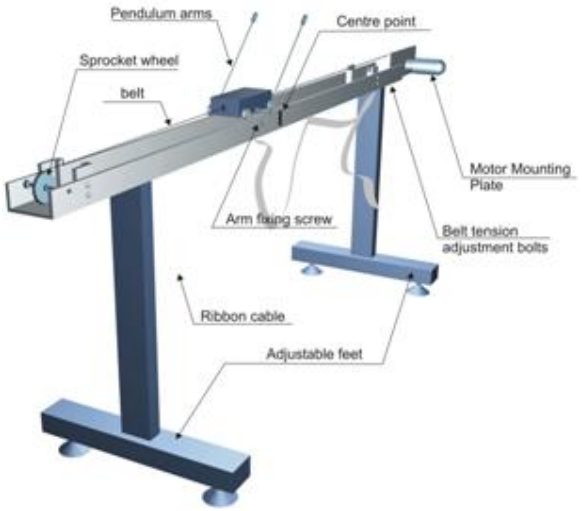

Figure 1. Digital Pendulum mechanical unit [20].

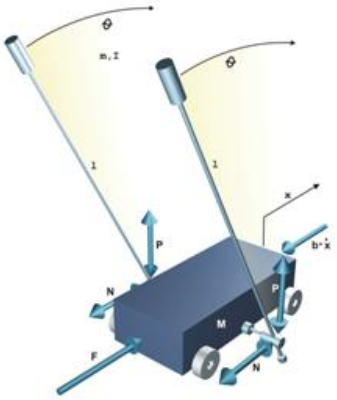

Figure 2. Pendulum phenomenological model [20].
Figure 3.

The phenomenological model of the pendulum is nonlinear, meaning that at least one of the states (x and its derivative or θ and its derivative) is an argument of a nonlinear function. For such a model to be presented as a transfer function (a form of linear plant dynamics representation used in control engineering), it has to be linearised.

Summing the forces acting on the pendulum and cart system and the moments we obtain the following nonlinear equations of motion [20]:

$$\begin{cases}(M+m)\ddot{x}+b\dot{x}+ml\ddot{\theta}\cos(\theta)-ml\dot{\theta}^2\sin(\theta)=F \\ (ml^2+I)\ddot{\theta}-mgl\sin(\theta)+ml\ddot{x}\cos\theta+d\dot{\theta}=0\end{cases}$$

(1)

To complete the model given by motion equation (1), we must introduce the values of all parameters. The following table gives these values:

Parameters	Values
g: gravity	9.81 m/s^2
l: Pole length	0.36 to 0.4 m - depending on configuration
M: cart mass	2.4 kg
m: Pole mass	0.23 kg
I: Inertia moment of the pole	About 0.099 kg.m^2 - depends on configuration
b: Cart friction coefficient	0.05 Ns/m
d: Pendulum damping coefficient	although negligible, necessary in the model- 0.005 Nms/rad

TABLE I. Pendulum parameters [20].

Two things have to be kept in mind when designing the controllers. Both the cart position and the control signal are bounded in a real time application. The bound for the control signal is set to [-2.5V .. +2.5V] and the generated force magnitude of around [-20.0N .. +20.0N]. The cart position is physically bounded by the rail length and is equal to [-0.5m .. +0.5m]. Assuming that the relation between the control voltage u and the generated cart velocity is linear, we might add the velocity vector generated by the motor to the model and ignore the F vector, or translate the control voltage u to the generated force F under the assumption that constant voltage will cause the cart to move with constant velocity:

$$F = K_{Fu}\frac{du}{dt}$$

(2)

where K_{Fu} is the gain between the u voltage derivative and the F force.

III. FUZZY ADAPTIVE PID CONTROLLER DESIGN FOR TRMS SYSTEM

Conventional PID controllers are is a generic control loop feedback mechanism (controller) widely used in industrial control systems. They are simple and easy to use. But one of the main drawbacks of these controllers is that there is no certain way for choosing the control parameters which guarantees the good performance. Therefore in real world applications these gains need to be fine-tuned to keep the required performance. To overcome this shortcoming, Fuzzy Logic Controller is used to tune PID gains online where the tracking error and the change of the tracking error are used to determine control parameters kp, ki and kd.

$$u_{PID} = k_p e(t) + k_i\int_0^t e(\tau)d\tau + k_d\frac{de(t)}{dt}$$

(3)

In this section, designing the adaptive PID controller using the fuzzy logic will be studied. In order to

control the TRMS with two degrees of freedom, two fuzzy adaptive PID controllers need to be developed: one for the horizontal axis and the other one for the vertical axis. Then, the fuzzy logic is used for

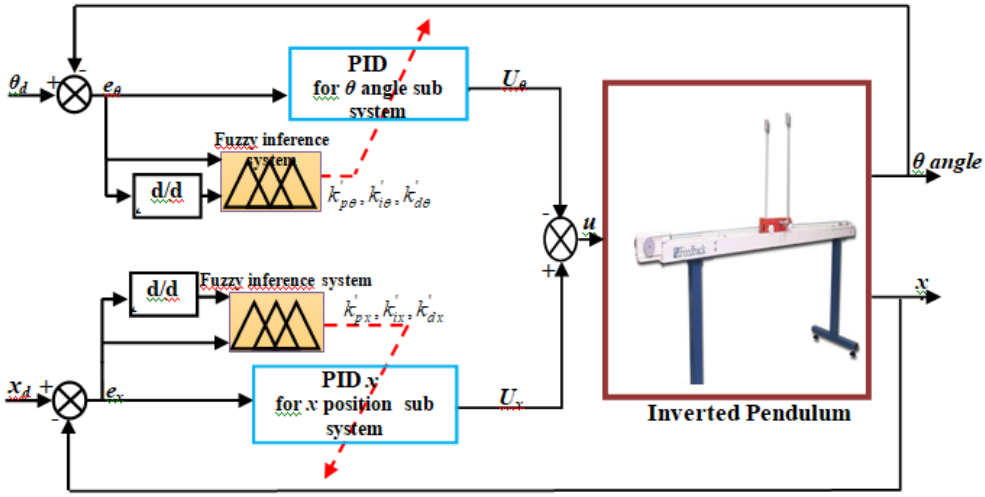

Figure 4. Block diagram of TRMS with FGSPID controller.

updating parameters of these PID controllers. The structure of fuzzy adaptive PID controller system is shown in Fig.3.

The proposed control (FGSPID) is an approach to systematically determine the gains kp, ki and kd, so that the FGSPID Controller is used to tune PID gains online where the tracking error and its first time difference are used to determine control parameters. The fuzzy tuner has two inputs, error (e) and error derivative (Δe), and two outputs are kp, ki and kd.

The parameters of the PID controller used in the direct chain, kp, ki and kd, are normalized into the range between zero and one by using the following linear transformations [21-23]:

$$\begin{cases} k_p^{'} = (k_p - k_{P\min}) / (k_{P\max} - k_{P\min}) \\ k_i^{'} = (k_i - k_{i\min}) / (k_{i\max} - k_{i\min}) \\ k_d^{'} = (k_d - k_{d\min}) / (k_{d\max} - k_{d\min}) \end{cases} \quad (4)$$

The parameters k_p, k_i and k_d are determined by a set of linguistic rules of the FGSPID controller structure, as following:

If e (k) is A_i, and Δe (k) is B_i, then k'_p is C_i, k'_i is D_i and k'_d is E_i.

Where: A_i, B_i, C_i , D_i and E_i are fuzzy sets corresponding to e (k), Δe (k), k_p, k_i and k_d respectively.

The application of FGSPID control to the TRMS corresponds to adapt the different gains k_p, k_i and k_d for the horizontal and vertical subsystems. The main advantage of this adaptation is to synthesize the six gains in the same time and in the same way, in order to stabilize both pitch and yaw angles while tracking the desired trajectories, to compensate the internal and external disturbances and to guarantee the robustness.

The block diagram of the FGSPID applied to the TRMS is shown in Fig.3. When k'_{pj}, k'_{ij} and k'_{dj} with $(j = \psi, \varphi)$ for each θ angle and x position subsystems are obtained by a fuzzy inference system, the gains k_{pj}, k_{ij} and k_{dj} with $(j = \psi, \varphi)$ of the PID regulator for each subsystem are calculated by the equation:

$$\begin{cases} k_{pj} = (k_{pj\max} - k_{Pj\min})k_{pj}^{'} + k_{Pj\min} \\ k_{ij} = (k_{ij\max} - k_{ij\min})k_{ij}^{'} + k_{ij\min} \\ k_{dj} = (k_{dj\max} - k_{dj\min})k_{dj}^{'} + k_{dj\min} \end{cases} \quad \text{with} \quad (j = \psi, \varphi)$$

(5)

The membership functions for the inputs e_j and Δe_j with $(j = \psi, \varphi)$ are defined in the range [-1, 1] and chosen to be triangular identical shapes as indicated in Fig.4 and Fig.5.

They are quantized into seven levels represented by a set of linguistic variables defined as follows:

(NB): negative big. (PM): Positive medium.
(NM): negative medium. (PB): Positive big.
(NS): Negative small. (PS): Positive small.

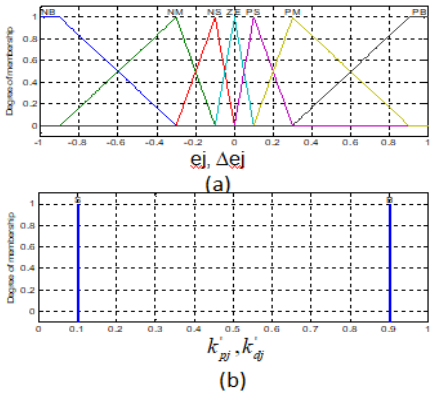

Figure 5. Fuzzy Membership functions of the inputs e_j and Δe_j and the outputs k'_{pj}, k'_{dj} with $(j = \psi, \varphi)$ [24].

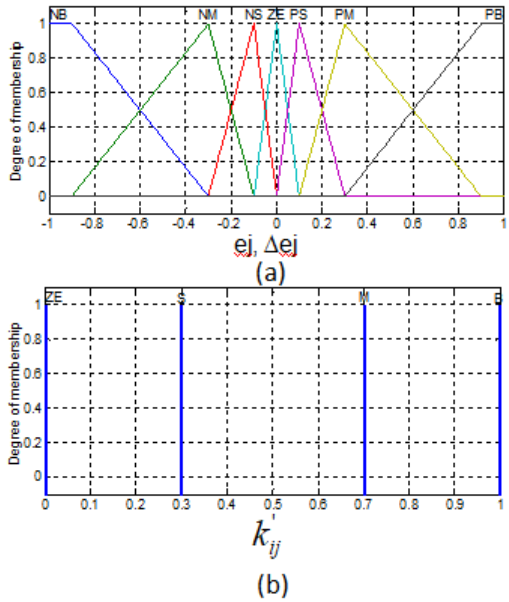

Figure 6. Fuzzy Membership functions of the inputs e_j and Δe_j and the output k'_{ij} with $(j = \psi, \varphi)$ [24].

Table.1, Table.2 and Table.3 shows the linguist rules of the k_{pj}, k_{ij} and k_{dj} used in the FGSPID Controller [24].

e_j \ Δe_j	NB	NM	NS	ZE	PS	PM	PB
NB	B	B	B	B	B	B	B
NM	S	B	B	B	B	B	S
NS	S	S	B	B	B	S	S
ZE	S	S	S	B	S	S	S
PS	S	S	B	B	B	S	S
PM	S	B	B	B	B	B	S
PB	B	B	B	B	B	B	B

TABLE II. Fuzzy tuning rules for k'_{pj} [24].

e_j \ Δe_j	NB	NM	NS	ZE	PS	PM	PB
NB	B	B	B	B	B	B	B
NM	M	M	B	B	B	M	M
NS	S	M	M	B	M	M	S
ZE	ZE	S	M	B	M	S	ZE
PS	S	M	M	B	M	M	S
PM	M	M	B	B	B	M	M
PB	B	B	B	B	B	B	B

TABLE III. Fuzzy tuning rules for k'_{ij} [24].

e_j \ Δe_j	NB	NM	NS	ZE	PS	PM	PB
NB	B	B	B	B	B	B	B
NM	M	M	B	B	B	M	M
NS	S	M	M	B	M	M	S
ZE	ZE	S	M	B	M	S	ZE
PS	S	M	M	B	M	M	S
PM	M	M	B	B	B	M	M
PB	B	B	B	B	B	B	B

TABLE IV. Fuzzy tuning rules for k'_{dj} [24].

The generated surfaces are shown in Fig.6, Fig.7 and Fig.8.

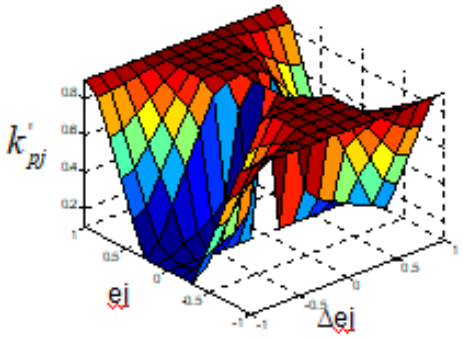

Figure 7. Surface of the gains k'_{pj} .

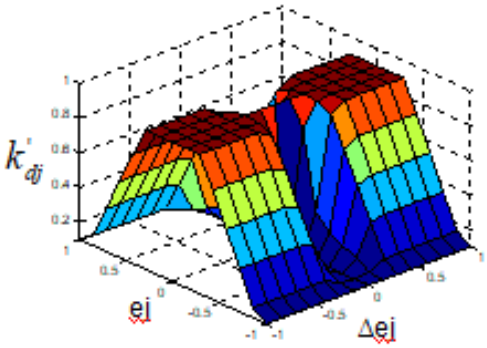

Figure 8. Surface of the gains k'_{dj} .

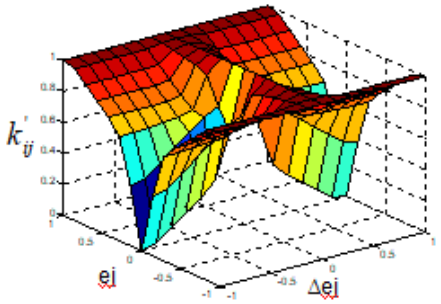

Figure 9. Surface of the gains k'_{ij} .

IV. EXPERIMENTAL RESULTS

The movement of the cart is caused by pulling the belt in two directions by the DC motor attached at the end of the rail. By applying a voltage to the motor we control the force with which the cart is pulled. The value of the force depends on the value of the control voltage. The voltage is our control signal. The two variables that are read from the pendulum (using optical encoders) are the pendulum position (angle) and the cart position on the rail. The controller's task will be to change the DC motor voltage depending on these two variables, in such a way that the desired control task is fulfilled (stabilizing in an upright position, swinging or crane control). Fig.9 presents how the control system is organized.

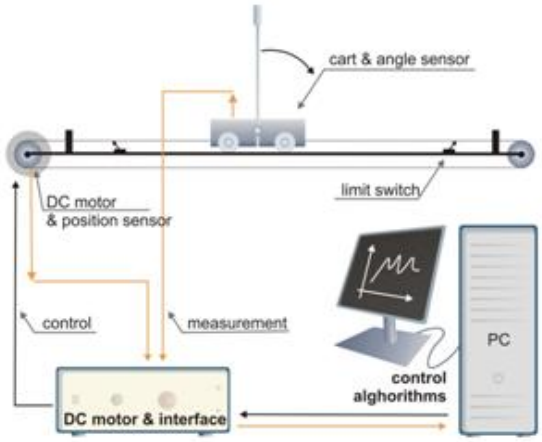

Figure 10. Pendulum control system

Fig.10 illustrates the responses of the control system according to stabilization for θ angle and x position, which show the ability of the proposed control system in the stabilization problem. In addition, Fig.10 indicate that the actual control voltage *u* of the DC motor are confined in the permitted interval of [-2.5, 2.5] volts.

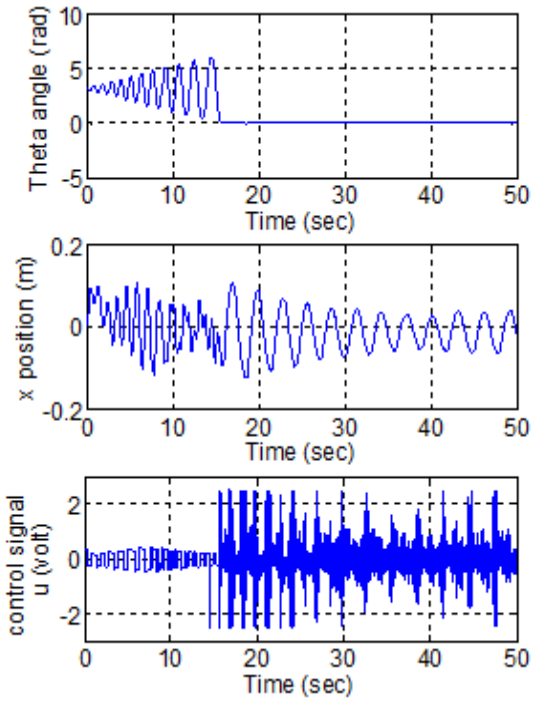

Figure 11. Experimentatl results of inverted pendulum stabilization.

V. CONCLUSION

This paper addressed the design of fuzzy gain-scheduled PID controller for a inverted pendulum system. Firstly, we start by the presentation of the dynamic model of the inverted pendulum taking into account the different physics phenomena. Experimental results are presented to show the effectiveness of the proposed method.

REFERENCES

[1] Ziegler J.G., Nichols N.B. Optimum settings for automatic controllers. ASME Trans. 1942; 64:759-768.
[2] Jih-Gau J, Ming-Te H, Wen-Kai L. PID control using presearched genetic algorithms for a MIMO system. IEEE Systems, Man, and Cybernetics Society 2008; 38: 716-727.
[3] Ayan S, Sarbani C. Genetic algorithm based I-PD controller design for Twin Rotor MIMO system. Proceedings of the IEEE International Conference on Control, Instrumentation, Energy & Communication, 2016: 15-19.
[4] Yu K, Hsu J. Fuzzy gain scheduling PID control design based on particle swarm optimization method. In Second International Conference on Innovative Computing, Information and Control. Kumamoto 2007.
[5] Zulfatman, Rahmat M. F. Application of self-tuning fuzzy PID controller on industrial hydraulic actuator using system identification approach. Int. J. on Smart Sensing and Intelligent Systems 2009; 2:246-261.
[6] Guo Y, Yang T. A new type of computational verb gain-scheduling PID controller. In International Conference on Counterfeiting Security and Identification in Communication; Chengdu 2010; 235-238.
[7] Yao L, Lin C. Design of gain scheduled fuzzy PID controller. World Academy of Science, Engineering and Technology 2005; 1:152-156.
[8] El Emary I M M, Emar W, Aqel M J. The adaptive fuzzy designed PID controller using wavelet network. Journal of Computer Science and Information System 2009; 6141-163.
[9] Juang J.G, Lin R.W, Liu W.K. Comparison of classical control and intelligent control for MIMO system. Applied Mathematics and Computation 2008; 205: 778-791.
[10] Jih-Gau J, Kai-Ti T. Design and realization of a hybrid intelligent controller for a twin rotor MIMO system. Journal of Marine Science and Technology 2013; 21:333-341.
[11] Karray F, Gueaieb W, Al-Sharhan S. The hierarchical expert tuning of PID controllers using tools of soft computing. IEEE Trans. Systems. Man, and Cybernetics-Part B: Cybernetics 2002; 32:77-90.
[12] Zhao Z, Tomizuka M, Isaka S. Fuzzy gain scheduling of PID controllers. IEEE Trans. Systems. Man, and Cybernetics 1993;23:1392-1398.
[13] Hu B, Mann G K I, Gosine R G. A systematic study of fuzzy PID controllers-function-based evaluation approach. IEEE Trans. Fuzzy Systems 2001; 9:699-712.
[14] A. P. S. Ramalakshmi A.P.S, Manoharan P.S. Non-linear modeling and PID control of twin rotor MIMO system. Proceedings of the IEEE International Conference on Advanced Communication Control and Computing Technologies, 2012; 366-369.
[15] Sumit K.P, Vijaya L. Control of twin rotor MIMO system using PID controller with derivative filter coefficient. Proceedings of the IEEE International Conference on Electrical, Electronics and Computer Science, 2014; 1-6.
[16] Anup K, Srinivasan N, Mahindrakar A. Terminal Sliding Mode Control of a Twin Rotor Multiple-Input Multiple-Output System. Proceedings of the 18th IFAC World Congress, 2009: 10952-10957.
[17] Faris F, Moussaoui A, Boukhetala D, Tadjine M. Design and real-time implementation of a decentralized sliding mode controller for twin rotor multi-input multi-output system. Journal of Systems and Control Engineering 2017; 231:3-13.
[18] Zeghlache S, Amardjia, N. Real time implementation of non linear observer-based fuzzy sliding mode controller for a twin rotor multi-input multi-output system (TRMS). Optik - International Journal for Light and Electron Optics 2018; 156:391-407.
[19] Mondal S, Mahanta C. Adaptive second-order sliding mode controller for a twin rotor multi-input-multi-output system. IET on Control Theory & Applications. 2012; 14: 2157-2167.
[20] Inverted Pendulum System Manual, Feedback Instruments Ltd., UK (2006).
[21] Meliani B, Meroufel A, Khouidmi H. Fuzzy gain scheduling of PI controller for dual star induction machine fed by a

matrix converter. Carpathian Journal of Electronic and Computer Engineering 2012; 6: 77-82.

[22] Hazzab A, Bousserhane I.K, Zerbo M, Sicard P. Real Time Implementation of Fuzzy Gain Scheduling of PI Controller for Induction Motor Machine Control. Neural Processing Letters, 2006; 24: 203-215.

[23] Jeyalakshmi V, Murugan S. On Line Tuning of intelligent controller for induction drive system. International Journal of Engineering Science and Technology, 2010;10: 5350-5356.

[24] Mohammad H.A, Abbas C, Youmin Z. Fault-tolerant fuzzy gain-scheduled PID for a quadrotor helicopter testbed in the presence of actuator faults. Proceedings of the IFAC Conference on Advances in PID Control, 2012, 1-6.

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ROBUST SLIDING MODE CONTROL VIA TYPE-2 FUZZY LOGIC FOR DOUBLY STAR INDUCTION MOTOR

[1]HILAL RAHALI, [2]SAMIR ZEGHLACHE

[1]Laboratoire genie élecrtique, dept. of Electrical Engineering, University Mohamed Boudiaf of M'sila, BP 166, Ichbilia 28000, M'sila, Algeria
[2]Laboratoire LASS, dept. of Electrical Engineering, University Mohamed Boudiaf of M'sila, BP 166, Ichbilia 28000, M'sila, Algeria
E-mail: [1]hilal.rahali@univ-msila.dz, [2]samir.zeghlache@univ-msila.dz

Abstract - To ensure the proper control of the system of doubly star induction motor (DSIM), a novel proposed scheme control using the Type-2 Fuzzy logic sliding mode technique (T2FLSMC) for to control the speed of a DSIM, to make guaranteeing the stability and the robustness performance machine system. An appropriate combination of the sliding mode controller (SMC) Improved by type 2 fuzzy logic is adopted for approximate the discontinuous control of SMC to improve the robustness of control systems with high accuracy and can eliminates the chattering effect. The control system is modelled, simulated and validated in MATLAB/Simulink, behaviour; the modelling details and the simulations results obtained are presented described in detail after.

Keywords - DSIM, Type 2 Fuzzy, Sliding Mode, Discontinuous Control, Chattering.

I. INTRODUCTION

The major disadvantage of the three-phase asynchronous machine is that it remains limited in power, in the growth of electrical energy consumption and in high power electrical applications, it's used in applications requiring high power such as electric vehicles, locomotive traction, and naval applications [1], [2]. One solution is to use high phase number machines due to their performances in high power fields, the doubly star induction machine consists one of the multiphase machines. It was used in place of traditional three-phase induction machines to improve their reliability; DSIM has like advantages, simple machine structure, robust, flexible in the control and their evolution capacities and minimizing torque ripples [3].

In the field of systems control, the sliding mode control remains an important area of research. It is more used to obtain good dynamic performance of controlled systems.

During the past several years, SMC widely used because is an effective control strategy in modern control and to obtain good dynamic performance, robustness and simple realization of controlled systems[4], as well as the ability to globally stabilize the system in the presence of other disturbances. The major drawback of sliding mode control is the chattering phenomenon [5]. In [6], SMC with fuzzy of non linear systems for DSIM was studied. Backstepping sliding mode controller improved with interval type-2 fuzzy logic was proposed for non linear system of DSIM in [7].

The sliding mode control is a particular function of variable structure systems remains an important area of research in the field of systems control. It is widely used to obtain good dynamic performance of controlled systems. Its major drawback is the chattering phenomenon. The sliding mode control is a particular function of variable structure systems remains an important area of research in the field of systems control. It is widely used to obtain good dynamic performance of controlled systems. Its major drawback is the chattering phenomenon especially in complicated environment and systems with uncertainty disturbance [8], this approach present the major drawback is the chattering phenomenon and very advantages, robustness to parameters variations and insensitive to external disturbances, as well as the ability to globally stabilize the system in the presence of other disturbances [9].

The hybrid Fuzzy type 2 sliding mode control used to approximate the discontinuous control and reduce the chattering phenomenon, The principal contribution of this paper applied to doubly star induction machine whose purpose is to control the speed and flux and currents of the MASDE, in order to solve the problem of trajectory tracking, in the presence of uncertainties while minimizing the chattering phenomenon.

The principal contribution of this paper is applied to doubly star induction machine to control the speed and flux as a one advanced control strategy, to solve the problem of the robustness of the speed control of a DSIM.

Quantitative comparison between the proposed T2FSMC Controller and controls proposed in [10] and [11] is presented

a comparative study between the proposed T2FSMC Controller (T2FSMC) and with first time adaptive field-oriented control using supervisory type-2 fuzzy control in [10], and with second time sliding mode control based on backstepping Approach [11] is carried out.

The control system is modeled, simulated and validated in MATLAB/Simulink. The modeling details and the simulations results obtained are presented described in detail after.

II. DSIM MODELLING

Doubly star induction machine is composed of two separate stator windings with a fixed three-phase winding and standard simple squirrel-cage rotor composed three rotors phases moving. The two stators are offset from each other by angle (α=π/6), their axes are shifted from each other an electrical angle equal to (2π/3) with isolated neutrals. [9], [12].

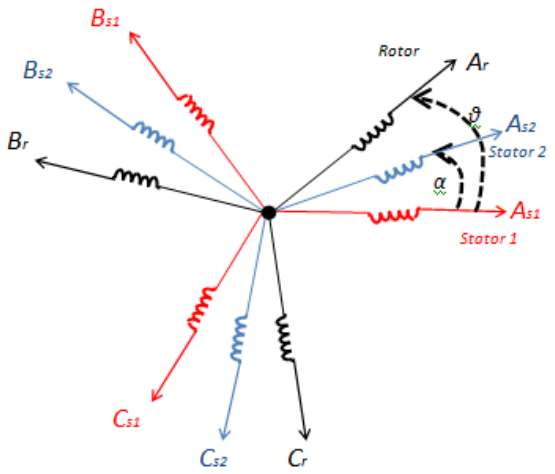

Fig.1. DSIM winding

The state equations for doubly star induction motor in the reference (d, q) are given by (1):

$$\begin{cases} \dot{i}_{ds1} = \frac{1}{L_{s1}}(V_{ds1} - R_{s1}i_{ds1} + \omega_s(L_{s1}i_{qs1} + T_r\,\phi_{rref}\,\omega_{glref})) \\ \dot{i}_{qs1} = \frac{1}{L_{s1}}(V_{qs1} - R_{s1}i_{qs1} - \omega_s(L_{s1}i_{ds1} + \varphi_{rref})) \\ \dot{i}_{ds2} = \frac{1}{L_{s2}}(V_{ds2} - R_{s2}i_{ds2} + \omega_s(L_{s2}i_{qs2} + T_r\,\varphi_{rref}\,\omega_{glref})) \\ \dot{i}_{qs2} = \frac{1}{L_{s2}}(V_{qs2} - R_{s2}i_{qs2} - \omega_s(L_{s2}i_{ds2} + \varphi_{rref})) \\ \dot{\Omega} = \frac{1}{j}(p\frac{L_m}{L_m + L_r}\varphi_{rref}(i_{qs1} + i_{qs2}) - C_r - K_f\Omega) \\ \dot{\varphi}_r = \frac{-R_r}{L_m + L_r}\varphi_r + \frac{L_m.R_r}{L_m + L_r}(i_{ds1} - i_{ds2}) \end{cases}$$

(1)

III. TYPE-2 FUZZY LOGIC SLIDING MODE CONTROL (T2FSMC) DESIGN

Sliding Mode Control (SCM) is an effective control strategy in modern control because of its robustness and simple realization, it is a particular type of variable structure control (VSC), SMC is to intentionally modify the system topology, consists in bringing the state trajectory of the looped system to switch around a suitably selected hyper-surface, called a sliding surface, and then to slide on it up to the equilibrium point thanks to a control law that will always maintain the system in this region. So the system becomes external disturbances and insensitive to parametric uncertainties.

The sliding mode control comports two terms namely equivalent control term and switching control term

Totally, the SMC law can be represented as [9]:

$$U = U_{eq} + U_s . \quad (2)$$

U_{eq} is the equivalent control, it is expressed, considering that the derivative of the surface is zero $\dot{S}=0$.

U_s described the discontinuous control.

Generally, the discrete command in sliding mode can take the form of the following expression [9]: $U_s = -K\ sign(s)$

With K>0 is sliding gain.

The idea of application fuzzy is constructing set of fuzzy rules based on the fuzzified distance. Figure (1) illustrates three labels of fuzzy sets are assigned to the sliding variable S: negative (N), zero (Z) and positive (P).

The control output Uf, the labels of the fuzzy sets are also three: negative (N), zero (Z) and positive (P). The fuzzy linguistic rule base involved in the FDTSMC system can build them as follows:

Rule 1: If s is negative (N), then U_f is negative (N);

Rule 2: If s is zero (Z), then U_f is zero (Z);

Rule 3: If s is positive (P), then U_f is positive (P).

All the membership functions of the fuzzy input linguistic variable s (i) are chosen to be triangular and the membership functions of the fuzzy output switching control $U_{f.}$ is chosen to be Gaussian.

Figure 2 and Figure 3 illustrated the fuzzy membership functions of the input S and output $U_{f.}$

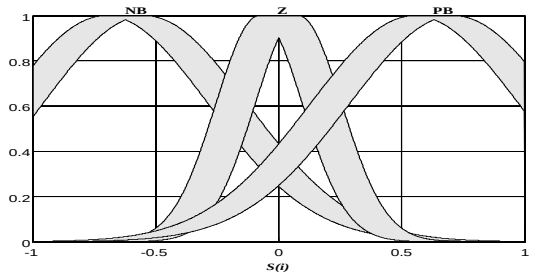

Fig.2. Membership functions of the fuzzy input linguistic variable s (i).

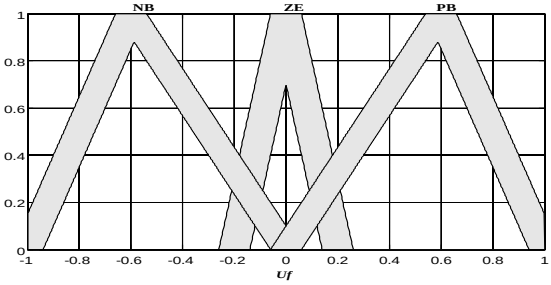

Fig.3. Membership functions of the output linguistic variable U_f

The last step is the defuzzification after the determination of the membership functions and the fuzzy rules, which is the procedure to determine a crisp control for U_f.

Among the possible structures of a sliding mode controller we have proposed the following structure [10, 13]:

$$u_f = -K\,sign\left(\frac{s}{\varphi}\right) \quad (3)$$

IV. T2FSMC STRATEGY

We saw that the dynamic equations of the doubly star induction machine are non-linear, therefore gives a complex control difficult to conceive, the Sliding Mode Control (SMC) is an effective control strategy in modern control because of its robustness and simple realization, the problem of the sliding mode control is the phenomenon of Chattering which is characterized by fluctuations in torque.

It generates noises and dangerous vibrations in its outputs. It is undesirable in conventional sliding mode controller in practice, because it can excite the high frequency dynamics of the system [9, 13].

The objective of the controller is particularly in the attenuation of the chattering phenomenon, obtains a robust performance control and makes it possible to preserve the simplicity of implementation of the sliding mode control.

The synthesis of the hybrid Fuzzy sliding mode control (T2FSMC) with a sliding surface to doubly star induction motor can be achieved in two successive steps [13-15], In the following, the regulators of the speed, the flux and the fourths of the currents are substituted by a sliding mode regulator, an equivalent control part (SMC) and a fuzzy control part (FLC) are contained in the present command (T2FSMC). The bloc diagram of the proposed T2FSMC is shown in Figure 3.

The sliding surface requires to as to retain, so the error on the sliding surface s (e, t) =0, if for that which brings back us to define the speed equivalent control and the rotor flux module in the following way [11]:

$$\dot{s} = \begin{cases} S_w = 0 \\ S_\varphi = 0 \end{cases} \quad (4)$$

The surface of the rotor speed S_ω and flux S_φ are defined by:

$$\begin{cases} S_w = \omega_{ref} - \omega_r \\ S_\varphi = \varphi_{ref} - \varphi_r \end{cases} \quad (5)$$

Derivative of the sliding surface S_ω and S_φ are calculated by:

$$\begin{cases} \dot{S}_\omega = \dot{\omega}_{rref} - \dot{\omega}_r \\ \dot{S}_\varphi = \dot{\varphi}_{rref} - \dot{\varphi}_r \end{cases} \quad (6)$$

Replacing the derivate of the speed ω_r and flux φ in Eq. (6), thus one obtains the following equations:

$$\dot{S}_\omega = \dot{\omega}_{rref} - \frac{p^2}{j}\frac{L_m}{L_m + L_r}\varphi_{rref}(i_{qs1} + i_{qs2}) + C_r\frac{p}{j} + \frac{K_f}{j}\omega_r \quad (7)$$

$$\dot{S}_\varphi = \dot{\varphi}_{rref} + \frac{R_r}{L_m + L_r}\varphi_r - \frac{R_r L_m}{L_m + L_r}(i_{ds1} + i_{ds2}) \quad (8)$$

Finally:

$$\dot{S}_\omega = 0 \Rightarrow \begin{cases} \mathrm{I}_{qseq} = \dfrac{j}{p^2}\dfrac{L_m + L_r}{L_m \phi_{rref}}\left(\dot{\omega}_{rref} + \dfrac{p}{j}C_r + \dfrac{K_f}{j}\omega_r\right) \\ I_{qsn} = -K_\omega . sign\left(S_\omega\right) \end{cases} \quad (9)$$

$$\dot{S}_\varphi = 0 \Rightarrow \begin{cases} I_{dseq} = \dfrac{L_r + L_m}{R_r L_m}\left(\dot{\varphi}_{rref} + \dfrac{R_r}{L_r + L_m}\varphi_r\right) \\ I_{dsn} = -K_\varphi . sign\left(S_\varphi\right) \end{cases} \quad (10)$$

Where K_ω, K_φ are gains (positive parameters) selected in order to ensure the stability of system and are obtained by adjustment.

In this second step four new errors of the components of the stator current given by:

$$\begin{cases} S_{ds1} = i_{ds1ref} - i_{ds1} \\ S_{ds2} = i_{ds2ref} - i_{ds2} \\ S_{qs1} = i_{qs1ref} - i_{qs1} \\ S_{qs2} = i_{qs2ref} - i_{qs2} \end{cases} \quad (11)$$

$$\begin{cases} \dot{S}_{Ids1} = \dot{I}_{ds1ref} - \dfrac{1}{L_{s1}}\left\{V_{ds1} - R_{s1}I_{ds1} + \omega_{sref}\left(L_{s1}I_{qs1} + T_r\phi_{rref}\omega_{glref}\right)\right\} \\ \dot{S}_{Ids2} = \dot{I}_{ds2ref} - \dfrac{1}{L_{s2}}\left\{V_{ds2} - R_{s2}I_{ds2} + \omega_{sref}\left(L_{s2}I_{qs2} + T_r\phi_{rref}\omega_{glref}\right)\right\} \\ \dot{S}_{Iqs1} = \dot{I}_{qs1ref} - \dfrac{1}{L_{s1}}\left\{V_{qs1} - R_{s1}I_{qs1} - \omega_{sref}\left(L_{s1}I_{ds1} + \phi_{rref}\right)\right\} \\ \dot{S}_{Iqs2} = \dot{I}_{qs2ref} - \dfrac{1}{L_{s2}}\left\{V_{qs2} - R_{s2}I_{qs2} - \omega_{sref}\left(L_{s2}I_{ds2} + \phi_{rref}\right)\right\} \end{cases} \quad (12)$$

The condition to stay on the sliding surface is $\dot{S}=0$; therefore, the equivalent control is:

$$\begin{cases} V_{ds1eq} = L_{s1}\dot{I}_{ds1ref} + R_{s1}I_{ds1} - \omega_{sref}\left(L_{s1}I_{qs1} + T_r\phi_{rref}\omega_{glref}\right) \\ V_{ds2eq} = L_{s2}\dot{I}_{ds2ref} + R_{s2}I_{ds2} - \omega_{sref}\left(L_{s2}I_{qs2} + T_r\phi_{rref}\omega_{glref}\right) \\ V_{qs1eq} = L_{s1}\dot{I}_{qs1ref} + R_{s1}I_{qs1} + \omega_{sref}\left(L_{s1}I_{ds1} + \phi_{rref}\right) \\ V_{qs2eq} = L_{s2}\dot{I}_{qs2ref} + R_{s2}I_{qs2} + \omega_{sref}\left(L_{s2}I_{ds2} + \phi_{rref}\right) \end{cases} \quad (13)$$

$$\begin{cases} V_{ds1n} = -K_{Ids1}sign(\mathrm{S}_{Ids1}) \\ V_{ds2n} = -K_{Ids2}sign(\mathrm{S}_{Ids2}) \\ V_{qs1n} = -K_{Iqs1}sign(\mathrm{S}_{Iqs1}) \\ V_{qs2n} = -K_{Iqs2}sign(\mathrm{S}_{Iqs2}) \end{cases} \quad (14)$$

Where K_{Ids1}; K_{Ids2}; K_{Iqs1}; K_{Iqs2} are gains (positive parameters) selected in order to ensure the stability of system and are obtained by adjustment.

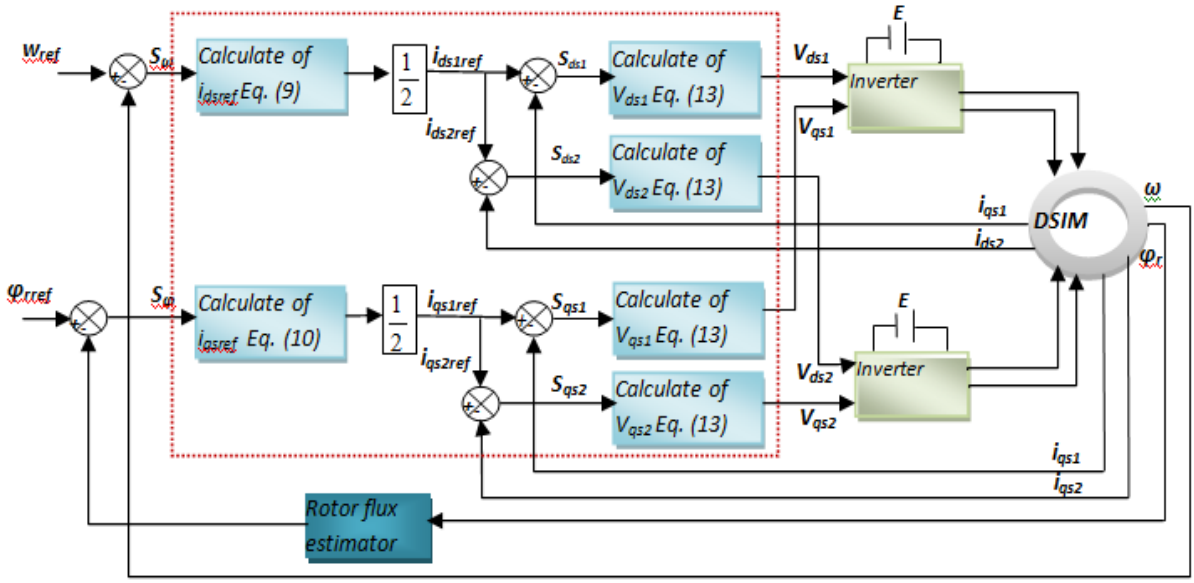

Fig.4. Diagram of the type2 fuzzy sliding mode control (T2FSMC).

In the hybrid fuzzy sliding mode control, just replace the sign (x) function with a fuzzy controller that has an S(x) input and an output U_n.

V. RESULTS AND DISCUSSION

Several simulations were carried using the Matlab and Simulink® in order to test the FSMC control of the MASDE, we have simulated the system under variable operating conditions namely the variation of the speed, of the resistant torque. The simulation results obtained are discussed.

Following figures (5-7) shows the simulated responses of speed, electromagnetic torque, d-q axis stator currents and rotor field.

The nominal load disturbance torque 15 N.m is suddenly applied at 3sec, followed by a reversal of speed from 300 rad/sec to t=1.5 sec up to -200 during a period of 1 sec, while the other parameters are held constant.

The speed responds in a shorter time to reaches its reference value at 0.4 sec without exceeding and it also grants a better continuation as well as a quasi-total rejection of the perturbation of the increase of the load as is shown in Figure 4, the electromagnetic torque at starting exceed a value equal to 70 N.m. Figures 6 and 7 show that the application of the charge from time t=3 sec, generates increases in electromagnetic torque and stator currents, we have a positive influence of the couple that increases to keep the speed follow its reference value.
Figure 7 shows that the response of the current of the q axis which controls the torque is similar to electromagnetic torque, whereas the current of the axis d which controls the flow of the rotor remains constant.

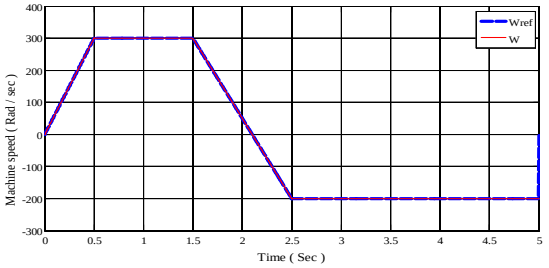

Fig.5. Simulated results of Speed response

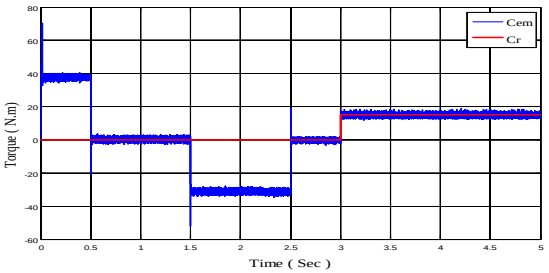

Fig.6. Simulated results of Torque under a load C_r=14N.m in 3s.

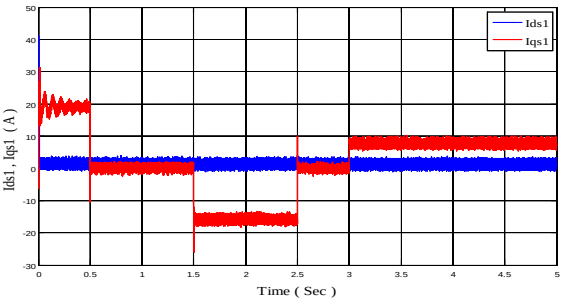

Fig.7. Simulated results of currents stator (I_{qs1}, I_{ds1}) under a load C_r=14 N.m in 3s.

VI. COMPARATIVE STUDY

To examine the different control laws developed for the DSIM, we opted for a comparative study between the proposed control and other control strategies, this study will allow us to conclude on the performance of

the control law developed for DSIM and others. It is based on the following two criteria:

- The energy of the command:

$$J_1 = \frac{1}{2}\sum_{k=1}^{p}\left(u^T u\right)$$

- The sum squares of the errors:

$$J_2 = \frac{1}{2}\sum_{k=1}^{p}\left(e^T e\right)$$

The same simulation conditions, such as the simulation step, the time range, the gains of command…etc, were used. The results of this comparison are collated in Table 1.

	T2FSMC	Control proposed by [11]	Control proposed by [10]
$J_1 = \frac{1}{2}\sum_{k=1}^{p}\left(u^T u\right)$	4.2×10^4	2.1×10^5	1.01×10^5
$J_2 = \frac{1}{2}\sum_{k=1}^{p}\left(e^T e\right)$	3.5×10^3	6.3×10^3	9.89×10^3

TABLE I: Quantitative comparison between the proposed T2FSMC Controller and controls proposed in [10] and [11].

From the results presented in Table 1, we can conclude that the sliding mode control combined with the type 2 fuzzy control is in general, the most efficient from the point of view of minimization of the two criteria. However, the performance of this hybrid control depends on the parameters of the type 2 fuzzy system used.

VII. CONCLUSION

The speed adjustment by T2FSMC brings remarkable improvements. Because the T2FSMC regulators offer good static and dynamic performance, shorter response time and no overshoot, high accuracy, good stability, simplicity and robustness ... etc, it is considered a major step in the evolution of intelligent control.

The obtained results show the good performances and assure global stability, it allows having fast response without overtaking, settling time in speed response and completing decoupling between the flux and the torque, it allows having fast response without overtaking, settling time in speed response minimize and complete decoupling between the flux and the torque.

Those results confirm the high performance of the proposed controller demonstrates robustness under various operating conditions and assure global stability of this machine.

Finally, in the future work the experimental implementation of the proposed control scheme will be addressed.

Appendix A

Machine parameters

P_ω=4.5 kW	Mechanical Power
V_n=220 V	Nominal Voltage
I_n=6.5 A	Nominal Current
ω_n	Nominal speed
P=1	Pole pairs number
$R_{s1}=R_{s2}$=3.72 Ω	Stators resistances
R_r =2.12 Ω	Rotor resistance
$L_{s1}=L_{s2}$=0.22 H	Stators self inductance
L_r=0.006H	Rotor self inductance
L_m=0.3672 H	Mutual inductance
J=0.625 kg.m2	Inertia
K_f=0.001Nms/rad	Friction coefficient
f=50Hz	Nominal Frequency

Greek symbols

ω	Mechanical speed
ω_s,ω_r	Stator and rotor pulsation
ω_{glref}	Sliding speed reference
C_{em}	Electromagnetic torque
C_r	Load torque
φ	Flux

REFERENCES

[1] Z. Tir, Y. Soufi, M.N.Hashemnia, O.P. Malik, and K.. Marouani, “Fuzzy logic field oriented control of double star induction motor drive”, Electrical Engineering, vol. 99, pp. 495-503, 2016.

[2] C. Wang, K. Wang and X. You, “Research on Synchronized SVPWM Strategies Under Low Switching Frequency for Six-Phase VSI-Fed Asymmetrical Dual Stator Induction Machine,” IEEE Transactions on Industrial Electronics, vol. 63 , pp. 6767-6776, 2016.

[3] S. Chekkal, N. Aouzellag Lahaçani, D.Aouzellag, K. Ghedamsi “ Fuzzy logic control strategy of wind generator based on the dual-stator induction generator,” Electrical Power and Energy Systems, vol. 59 166–175, 2014

[4] S. Zeghlache, D. Saigaa, K.Kara, A. Harrag, A. bouguerra, “Backstepping sliding mode controller improved with fuzzy logic: Application to the quadrotor helicopter,” Archives of Control Sciences, vol. 22, pp. 255-282, 2012.

[5] C. Navaneethakkannan, M. Sudha, “Comparison of Conventional & PID Tuning of Sliding Mode Fuzzy Controller for BLDC Motor Drives”, In International Conference on Computer Communication and Informatics (ICCCI 2013), Coimbatore, 2013, vol. 4, pp.1-6.

[6] A. Gholami, A.H.D. Markazi, “Direct adaptive fuzzy sliding observation and control,” Transactions of the Canadian Society for Mechanical Engineering, vol. 36, pp. 329-342, 2012.

[7] L. Benalia, “in Control of a double feed and double star induction machine using direct torque control,” in Torque Control, (M. T. Lamchich Ed, chapter 5, In Tech, Croatia, 2011, pp. 113-126.

[8] C. Navaneethakkannan, M. Sudha, “Comparison of Conventional & PID Tuning of Sliding Mode Fuzzy Controller for BLDC Motor Drives”, In: Proc. of International Conf. International Conference on Computer Communication and Informatics (ICCCI 2013), Coimbatore, pp.1-6, 2013.

[9] S. Zeghlache, K. Kara, D. Saigaa, “Fault tolerant control based on interval type-2 fuzzy sliding mode controller for coaxial trirotor aircraft”, ISA Transactions, Vol. 59, pp. 215-231,2015.

[10] H. Rahali1, S. Zeghlache, L. Benalia, “Adaptive Field Oriented Control Using Supervisory Type-2 Fuzzy Control

for Dual Star Induction Machine", International Journal of Intelligent Engineering and Systems, Vol.10, No.4, pp.28-40, 2017.

[11] H. Rahali, S. Zeghlache, L. Benalia, "Sliding Mode Control based on Backstepping Approach for a Double Star Induction Motor (DSIM)", Advances in Modeling and Analysis C, Vol.73, No.4, pp.150-157, 2018.

[12] S. Lekhchine, T. Bahi and Y. Soufi, "Indirect rotor field oriented control based on fuzzy logic controlled double star induction machine", International Journal of Electrical Power & Energy Systems, vol. 57, pp.206-211, 2014.

[13] T. Laamayad, F. Naceri, R. Abdessemed, S. Belkacem, "A New PI Fuzzy Sliding Mode Controller .Application to the Dual Star Induction Machine (DSIM)", In: Proc. of International Conf. 1rd International Conference on Electronics & Oil, Ouargla, Algeria, pp.261-266, 2011.

[14] N. Djeghali, M. Ghanes, S. Djennoune, "Sensorless fault tolerant control for induction motors", International Journal of Control, Automation and Systems, Vol. 11, pp. 563-576, 2013.

[15] H. Echeikh, R. Trabelsi, A. Iqbal, "Online Adaptation of Rotor Resistance based on Sliding Mode Observer with Backstepping Control of A Five-Phase Induction Motor Drives", International Journal of Power Electronics and Drive Systems (IJPEDS), Vol.7, pp. 648-655, 2016.

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SOCIAL WORK EDUCATION AND PROFESSIONAL IDENTITY. IDENTITY STRUCTURE ANALYSIS OF HUNGARIAN SOCIAL WORKERS

[1]REBEKA JAVOR, [2]MARTA B. ERDOS, [3]ROGER ELLIS

[1,2]Department of Community and Social Studies, University of Pécs, Pécs, Hungary
[3]Social and Health Evaluation Unit, Identity Exploration Ltd., United Kingdom
E-mail: [1]javor.rebeka@pte.hu, [2]erdos.marta@pte.hu, [3]rogerellis2@me.com

Abstract - Social work education presents several challenges globally, and some specific ones in the countries where previous dictatorships interrupted the development of the profession.In these countries, social workers face problems that are associated with deficiencies in professionalization, largely determining social worker identities. Social work is a practice-based caring profession where practitioners' professional identityis a special area of concern in education and in continuing professional development. This paper presents the results of a study conducted among Hungarian social workers, employing a unique method, Identity Structure Analysis (ISA) to study professional identity. The method yields an insight into the dynamic of identity formation, professional values,and areas of conflict, as well as potential strengths and weaknesses. Hungarian social workers have special difficulties concerning the "double mandate" problem, that is, simultaneously representing their clients and the government; and they experience adversities originating from the overall low prestige of the profession. As a group, they adhere themselves to core values indicated in the Global Definition of Social Work, but evaluate professional education, research activities and critical-reflective thinking as secondary. These findings call for targeted strategies on part of higher education institutions to focus more on professional identity concerns in their curricula.

Keywords - Social work, Professional identity, Professionalization, Higher education, Identity Structure Analysis.

I. INTRODUCTION

In Hungary, the development of social work had three distinct phases. Church-based nonprofessional charity work was followed by the settlement model and a framework named "open care", with social interventions provided in poor persons' or families' own homes. These early achievements were similar to advances in other European countries. The Soviet conquest and the forced communist rule after World War 2 put an end to early developments. Social work as a distinct professional area ceased to exist, though in the years of "soft" dictatorship in the 1970s the system tolerated certain forms of care to manage emerging social problems [1]. The rebirth of the profession could take place shortly before the 1989 system change. Re-emergence of social work was not the result of a strengthening sense of social solidarity on part of the public but of a centralized preventive measure to combat predictable social problems related to system change. The first social workers were members of the critical intelligentsia with social justice as a core value; co-professionals (teachers, psychologists etc. who were interested in social issues) and even former party members striving to preserve communist "developments"[2].

In these years, Hungarians had hoped for a western-type welfare system, including a system of social safety and solidarity. These aspirations were formulated in an era when the crisis of the welfare state – a solid basis for social work – was evident. The new profession, lacking adequate resources and public recognition, was expected to treat the social ills brought about by the transition, such as poverty, growing inequalities, unemployment, homelessness, and discrimination.

Historical precedents have had their impact on Hungarian social workers' current social status and career development.Recent advances in professionalization[3] include the formation of a distinct knowledge base represented in the study programs, a consolidated value system described in the code of ethics, and a relatively well-developed institutional system. Public recognitionmanifested in low levels of remuneration and a diminished degree of autonomy are among its weaknesses[4].

Professional identity is a decisive factor in the caring professions. In the context of the helping relationship, professionals' attitudes, such as empathy and congruence; and values as unconditional positive regard, solidarity and liberation of people are prerequisites to success. Further, the professional serves as a role model for the clients. How has social workers' professional identity been shaped by the abovehistorical precedents and external factors? What are social workers' responses to the volatility of the social context and to role conflicts? How do they envision their future? What are the lessons involved for institutions of higher education? How can HEIscontribute to building a strong and coherent professional identity?

II. SOCIAL WORKERS' PROFESSIONAL IDENTITY

Social workers professional identity is their self-concept by which they "define themselves in specialized, skill- and education-based occupations" [5: 1–3]; comprising values, attitudes, memories,

convictions, aspirations, and reflections that are unique to an individual" [6]. Professional identity is determined by the professional's knowledge, skills, and values [7].

Social work is a context-dependent professional area, what is a major challenge in the studies on SW professional identity. Social workers' roles and recognition vary from country to country; and the immediate work environment adds a lot to the variability of the profession[8][9]. They may assume administrative roles or conduct therapies, work with individuals, families or groups and communities. The Global Definition of Social Work [10]is an international resource for educators, practitioners, researchers, and the public. It strives to answer the question: What is, and what is not social work? GDSW determines the core mandates and principles of the profession. Further, the document defines a shared knowledge base and common guidelines for professional practice. GDSW lays great emphasis on values and attitudes as professional identity elements: „Social work is a practice-based profession and an academic discipline that promotes social change and development, social cohesion, and the empowerment and liberation of people. Principles of social justice, human rights, collective responsibility, and respect for diversities are central to social work (…). A social work definition can only be meaningful when social workers actively commit to its values and vision."

Theoretical articlesoften discuss the problem of double mandate: representing clients' and government's (as main employer's) interests by simultaneously emphasizing help and social control – a major source of role conflicts to be balanced by a commitment to human rights and following principles of professional ethics [11][12][13][14][15]. Focusing on potential role conflicts and the related ethical dilemmas is notalways described specifically in terms of the double mandate problem and articles discuss several other aspects of internal, profession-based role conflicts (counsellor, care manager, case worker, collaborator, innovator (in policy shaping) partner, risk assessor etc.)[16][17]. Studying social workers' values fits in the same theoretical and empirical direction[18][19].

Another main area of SW identity research is directly related to client-helper relationship. This research direction goes back to Jung's wounded helper concept and to empirical studies on burnout and helfer syndrome[20][21][22][23][24].

III. METHOD

Identity Structure Analysis (ISA), and its measure, Ipseus, is a flexible framework software comprising the advantages of qualitative and quantitative methods frequently used in studies on identity. ISA is externally („population" standards) and internally (group-level standards) standardized.

The discourses to be evaluated are made up of relevant entities belonging to main domains; and constructs representing key themes of the area. These are based on substantial literature review, qualitative studies /interviews, observations, focus groups etc./. Pilot versions are fine-tuned, relying on the feedback from practitioners and experts of the area[25][26].

Entities position the self in a variety of temporal and social perspectives and situations, such as „me in ten years"; „when I decided to become a social worker"; „me under pressure" etc. Constructs include core ideas and values of the profession, also comprising possible areas of conflict. Respondents are asked to evaluate the discourses that are a combination of the entities and constructs.

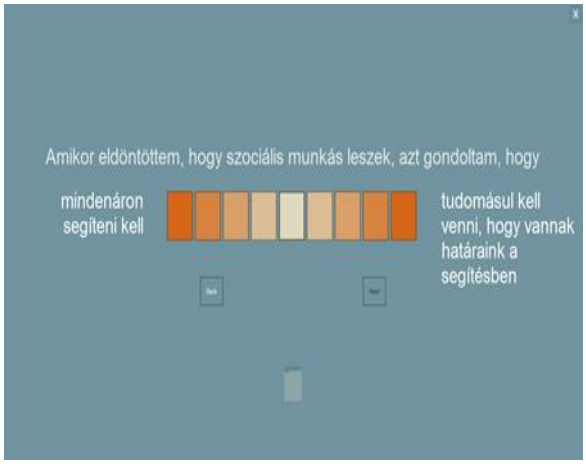

Figure 1: An Ipseus slide of the social worker instrument[23]

Main results provided by the instrument are informative on respondents' values; self-evaluations; attitudes to and relationships with others [25][26].

Our study used a convenience sample of Hungarian social workers, 11 men and 46 women.

	Label	Classification
1	When decided	Past Self
2	Currently I	Current Self
3	Private self	Exploratory Self
4	Disrespected colleague	Disliked Person
5	Solving a difficult problem	Exploratory Self
6	The government	
7	My best friend	
8	My boss	
9	Professional role model	Admired Person
10	People in Hungary	
11	in ten years	Future Self
12	I as a bad professional	Contra Ideal Self
13	Clients think I	Metaperspective
14	Close colleague thinks I	Metaperspective
15	Ideally, I	Ideal Self

Table 1. Entities [23]

	Label Left	Label Right
1	client as equal	patronizing and control
2	continuing education	finished education
3	flexible about rules	rigid about rules
4	favors self-reflection	refuses self-reflection
5	deserving clients only	chance for everyone
6	part of clients' lives	client autonomy
7	focus on interpersonal relations	focus on societal problems
8	refuses research	research in practice
9	externally formed frameworks	own responsibility for frameworks
10	respect boundaries	help at all price
11	natural skills & practice	degree in social work
12	free from own problems	wounded helper
13	wants perfect solution	tolerates insecurities
14	empathetic	objective
15	autonomous decisions	externally controlled
16	distance from own ideologies	teaches own ideologies
17	critical thinking	never questions guidelines
18	societal catch-up	societal changes
19	faith in clients' positive capacity	people cannot change
20	spiritual orientation	welfare and success
21	team player	counts only on oneself

Table 2. Constructs [23]

IV. RESULTS

1. Self-summary is a combination of two parameters, identity diffusion and self-evaluation. ISA differentiates between nine possible states as in Table 2. Foreclosed/defensive identity variants were present in 22 of the 57 cases in the Hungarian sample, indicating a problematic response to challenging professional and personal situations[23].

Self-evaluation	Identity diffusion		
	low (foreclosed)	moderate	high
high	defensive high self-regard	confident	diffuse high self-regard
moderate	defensive	intermediate	diffusion
low	defensive negative	negative	crisis

Table 3. Self-summary [26: 106]

2. Self-development. Both ego-involvement (EI) and self-evaluation (SE) have significantly increased as we proceed from past to future self-states. The only exception is the difference between past and current selves EI, indicating more emphasis on (and hope in) future self-states (own source, see Table 4.)

	t	df	p (2-tailed)	Effect size
Involvement Past-Current	.277	56	.783 (n.s.)	-
Involvement Current-Future	-3.101	56	.003**	.40
Involvement Past-Future	-2.061	56	.044*	.27
Evaluation Past-Current	-5.881	56	.000**	.78
Evaluation Current-Future	-3.852	56	.000**	.51
Evaluation Past-Future	-7.164	56	.000**	.95

Sig. *p<.05, **p<.01

Table 4. Self-development [23]

3. Entity summary is a visual representation on self-evaluation and ego involvement, and it includes all entities.Low evaluation of „state" (government) and „people in Hungary" (the public, as source for other-ascribed identity) is a potential source of conflicts.

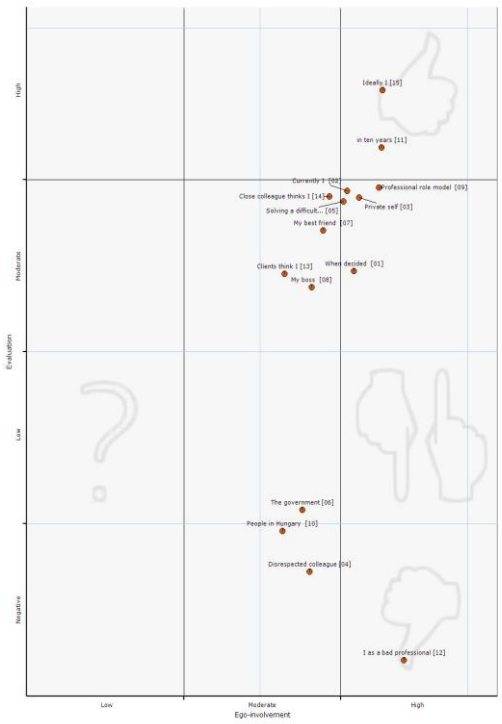

Figure 2: Entity summary [23]

4. Construct summary is a combination of emotional significance (ES) (ranges: low, moderate, and high) and structural pressure (SP) (construct coherence, differentiating between contradictory, conflicted, secondary, core and pressured levels) of the given construct. Utilizing internal, group-level

standardsclient autonomy, client as equal, a chance for everyone, self-reflection and continuing education were the core constructs of respondents, with moderate emotional significance. The two latter constructs are explicitly related to practitioners' developmental needs. Secondary constructs with moderate ES were faith inclient's capacity, eudaimonic/spiritual orientation, emphasis on interpersonal relations over societal problems, research in practice, critical thinking, the wounded healer concept, taking own responsibility for frameworks, autonomous decisions, respecting boundaries, tolerating insecurities and being a team player. The large number of secondary constructs may suggest that high-level commitment to professional values is risky in a non-supporting societal environment. Our respondents favored working in the interpersonal domain to managingsocietal challenges and regarded the construct as conflicted, together with objectivity vs. empathy. As the domestic training lays much more emphasis on societal issues, often neglecting the need for counselling skills, this preference seems problematic.

V. CONCLUSION

Our findings are in accordance with the worries often expressed but rarely studied by the domestic training institutions, employers, and professional organizations. Social work as a profession in Hungary is based on solid foundations – knowledge base and professional values – on the one hand; and is struggling with the lack of public recognition on the other hand. Our respondents' choices (preferred poles of the constructs) were in accordance with core professional values and ethical requirements, but a relative lack of commitment manifested in the relatively large number of secondary constructs and moderate emotional significance indicate that their current position is not at all rewarding.

Further, social workers underuse possible resources for professional development (qualification and research) but appreciate continuing (practice-based) education. Reflectivity[27]as a theme is a controversial idea: while self-reflection is regarded as very important, critical thinking and autonomy are ranked secondary.

Negative or low evaluation of the government and the public indicate that social workers perceive their own professional positions as insecure or threatened – in accordance with our findings on self-states where one third of the practitioners was characterized by vulnerable identity development.

Currently, social work is not an attractive profession in Hungary. Based on our study, the development of the area largely depends on reconstructing the position of Hungarian social workers within the society. Institutions of higher education can assist the process by introducing targeted programs to address problematic areas, and by strengthening their relations with social service institutions and professional organizations.

VI. IMPLICATIONS FOR CURRICULUM DEVELOPMENT

Presently, the Hungarian system of higher education is outcome focused. In accordance with the European Qualification Framework, the Hungarian Qualification Framework determines expected general outcomes (competencies), characteristic of the different levels of education. Learning and Outcome Requirements (LOR) [28] determine four components: knowledge, skills, attitudes, and degree of autonomy to be obtained in the given program, i.e., each program has its individual LOR. Due to domestic traditions, many programs focus much more on knowledge and lay less emphasis on the other three components.

The Global Standards for Social Work Education and Training [29] is a collection of guidelines and requirements specific to social work education. The document highlights the profession's mission (values); interrelations between practice and education, and social work's contextual nature: "appreciating the diverse political, historical and cultural contexts within which future generations of social workers will be educated."

As social work is a practice-based profession, internship, and practicums (seminars and trainings) are central elements in the programs. Accordingly, dual training systems, which combine training at HEIs and at workplaces, are also available. What is largely missing from these systems is the recognition that lecturers' and trainers' professional identity plays a key role in the development of student motivation and professional identity development.

In their new book, Ellis and Hogard [7] focus on professional identity that they regard as "the overall organizing idea in the curriculum", briefly, curriculum for professional identity development (CuPID). The authors translate the idea into three components of professional identity that can be targeted in training systems: knowledge, skills and values that govern behavior.CuPID fits well into outcome-focused approaches and helps keep the developments targeted.

Academic mentoring is one way to put CuPID principles into practice. A faculty member presents knowledge, provides support, and offers guidance to a student on academic (classroom performance, research etc.) as well as non-academic, study-related personal issues [30]. This type of mentoring facilitates psychological adjustment and fosters a sense of professional identity [31]. In this sense, the mentor-mentee relationship promotes the mentee's professional socialization and professional competence/readiness. Students whose development is supervised and guided by a mentor show

considerable performance improvement, they acquire specific skills more efficiently, and their self-confidence and motivation increase [32]. Through these functions and processes, students become more successful not only in their studies but in their future workplaces as well as valued and efficient workers [30] [33]. In sum, the role of the mentor is not limited to managing academic progress, mentors shape mentees' professional identity. Professional identity is a central concept in education but is difficult to assess. It is not a form of behavior but is an underlying, comprehensive factor. Identity Structure Analysis provides the educators and researchers with a unique tool to measure identity and utilize the results in student and workplace /internship selection, clinical supervision and in designing individualized professional development programs, such as mentoring. Further, an ISA-analysis supports human resource management decisions in social services with varied activities and institutional contexts.

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REFERENCES

[1] K. Pik, „A szociális munka története Magyarországon. A pesti és budai Jóltévő Asszonyi Egyesület. (The history of social work in Hungary. The Pest and Buda Women's Charitiy Association),” Esély, vol. 2, pp. 80¬–90, 1998.

[2] L. Németh, „Hova jutott a szociális szakma a rendszerváltástól napjainkig? (What is the development of social work since the transition of the social system?),” Esély, vol. 3, pp. 95–99, 2014.

[3] S. Jones and R. Joss, „Models of Professionalism,” In M. Yelloly and M. Henkel (Eds.), Learning and Teaching in Social Work. Towards Reflective Practice, London, UK: Jessica Kingsley Publishers, pp. 15–33, 1995.

[4] M. B. Erdos and T. Gomory, „Social Work's Mission and Professional Identities in the US and Hungary: A Comparative Discussion,” (in press), 2020.

[5] H.S. Slay and D.A. Smith, “Professional identity construction: Using narrative to understand the negotiation of professional and stigmatized cultural identities,”Hum. Relat.,vol. 10, pp. 1–23, 2010.

[6] E. Hogard, “Evaluating the identity of program recipients using an identity exploration instrument,”Can. J. Program. Eval., vol. 1, pp. 1–35, 2014.

[7] R. Ellis and E. Hogard (Eds.),“Professional Identityin the Caring Professions:Meaning; Measurement; and Mastery,”London and New York: Routledge, 2020.

[8] S. Fargion, “Reflections on social work's identity. International themes in Italian practitioners' representation of social work,”Int. Soc. Work., vol. 51, no. 2, pp. 206–219, 2008.

[9] M. Payne, “European social works and their identities,”ERIS Web Journal, vol. 2, pp. 2–14, 2014.

[10] Global Definiton of Social Work,“IASSW”. https://www.iassw-aiets.org/global-definition-of-social-work-review-of-the-global-definition/, 2014.

[11] L. Bonisch and H. Losch, “Das Handlungsverständnis des Sozialarbeiters und seine institutionelle Determination,” In H-U. Otto and S. Schneider (Eds.),Gesellschaftliche Perspektiven der Sozialarbeit. Bd.2. Darmstadt: Luchterhand,pp. 21–40, 1973.

[12] S. Staub-Bernasconi, “Social Work and Human Rights. Linking Two Traditions of Human Rights in Social Work,”J. Hum. Rights. Soc. Work., vol. 1, pp. 40–49, 2016.

[13] É. Pataki, “A szociális identitás szerepe a szociális hivatásban (The role of social worker identity in the social professions),”MACSGYOE XX. Szakmai konferencia. Siófok, Hungary,May 11–13, 2011.

[14] P. Sárkány,“A szociális munka mint alkalmazott etika (Social work as applied ethics),” Szociális Szemle, vol. 1–2, pp. 7–18, 2011.

[15] Somogyi, “Értékkonfliktusok a szociális munkában (Value conflicts in social work),” Válogatott tanulmányok a társadalomtudományok köréből, Komárno, SK: International Research Institute s.r.o, 2017, pp. 237–241.

[16] P. Navrátil and P. Bajer, “Social Construction of Social Work Identity in the Processes of its Institutionalization,”Annals of Social Sciences, & Management Studies,vol. 1, no. 3, pp. 51–53,2018.

[17] K. Szoboszlai, “A szociális munka a változások tükrében: kik vagyunk, hol tartunk, és mit kellene tennünk? (Social work in the light of change: who are we, where are we going, and what should we do?),”Esély,vol. 3, pp. 87–94, 2014.

[18] Pilinszki, O. Béres, B. Sipos and G. Ittzés, “Mit értékelnek a szociális munkások? Mesterképzésben részt vevő szociális munkások értékrendjének sajátosságai. (What are the values of social workers? Characteristics of the value system of social workers in postgraduate training),”Esély, vol. 5, 87–94, 2004.

[19] S.A. Webb, “Professional identity as a matter of concern”. European Social Work. Research Conference, Aalborg University, Denmark, April 19–21, 2017(a).

[20] C. Maslach and S.E. Jackson, “The Measurement of Experienced Burnout,”J. Organ. Behav.,vol. 2, no. 2, pp. 99–113, 1981.

[21] M. Newcomb, J. Burton, N. Edwards and Z. Hazelwood, “How Jung's concept of the wounded healer can guide learning and teaching in social work and human services,”Advances in Social Work and Welfare Education, vol. 17, no. 2, pp. 55–69, 2015.

[22] S. Straussner, E. Senreich and J.T. Steen, “Wounded Healers: A Multistate Study of Licensed Social Workers' Behavioral Health Problems,”Social Work, vol. 2, pp. 125–133, 2018.

[23] M. B. Erdos, B.A. Vass andR. Javor, “Social workers: Rebirth of the professional in Hungary. Identity Structure Analysis as a means to explore social worker professional identity,” (in press), 2020.

[24] S.A. Webb, “Matters of professional identity and social work,” In S.A. Webb (Ed.) Professional Identity and Social Work, London, UK: Routledge. pp. 1–18, 2017(b).

[25] Erskine and R. Ellis, “An introduction to identity exploration and our Ipseus™ Software,”Workshop. University of Pécs, Hungary, 2017.

[26] P. Weinreich, “Identity Structure Analysis,” In P. Weinreich and W. Saunderson (Eds.), Analyzing identity: Cross-cultural, societal, and clinical contexts, London, UK: Routledge, pp. 7–76, 2004.

[27] D. Schön, “The reflective practitioner: how professionals think in action,” New York, NY: Basic Books, 1983.

[28] Learning and outcome requirements. (18/2016 (VIII.05) EMMI, ministerial decree).

[29] V. Sewpaul and D. Jones, “Global Standards for Social Work Education and Training,”Soc. Work. Educ.,vol. 2, no. 5, pp. 493–513, 2004.

[30] M. Jacobi, “Mentoring and undergraduate academic success: A literature review,”Rev. Educ. Res.,vol. 61, no. 4, pp. 505–532, 1991.

[31] A.E. Austin,“Preparing the next generation of faculty,” J. Higher. Educ.,vol. 73, pp. 94–122, 2002.

[32] Roberts, “Mentoring revisited: a phenomenological reading of the literature,”Mentor. Tutoring., vol. 8, no. 2, pp. 145–170, 2000.

[33] J.E. Girves, Y. Zepeda and J.K. Gwathmey, “Mentoring in a post-affirmative action world,”J. Soc. Issues., vol. 61, no. 3, pp. 449–479, 2005.

SURVEY ON MULTIMEDIA SECURITY AND VISUAL CRYPTOGRAPHY

[1]ABHILASH S NATH, [2]A. JEYASEKAR

[1]Research Scholar, Dept. of Computer Science and Engg, SRMIST,KattankulathurCampus, Chennai 603203
[2]Associate Professor, Dept. of Computer Science and Engg, SRMIST, Kattankulathur Campus, Chennai 603203
E-mail: [1]abhilass@srmist.edu.in, [2]jeyaseka@srmist.edu.in

Abstract - The people using internet has become so extensive across different sectors in day to day life. Security is the important feature different across the platform and mobile applications we use. The important aspect in the sectors is usage of the data having significant role in identifying the user preferences in using the data for video, text and games etc. Due to the large volume of data consumed by the customers is high it's difficult for user to identify the identification of the pattern of data that is stored by the remote servers .The advertisements and the thumbnails that come across as your search relates can be seen. This understanding by the service providers or the sites that we visit store our preferences in choosing the content matters .Mostly people chooses the video content for news, entertainment .The people also uses camera for home security and even for live streaming personal mobile cameras used. These all uses huge amount of data. The information loss during the communication between the devices through internet there is a lack of features which even cannot be controlled by the protection software's. To avoid all leaky information from the transfer of data technique called visual cryptography is used. In this survey, present an overview of the characteristics, security threats and major security challenges. The contribution of the survey will lead to understand the visual cryptography and security facets of it. The various techniques existing in the visual cryptography will help to figure out the improvement of cryptographic technique in various years. Some identified areas of security which can also affect our day to day life which give motive to find new ways of security mechanism.

Keywords - Internet, Visual Cryptography, Information Loss

I. INTRODUCTION

The network is collection of interconnected devices. The network has been secured for large number of devices .There are different type of attacks which is happening in computer networks. The activity of hackers in to gain huge amount of information in multimedia data would generate a major concern for security. The multimedia applications created by the users find more vulnerable to different attacks. The major part of the idea is encryption of the large number of image shares. These attacks used efficient and secure way to break in to a system. While understanding the side channel attack by leaking information, the attacker can infer the activities based on size of the data of an encrypted video stream. The video market is expected to reach dollar 45 billion by 2020. Saving the bandwidth and space for storage a encoder removes spatial redundancy .Difference coding causes significant side-channel information leakage. Some of activities increase the storage space and increase the size of the traffic data. The visual cryptography increases the safety of the image in a huge way it help to store in a very important way it decreases the storage space of the data and increases the transmission of the data in a huge manner. Big Organizations wants strong security devices for analyzing the vulnerabilities in their networks. But with big scale networks and managing their complex configurations technically difficult. The network has to be changed with configuration change in other networks. The network admin wants to respond newly invented weakness by giving new patches and changes to the network configuration or utilizing resources to reduce the risk from attacks.
Side-channel attacks gain technical information in the form power differential analysis and black-box attacks. The cases in the side-channel include cache attack, timing attack, power-monitoring attack and differential attack analysis.

II. TYPE OF SECURITY ATTACKS

In security attacks there are two type of attacks which are passive and active attacks. Passive attack means it make use of information without any need of algorithm. They learn the information but don't change the device operations. The main feature of passive attack is to monitor the operations. It just wants the information which is transferred. Release of message content and analysis of traffic which are types in passive attacks. Sensitive information collected through mail or talking through communication devices. The information received through email can identify by observing the pattern in which the length of messages and location of receiver or sender even though a message is encrypted. These types of attack are very difficult to track. But in active attack they change the operation of system .In the active attack there is alteration of the data by generating false data into the data stream. The active

attack is divided into four types masquerade, modification, replay and denial of service.

In masquerade attack it pretends to be a person who is an attacker trying to send a message to the receiver which thinks its from original source or sender.This is done by capturing the privileges own by sender for obtaining more privileges by masquerading it has the same privileges. The modification of the information is altered. This is delayed to generate wrong exchange of message. The attacker will change a small part of the information during this delay and send to the receiver. In the replay attack the capture of message from sender to receiver where later replay message to receiver side.denial of service where it will prevent from communication services. This is denial of a service in a network. They are done for performance degrading. This can be targeted to any of the services this can be mostly seen when offers are made by particular website selling during festive seasons or launching of product for flash sales.

The passive attacks which are difficult to trace in the ways it procure the essential data from large network. The information which is transmitted through the network is large. The attacker can analyze different information by the pattern of the information passed across the network. Side-channel attack is a passive attack where information is gathered from system without algorithm which is implemented in the system itself.

A timing attack watches the movement of the data in and out of data of the CPU or memory on the hardware running the cryptosystem or algorithm simply by observing variations in how it takes to perform cryptographic operations. It might be possible determine the secret key. Such attacks involve statically analysis of timing measurements and have been demonstrated across the networks. In order to increase the confidentiality and privacy of the image share an encryption algorithm is used. Digital knowledge can be understood in different ways. It can be text, video, audio etc.

Private video can be transmitted and can be used for storage purpose easily. But due to the growth of information age security and the issue in privacy is very important. An authorized can login to account for his private data which is very sensitive. The answer to above problem is by encrypting the video to protect from an unauthorized access. The traffic in network during video streaming which has a pattern develops a threat of privacy of user. The network have huge amount of traffic due to the amount of data people use is very huge. Variable bit rate encoding used for balancing the video bit rate

same. Video segments, its content and quality levels help the attacker to eavesdrop the traffic within a span of 3 minutes with a accuracy of 90 percent.. The quality level of video segment for playback, the pattern that is emerged helps for identification of videos. These mechanisms are seen in DASH which targets segment size variation of Variable bit rate and a particular traffic pattern. the identification of video in the traffic during video streaming without any change to video client and server. The differential bitrate based feature extraction for generating stable video features. The video finger prints and stream features are concatenated together for derive video identity by designing a partial matching method. The privacy of PC is challenged nowadays. There are two type of attacks passive an active attacks. The passive attack happens by eavesdrop of traffic from network side without direct contact with the device. The side-channel information of an encrypted traffic is used to collect the information about communications. This can be used for studying hugely for understanding the video streaming and web browsing etc. The research is mainly conducted on web traffic for its problems. Webpage can be monitored by the other people who can gain the personal information of user. It can be video information or text information mostly people prefer for storing theirinformation. So some webpages have to hide some information to get away from eavesdroppers. The side-channel attacks on encrypted data, mixed with the selective sections of web apps are becoming a threat for privacy of user data processed by applications which is highly confidential and sensitive. Side channel is cl assified into two different categories of profiled and non-profiled where in profile phase a testing device which allows featuring the physical leakage and making an exact leakage model and non-profiled where attack is against a same target device to do a secret key extraction. Non-profile side channel attack includes differential power analysis, correlation power analysis variance ratio. Profile side channel attacks have stochastic approach and template attacks. Existing side channel attacks use an ideal measure environment with a mechanism to trigger the source code to get access to the target device. However this is not applicable to all real time events. Side channel data leakage in network studied vastly for more than a decade in the reference of cryptographic protocols and encrypted voice over internet protocol. Side-channel attacks have been there during the era of smart cards. Big Organizations wants strong security devices for analyzing the vulnerabilities in their networks. But with big scale networks and managing their complex configurations technically difficult. The network has to be changed with configuration change in other networks. The network admin wants to respond newly invented weakness by giving new patches and changes to the network configuration or utilizing resources to reduce the risk from attacks. The basic knowledge of visual secret sharing made for sharing visual information in the network. While other normal encryption or decryption processes, Visual secret sharing scheme has the advantage of make use of human visual system to decrypt the secret images without any complex mathematical computations. In this scheme, the encrypted image is split into m random shares. Then joining at least k

shares to recover the original image. There is lot of research done in binary, grey-scale or color images. Since we used color and grey-scale image for hiding an information similar techniques are also used to hide image related to grey and color scale images. Most of the methods view on focusing to hide the information. Other than hiding, there is a method in which can restore the real image after reversing the hidden data for applications related to medical field and also geostrategic terrain images. These images must be highly secure and safe while sending to a specific person. Some uses a encryption method for securing the secret image with conventional encryption methods. The security depends whether the key generation algorithm is able to withstand a cryptanalysis or methods used to crack the key in possible ways. The image which is made into different shares using visual cryptography techniques and encrypting with a key is more secure.

III. VISUAL CRYPTOGRAPHY

Visual cryptography which was introduced by Shamir, Naor in 1995 is the technique based on human visual system. In this technique the encrypted data which is done by dividing the shares is decrypted by human eye. The complex structure of mathematical algorithms is not required in encryption and decryption. The images shares are encrypted into differentnumber of images. When the images are stacked together to match the sub pixels among the images. The implementation of this scheme is 2 shares. The shares uses exclusive xor operations .This scheme is extended into k out of n shares where less than k shares are needed .k<=n. Naor and Shamir used for only black and white images. After some years Verheaul and Tilborg developed a scheme for colored images. They use random shares to cover the secret images but the quality of images recovered is poor. When the cryptanalysis of the image shares are considered if attackers are able to gain all the shares only then recovering of original image share can be done.

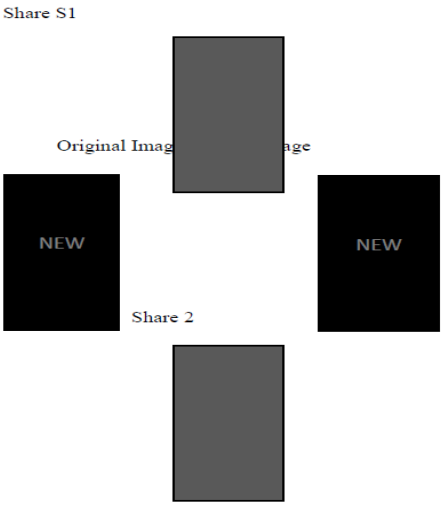


Fig.1: 2-out of 2 visual cryptography

In the above figure the representation of a secret image is made into shares in visual cryptography. The stacked image was obtained as a result of xoroperation .

Each pixel into a set of m black pixels white sub pixels in each of n shares for n-participants. When m=2 and n=2 its 2 out 2 scheme. To read all this images shares are stacked together. The result is reconstructed images of the secret image. But this image also contains noises. The display quality is affected by blackness and contrast value. Based on the degree of blackness there is deterministic model and probabilistic model. The (n,n)visual cryptographic schemes

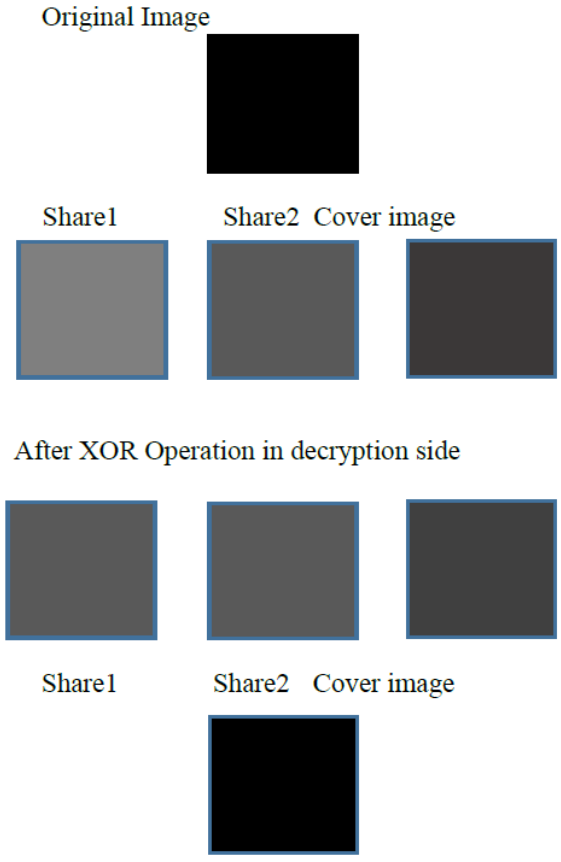


Fig.2 :k out of n visual cryptography

falls in first category and k,n visual cryptographic scheme in the later one. Researchers invented new visual cryptography techniques for gray scale and colored images. If The improvement of quality of images is limited in terms of development of VC algorithm where human eyes can perceive the image is not linked with the metrics used for quality measurement. There are researches where gray scale secret image is half toned by a quantizer of different level to generate binary images called halftone image and a threshold image. So different size invariant visual cryptography algorithms will be tested to the binary images these categories engulf the existing algorithms. In other category the intensity of block is

quantized at various levels which turn represented by different patterns of binary images to accurate the local intensity. The secret images are encrypted into shares which can be considered as an analysis step for reconstructing the target image which is called synthesis step where image shares are binded .The target image in AbS process is pass on to analysis process where the pixel difference between target image and gray scale secret block is familiar to the encryption process.

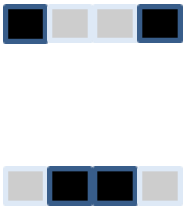
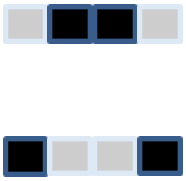
Pixel	Probability	Stacking of shares	Pixels
White Pixel	0.5 0.5		
Black pixels	0.5 0.5		

Fig.3: (2,2)scheme with 2 sub pixel stack

gray scale secret block is familiar to the encryption process. So the half toning method in encryption process can make changes to less the difference between the target image and secret block. i.e. the error between the original image and target image. Here in the above scheme m = 2 and n=2 so its called (2,2) scheme. The secret sharing expands the one pixel into several sub pixels. The recovered image is not the same exactly with the original one and makes it as noisy images.

When a pixel is black it choose two combinations. The two binded pixels become blacks. When binding white pixels in secret image are half-black and half white.The contrast of reconstructed image degraded by half percentage because degradation happened during the visual cryptography technique. The color images used by media are different. The contrast of pixels and the light colors usage. The gray level in images depends on the density of dark pixels. The way of using density of pixels needed is set to be scattered and those of dark areas are more and made gray level to half tone image. The human eye can see only concentrated region in the image.

Two models are used in color models. First additive model and subtractive models. In additive model Red, Green, Blue which is primary colors where colors are mixed to get composite colors. When all colors are mixed with equal wavelength (Red Green and Blue) obtain white color. Modulate the color Red, Green so we get different components of colors. The different colors which we get by mixing will add up the brightness of light. The compound color produces colors where more brightness is produced. The screen of computer is additive system. The other colors we see is combinations of primary colors. If we paint a wall with green color it will emit and blue color will absorb colors during natural sunlight.

While using computer the software's are of provided with image processing software's. The operating system are inbuilt itself with RGB color model. Here the screen of computer is output. The human retina identifies the RGB colors.

RGB color represents 0 to 255 color bits. Its 8 color bit each.

(0,0,0) represent black and (1,1,1) represent white. In Visual cryptography the using of shares we can makes the relationship between the complementary colors (Cyan, Magenta, Yellow) which are in the subtractive model. This visual cryptography can be identified using half

tone and grey color visual cryptography methods. The original image pixels and these are RGB pixel measures. Every pixel in the image is enhanced as shares. The shares of RGB image shares having RGB color components which are separated and also depend on the color image. The encryption of image is decided how much of shares are need to be generated.

The random grid based visual sharing scheme which help deal with general access structure and visual quality of reconstructed image .This paper proposes the security of proposed scheme and using generalized random visual secret sharing scheme quality of image in different situations. Analyzing the contrast of light in image in detail. They finally prove proposed method where optimal light contrast is minimal. The second part was proving the efficiency in the construction of the image without loss in quality. Here the image quality of reconstructed image are compared with Wu and Sun's scheme

In extended visual cryptography scheme a color images which was introduced by Droste. In a work for sharing a color images two extended visual cryptography was proposed. A 3 meaningful shares are proposed where it contains R,G ,B components of extended image. These three shares required for recovering original image and second method was two shares required for recover secret images. The components RG GB and RB contains secret image. The proposed method is made meaningful for increasing security where a cover image is also added with shares. The proposed technique in this paper is lossless in nature. The dimensions of cover images and of secret image and reconstructed images are same.

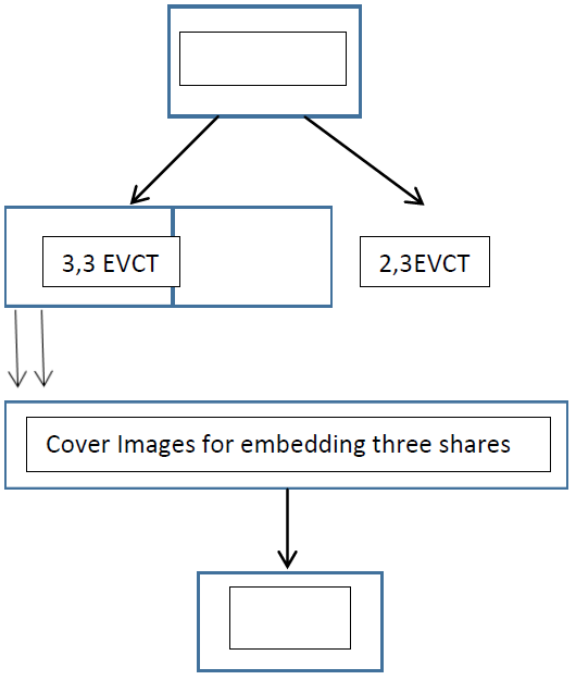


Fig.4: Extended Visual Cryptography for color images

The 3,3 EVCT and 2,3 EVCT are the two techniques to share color image. Here RGB image which is 24 bit made into 8-bit R G B components share using color decomposition. These are binded with the cover images to make them meaningful. These image shares are send to the communication medium. Every share contains 2 out of 3 components. RG, GB and RB share are created other than R, G,B shares. Hence 2,3 EVCT can produce original image. Error diffusion technique is used for high quality of visual data. The reconstructed images effectiveness are considered are on parameters such as total number of colors present in secret image. Operations performed on decryption side. Execution time for running the techniques and recovered images is lossy or not. The dimension of the image used in this experiment and applying the proposed techniques with high dimension images can also be analyzed. These techniques can be extended to general extended visual cryptography.

In chaos based visual cryptography the pixel position are used to generate the shares. This is done by using chaotic mapping where pixel values along with pixel positions are used.

In visual cryptography schemes sometimes fake shares can be inserted and remain a challenge. To avoid this XOR based visual cryptography schemewas proposed. To enhance the security these shares can be again encrypted by conventional encryption algorithms. These shares can be easily be retrieved at receiver side with fast execution and minimal peak signal noise ratio. Some visual cryptography watermarking technique is used for security. The public key cryptography like RSA algorithm is used for encrypting the image shares. This is for transmitting image shares more securely.

The progressive visual cryptography by stacking more image shares. The original image can be recovered only when more shares are binded together progressively. Here if we shadow images are binded together secret image cannot be identified which can be a security advantage in case of constructed threshold visual cryptography.

In multiple image visual cryptography, when image shares are produced in correlative matrices which is used to encode the binary secret images where each pixel corresponds to block and each block extended to form n x n pixels.

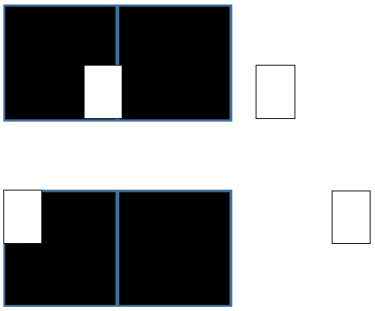


Fig.5:4 Different patterns of secret sharing

The extended block in the share will choose any of the patterns in the figure .This visual cryptography can hide more than one secret but contrast loss, security is issue. It have limits because here the image shares are square type the rotation angle is 0, 90,180, 270 only. Some changes in multiple secret sharing were done to overcome the limitation such as recursive visual cryptography. In recursive visual cryptography system images is made into shares and sub shares based on recursion. The security can be enhanced using recursion.

In the below tree representation of 2 out 2 visual cryptography system with recursion it involves two levels of encryption. S which is reconstructed by stacking shares in many ways

$$S = I1 + I2$$
$$S = I1 + I21 + I22$$
$$S = I2 + I11 + I12$$
$$S = I11 + I12 + I21 + I22$$

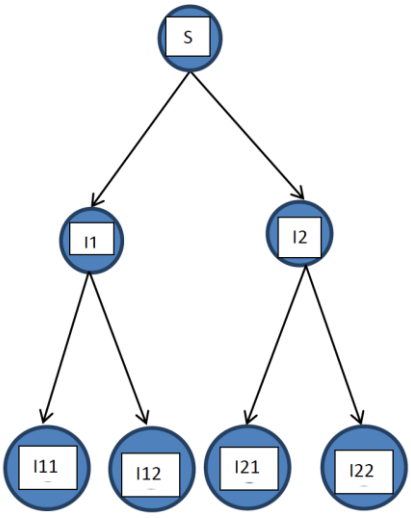


Fig.6:Two level of encryption for constructing Shares

The VCS using the many levels of encryption, the reliability and security can be improved. Here the first share is encrypted and second shares level is also again encrypted.

In segment based VC hiding message using numbers with seven segment display. The main importance in seven segment display the symbols are easily recognizable. The segment in seven segment display represented as Sn. The shares have no idea of hidden secret digit.

At the decryption side of visual cryptography the image shares are superimposed one with the other to recover the hidden secret image. There is XOR-based and OR-based VC. The shares which are produced based on OR-based VC where the pixel based which was used earlier. This is used because the reconstructed images are recovered from less number of shares. The quality of image is not degraded. Later when more shares started using the reconstructed image becomes darker. In XOR-based VC(Wu &Sun,2013) where the shares are superimposed to produce a good quality image. The XOR-based VC are commonly used logical operations at the receiver side.

Technique	No. of secrets	No. of shares	Pixel Expansion	Contrast loss	Computational Complexity
Bit-based VC	1	2	nil	1/2 or 1/4	-
Pixel-based VC	1	2	m	1/m	-
Extended VC	1	2	m	1/m	O(1)
Progressive VC	1	2	m	1/m	-
Multiple Image VC	2	2	m	1/m	O(1)
Segment based VC	1	n	nil	-	-
Chaotic VC	1	2	nil	-	-

Table 1: Different VC comparison based on parameters

The table represents the comparison between different visual cryptography. When the secret image reconstruction happens the black pixels in shares representing white pixels affect contrast loss. The size of shares used for generated by pixel based VC is directly proportional to the sub-pixels number in reconstructed image is termed as pixel expansion. The image reconstructed and having pixel expansion then size will be bigger for secret image which requires more storage space. The change in pixel intensity will affect the security. The time required for execution during the decryption must be small. So reducing the pixel expansion and contrast loss is important in visual cryptography. The strength of these techniques must be justified against histogram analysis, structural similarity index and bit error rate etc .Bit error rate is ratio between number of bit transmitted and received. Structural similarity index is the measure to find the alteration of structural information held by interdependent closed pixels and value lies between -1 to 1 .This helps about the objects in visual scene. Some of the images for transmission requires on the security aspect. The spatial image of region which have implications on security of a country. The threats can happen on both ways. The visual cryptography has various applications one is biometric privacy. The fingerprint and Iris are commonly used security feature for person. Visual cryptographic techniques are used to store and safe access into the official space and work.

In probabilistic VC the pixel expansion is focused which is arising from the pixel based VC. The contrast in the recovered secret image is same as that of pixel based. Each of the pixelsrepresent an image stored in computer as 1 bit number and common pixel format is the byte image where number stored as 8-bit ranging from 0 to 255.In intensity histogram pixel in the image at different intensity value. Some intrinsic characteristics of the image such as bulk data capacity and correlation in pixels traditional encryption like DES and IDEA not used. In flip-based visual cryptographic scheme two shares are encrypted into 2-dual based purpose shares where secret image is recovered from 2 transparencies. By flipping the one of 2 shares and binding with other share, second secret image is recovered. This scheme has optimal contrast and no pixel expansion.

Naor and Shamir proposed visual cryptography scheme. Initially the scheme was (2 ,2)-visual cryptography technique where 2-out-2 shares are reconstructed with the original image. The once which are shares are encrypted shares. The shares which are single cannot expose information in secret image. In each pixel can be expanded into many sub-pixels. It will have m sub-pixels after expansion.

The (k,n)-visual cryptography technique the color image and gray scale images by lattice based concept. The color images with C distinct colors shared using this technique. The (k,n) concept for color image have C subset in the finite lattice considered as pixels which corresponds to shares. The Naor and Shamir technique extended using linear programming for increasing the color contrast of the resultant images.

The improved security feature in extended visual cryptography by having the shares meaningful. The image shares are embedded by cover image to prevent the chaos created by something in secret image. The binary images where 2 white and 2 black sub pixel block and black pixel from cover images

expanded to one white and three black sub pixels. When images are recovered block which correspond to black have 4 black sub pixels and block which points to white the final image as one white and three black pixels. The contrast lost by shares half the percent of image and recovered image by 75%.

The extended visual cryptography technique was improved by taking pixel from original image. These shares have 5 white and 7 black pixels of cover image accordingly. The block is 3x3 sub pixels in share images.

In gray scale images where Chang proposed the technique where size of the image shares does not change as per the color changes in image.

The proposed techniques where k,n visual cryptography technique for color and gray-scale images uses half-toning technique .These will reduce the contrast of the color image.

The threshold visual cryptography proposed by Chao and Lin using CMY color decomposition. The 24 bits true color original image is changed into 3 bit CMY halftone image. The 3 bit halftone image is made into 2 x 2 block which is based on concept of vectors. All pixels of 3 bits halftone C-M-Y images which are processed and the image shares are constructed. 2 out of 3 image shares construct the original image. The disadvantage of this technique is that resultant secret image is noisy and lossy in nature.

The other halftone visual cryptography proposed in where making m colored halftone image shares. The quality of image is high with less noise.

The k,n visual cryptography technique based on qualified subsets where any subset group G shares images with m persons share each a distinct secret. Its said that every subset is qualified. The constructed subset will have minimal pixel expansion and good contrast.

The proposed extended visual cryptography algorithm for 4 colored images as input and constructs any 3 images which are related to images given as input. During the stacking the 3 images are binded to get fourth image. The size is the same during decryption and the constructed image shares are meaningful.

Lou proposed a method in which visual cryptography can be used by using a watermark where this can be developed using a secret and public image. A certified authority registers with secret image. Using XOR operation the watermark is developed. The proposed (3,3) and (2,2)- extended visual cryptography for sharing secret images its extension of traditional visual cryptography. The gray-scale covers are embedded into them. The binding of shares reveals original image.

Shyong and Ming proposed integer linear programming for (k,n) VCS. The generalized visual cryptography system helps with minimal optimal expansion. In this a generalized integer linear programming constructs general visual cryptography visual system.

A (2,2) circular visual cryptography for binary images. The technique is that m secret image can be stored in circular plate at a time. Then shares are created. First share in small dimension and second share in bigger dimension (double) than first share. The first share is binded with share 1 of second secret image having dimensions bigger than first secret. Again the share 2 is constructed by combining 3rd image with first two images and the method continues until secret image are encapsulated in grid. This is turn into a circular plate until final shares are constructed. Decryption of image starts when largest dimensions is extracted firstly followed by the image which is half the dimension until the method is continued secret image is found out. As seen the explanation its clear about that the proposed algorithm can handle the images of various categories and images. The sizes of image also based in the encryption phase.

In the context of cryptography security in extended visual cryptography system the conflict by dissolving the multiple images to retrieve the original image from the given images This may spoil the result as a part of quantization error where the information from the sheet and target can interact with each other because of high frequency of conflict. But human high level visual system retains only ability to understand the image recovered from originals. This will become the schemenot secure. These can be addressed by experimenting on the contrast enhancement and analyzing the image quality resulting output images. The security based on the image where the trade-off between contrast enhancement and the security of the images. The extend to this scheme to color images where color images separated in channels of primary colors red,green,blue which can be treated as independent gray scale for each color channel.

In a very naive approach, the system applies the encryption to each channel and merges the result to get the colored output. Under the ideal subtractive color mixing model, stacking the two colored sheets reveals the colored target1. In reality, however, such ideal subtractive color mixture is unlikely due to the properties of ink, transparencies, etc. It needs to establish a sophisticated color mixing model for the extended visual cryptography with better color quality.

Visual cryptography helps to secure the shares of the image. Particle swarm optimization algorithm is one of the optimization algorithms which optimize the value in the complete solution space. The particle swarm optimization based on the size of cluster for knowledge sharing in solution. In local PSO the solution the position of particle in local cluster and differs from particle. In global iteration is performed for updating of position of particle. Each particle which is part of cluster are depicted as solution which is optimize solution for new group of particles. In a network every particle can be identified which can be

a structure. In ring structure every adjacent particle which decides the speed of network for deciding new velocity. In cluster similar properties of particle are communicated by particle head and it acts the root of that cluster for the the individuals in that cluster. In a big network the particles which depict the best approach globally other than taking a local approach. The encryption side in visual cryptography for the shares. Other approach is differential evolution. The differential evolution genes decide the design in population It gives most relevant solution from a complete solution. In an image the primary colors like red green blue are chromosome. Here the new images are formed from the same image using existing images .Mutation in this images can helping generation of new image.

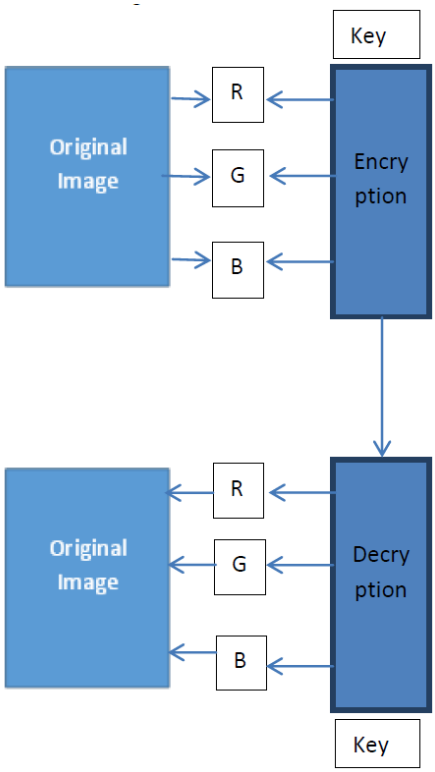


Fig.6: RGB shares secured transmission using a key

The original image which is spitted into three shares of RGB shares and encrypted. The encryption using a visual cryptography technique and a secret key generated by particle swarm optimization and encrypted by any cryptographic algorithm. The images are transmitted to the side of receiver. The key which is generated using optimization algorithm. In particle swarm optimization approach new images are formed where if differential evolution used for mutation of the particles. The values of color pixel are separated as RGB and the values from 0 to 255 are normalized. The encryption which is done by using best particle from resultant solution. The secret key obtained from final solution is used for encryption. The image shares are transmitted to receiver. The encrypted shares which constitute RGB colors are decrypted by the secret key and by superimposing all the image shares we get original image. Securing the sharing using the visual cryptography with the properties of conventional encryption of cryptography makes it harder to get the image which is divided and stored the match with a query. The original image is retrieved by superimposing the random images in regular manner. To decrease the time complexity multithread approach is used. The individual encryption of components in image (RGB) increases the encryption. In visual cryptography the security is a hard task. The pixel expansion reduction in pixel expanded techniques can be optimized and improved in some extent. The number of individuals increasing the expansion spike exponential. The storage space, the share transmission and the computation complexity as a result.

A genetic algorithm which was proposed by Holland in 1970.GAs is composed of chromosomes which represent a solution for a problem. A genetic algorithm uses solution for analyzing and best in the evaluation searching. The reproduction, crossover and mutation is the methods used by genetic algorithm. The reproduction method uses the chromosomes which is more durable is used in solution for genetic operations. The crossover used for exchanging the genes between two chromosomes to develop offspring. The mutation method for genetic alteration randomly. Therefore the genes which are suitable for present solution to the problem will happen in new solutions. The image half toning in region of binary image higher density because of the evenly distributed black pixels. The region becomes denser due to the degree of blackness. The probability of controlling the pixel in image help without a pixel expansion. The decryption process in visual cryptography where the human eyes can understand the difference in the black and white pixels from original image and superimposed image. If change in the rules of encryption it will make a difference in black and white spaces on the shares which are not identical

Pixels	Share	Share	Stacked	Probability
0	S11=0	S12=0	S13=0	P01=0.5
	S21=0	S22=1	S23=1	P02=0.0
	S31=1	S32=0	S33=1	P03=0.0
	S41=1	S42=1	S43=1	P04=0.5
1	S11=0	S12=0	S13=0	P11=0.0
	S21=0	S22=0	S23=1	P12=0.5
	S31=1	S32=0	S33=1	P13=0.5
	S41=1	S42=1	S43=1	P14=0.0
	Share S1	Share S2	Share Stacked	
0	FC01=0.5	FC02=0.5	SS01=0.5	
1	FC11=0.5	FC12=0.5	SS02=1.0	

Table 2: Probability for analyzing security and contrast

These tables are example for probability setting for good contrast and security. If changes are made in probability setting in the encryption of the image shares there will be a difference between black and white shares. The shares FC01=S11 x P01+S21 x P02 + S31 x P03 + S41 x P04 = 0.5 this shows the probability that a white pixel is encrypted as black pixel in S1 share. Here FC01=FC11=0.5 security is ensured.

The FC is the probability where white pixel is encrypted and binded as a black pixel on the stacked share of forbidden set.

The contrast of stacked probability that a white pixel encrypted and stacked as black pixel SS01 = S13 x P01 + S23 x P02 + S33 x P03 + S43 x P04 =0.5 and probability a black pixel is binded and encrypted as black pixel is 1.The main objective is to find the probability when contrast of stacked share is made optimized. Chromosomes are made of series of real numbers. The real parameter is used for avoiding the loss in precision by encoding method. Binary tournament selection method it picks two chromosomes with fitness values and chromosome with higher fitness value.

The visual cryptographic methods try to expand pixels and each share size become larger than original image. The distortion of shares also needs huge space. This will be leading to the difficulty in transmission of these shares and more requirements for storage. The probability concept was used for contrast issue for constructing an optimization model.

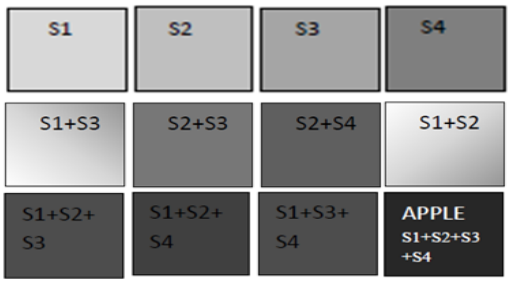


Fig.7: Probability concept for different stacked shares

From observing the above figure, It is much secure and it is easy to recognize the hidden information from the stacked shares. While using the probability model there is reconstruction of black pixels during the stacking. This is done in four shares of images. In the multiple images how much the probability model help to optimize and produce good results must be identified.

Images	Peak signal to Noise ratio	Mean squared error	Correlation co-efficient
Tree	53.00	1.23	0.9742
Jelly	36.38	0.385	0.9732
Lena	39.00	0.345	0.993
House	42.3	0.42	0.9782
Girl	55.00	0.20	0.9845

Table 3: Performance analysis of different standard test images

The table represents the performance in a system with attacks. This explains about the PSNR measure which is defined proportion of signals maximum availability to that of noise. Mean square error is average error in the occurrence in specific images. Correlation co-efficient which have two variables after encryption it will have higher correlation and identical when the correlation is 1 .This represents the hiding of information is failed .When the correlation coefficient is 0 it show major difference from the characteristics of original image.

In a digital watermarking method to get meaningful number of shares generated and also achieves more security. The water marking avoid active attack because it will not give idea about the original image. This method does not cause pixel expansion

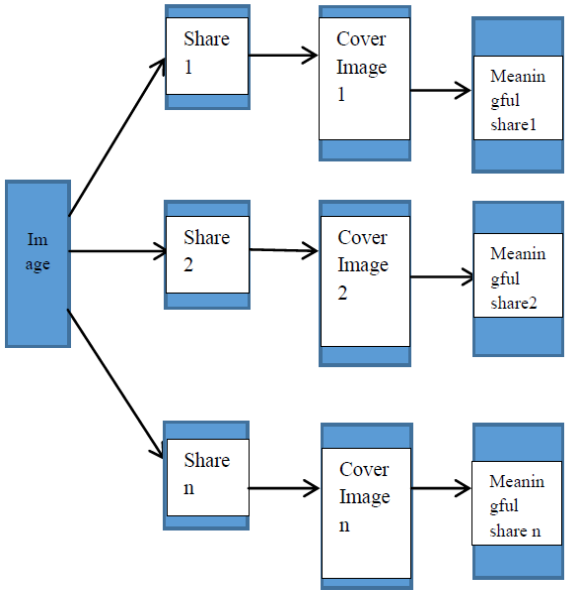


Fig.8: Securing multiple image shares using digital watermarking

The original image is tested with the watermarked image. The optimal number of shares decided based on the Structural similarity, Peak signal to noise ratio, Mean Squared error. Mean squared error is done to find if the two images are same. Peak signal ratio is test for signal strength.

Sometimes a possible attack on a watermark image changes the behavior of image this is identified by robustness of the image. When an image is made into three colors by decomposition C,M,Y . The digital watermarking to shares avoids the identification about the original secret image.

In water marking algorithms the encoding of the source image or text is done using a secret key. This key is also used in the decoding side for gain the information source. The above figure represents the watermarking embedding scheme. A typical watermarking algorithm must have properties of capacity, imperceptibility and security. Capacity means the number of bits a watermarking algorithm can embed in source data.

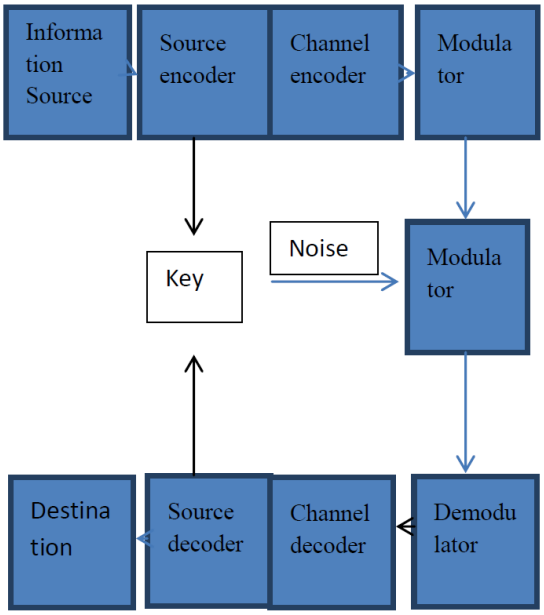


Fig.9 :Water marking encoding and decoding

The security depends where the watermarking can help protecting the source data. The other property is robustness. This was about how watermark helps in preventing attacks. The robustness is important feature of watermarking. The digital watermarking ishaving three phases creation of watermark, encoding phase and decoding part for authentication. The meaningful shares that is generated for achieving the security. The watermarked shares will avoid the noise or hackers from getting the original secret. In visual cryptography multiple image secret sharing schemes watermarking system is used. In progressive visual cryptography for meaningful shares and unexpanded shares the watermarking methodology is used for security. The optimization algorithms involved in improving the performance and cost had helped to reduce the computation complexity involved in decryption side.

The evolution and improvement of different visual cryptography schemes is illustrated in table.

Abbreviation	Explanation
VC	Visual cryptography
DBS	Direct Binary Search
PVC	Progressive visual cryptography
EVC	Extended visual cryptography
MDS	Maximum Distance Separable code
MPEM	Multipixel encoding method
SFCOD	Space-filling curve ordered dithering
CBR,BMC	Candidate Block Replacement, Basis Matrix Creation

Table 4: Abbreviation used in Table 5

Author	Year	Secret Image Format	Meaningful shares	Pixel Expansion	Multi secrets	Encryption method	Type of VSS
Kafri&Keren	1987	Binary	No	No	No	Random grids	2 out of 2
Naor& Shamir	1995	Binary	No	Yes	No	VC	K out of n
Ateniese	1996	Binary	No	Yes	No	VC for general access structures	N out of n, k out of n
Verheul& Van Tilborg	1997	Binary, grayscale, color	No	Yes	No	MDS code	K out of n
Yang &Laih	2000	Color,grayscale	No	Yes	No	VC	K out of n
Hou	2005	Grayscale,color	No	Yes	No	Halftoning ,Color Decomposition method	2 out of 2
Luckac&Plataniotis	2005	Binary,grayscale,color	No	Yes	No	B-bit level Secret sharing scheme	2 out of 3
Hou&Shu-Fen	2005	Grayscale,color	No	No	No	MPEM	2 out of 3
Zhou et al	2006	Binary	Yes	Yes	No	DBS halftoning method	K out of n
Wang	2006	Grayscale	Yes	Yes	No	Error diffusion method	K out of n
Wang &Arce	2006	Grayscale	Yes	Yes	No	Random grids, halftoning, color	2 out of 2
Shyu	2007	Grayscale, color	No	No	No	Random grids	N out of n
Chen, Tsao& Wei	2008	Grayscale, color	No	No	No	Random grids, Halftoning	2 out of 2
Chen, Tsao& Wu	2008	Binary, grayscale	No	Yes	Yes	Multi-secret VSS	2 out of 2
Shyu	2009	Binary, grayscale, color	No	No	No	Random Grids	N out of n
Chen &Tsao	2009	Color,Binary	Yes	No	No	Random Grids	2 out of 2
Chang et al	2010	Binary	No	No	Yes	Random grids	2 ot of 2
Wang et al	2010	Binary	No	No	No	IVCRG	N level IVCRG
Prakash&Govindraju	2011	Color	Yes	No	No	DBS with adaptive search & swap	n out of n
Chen &Tsao	2011	Binary, Grayscale,color	No	No	No	FRGVSS	2 out of 2
Sharma	2012	Grayscale	Yes	Yes	No	Error diffusion method	2 out of 2
Hsu &Jua	2012	Binary	No	Yes	No	Random grids	2 out of 2
Chang & Juan	2012	Binary	No	No	Yes	Shifting random grids	2 out of 2
Wu & Sun	2012	Binary	No	No	No	Random grids, halftoning, color	Access structure
El-Latif et al	2013	Binary	Yes	No	No	Random grids, Error diffusion, chaotic encryption	k out of k
Hou et al	2014	Binary, color	Both meaningful	No	No	Random grid	2 out of 2

Guo et al	2014	Binary, grayscale, color	Yes	No	No	Random grids, dithering, color decomposition	k out of k
Chiu & Lee	2015	Binary	Yes	No	No	User-friendly threshold VC	k out of n
Ou et al	2015	Binary, grayscale, color	Yes	No	Yes	XOR-based VC	n out of n
Yan, Wang, et al	2015	Binary, grayscale, color	Yes	No	No	Random grid	k out of n
Shivani&Agarwal	2016	Grayscale	Yes	No	Yes	CBR,BMC	PVC(n>.=4)
Chiu & Lee	2016	Binary	Yes	No	Yes	PVC	2 out of n
Yan et al	2016	Binary	No	No	No	PVC	k out of n
Gao et al	2017	Grayscale	No	Yes	Yes	Hyper chaos	2 out of 2
Yan et al	2018	Binary	No	No	No	Random grid	k out of n
Hsu &Jua	2012	Binary	No	Yes	No	Random grids	2 out of 2
Chang & Juan	2012	Binary	No	No	Yes	Shifting random grids	2 out of 2
Wu & Sun	2012	Binary	No	No	No	Random grids, halftoning	Access structure
El-Latif et al	2013	Binary	Yes	No	No	Random grids, Error diffusion, chaotic encryption	k out of k
Hou et al	2014	Binary, color	Both meaningful	No	No	Random grid	2 out of 2
Guo et al	2014	Binary, grayscale, color	Yes	No	No	Random grids, dithering, color decomposition	k out of k
Chiu & Lee	2015	Binary	Yes	No	No	User-friendly threshold VC	k out of n
Ou et al	2015	Binary, grayscale, color	Yes	No	Yes	XOR-based VC	n out of n
Yan, Wang, et al	2015	Binary, grayscale, color	Yes	No	No	Random grid	k out of n
Shivani&Agarwal	2016	Grayscale	Yes	No	Yes	CBR,BMC	PVC(n>.=4)
Chiu & Lee	2016	Binary	Yes	No	Yes	PVC	2 out of n
Yan et al	2016	Binary	No	No	No	PVC	k out of n
Gao et al	2017	Grayscale	No	Yes	Yes	Hyper chaos	2 out of 2
Yan et al	2018	Binary	No	No	No	Random grid	k out of n

Table 5: Different type of visual cryptographic techniques

IV. CONCLUSION

In the network we discuss about the different type of attack. The attack which is very unable to trace is passive attack. This does not require any software or any algorithm for gaining the information. The amount of data especially multimedia data which is transmitted through network has a amount of loss due to the various factors which was discussed in this paper. This paper also discuss about visual cryptography. After analyzing from table there are more number of visual secret sharing schemes are being available and developed over the years. The amount of data that is transferred through network is huge. The concern for secure transmission of data is biggest challenge. The method to protect the multimedia data from unauthorized person is a threat for the distribution and major disadvantage for the business related to IT industry. The images that are used for encryption during the transmission require security with less decryption time. This will help for less computation complexity and also the cost of implementation of visual secret sharing scheme in a large network. There are many visual secret sharing

schemes which is used for different purposes in real time environment. The visual cryptography techniques with different performance parameters are identified such as pixel expansion, quality of shares, size, visual quality recovered image, contrast, size of the image, computational complexity and number of shares generated for different visual cryptographic techniques.

REFERENCES

[1] Ateniese, G., Blundo, C., De Santis, A., & Stinson, D. R., " Visual cryptography for general access structures", Information and Computation, 129(2), 86–106. doi:10.1006/inco.1996.0076,1996

[2] Ateniese, G., Blundo, C., De Santis, A., & Stinson, D. R., "Extended capabilities for visual cryptography.", Theoretical Computer Science 250(1–2): 143–161. doi:10.1016/S0304-3975(99)00127-9,2001

[3] Chao, H. C., & Fan, T. Y., "XOR-based progressive visual secret sharing using generalized random grids", Displays, 49, 6–15. doi:10.1016/j.displa.2017.05.004, 2017

[4] Chen, T. H., &Tsao, K. H., "Visual secret sharing by random grids revisited", Pattern Recognition, 42(9), 2203–2217. doi:10.1016/j.patcog.2008.11.015

[5] Chen, T. H., &Tsao, K. H.," Threshold visual secret sharing by random grids ", Journal of Systems and Software, 84(7), 1197–1208. doi:10.1016/j.jss.2011.02.023,2011

[6] Chen, T. H., &Tsao, K. H., "User-friendly random-grid based visual secret sharing" , IEEE Transactions on Circuits and Systems for Video Technology, 21(11), 1693–1703. doi:10. 1109/TCSVT.2011.213347

[7] Chen, T. H., Tsao, K. H., & Lee, Y. S, "Yet another multiple-image encryption by rotating random grids", Signal Processing, 2012. doi:10.1016/j. sigpro.2012.02.015

[8] Chiu, P. L., & Lee, K. H., " User-friendly threshold visual cryptography with complementary cover images ", Signal Processing, 108, 476–488. doi:10.1016/j. sigpro.2014.09.032, 2015

[9] Chiu, P. L., & Lee, K. H., "An XOR-based progressive visual cryptography with meaningful shares", Computer Communication and the Internet (ICCCI), 2016 IEEE International Conference on (pp. 362–365), Wuhan, China: IEEE. doi:10.3389/fpls.2016.00362,2016

[10] Carlo Blundoa, StelvioCimatob, Alfredo De Santisa., "Visual cryptography schemes with optimal pixel expansion", Theoretical Computer Science 369 (2006) 169– 182, 2018

[11] El-Latif, A. A. A., Yan, X., Li, L., Wang, N., Peng, J. L., &Niu, X , " A new meaningful secret sharing scheme based on random grids, error diffusion and chaotic encryption ", Optics & Laser Technology, 54, 389–400. doi:10.1016/j. optlastec.2013.04.018,2013

[12] Hou, Y. C, "Visual cryptography for color images. Pattern Recognition, 36(7), 1619–1629. doi:10.1016/S0031-3203(02)00258-3,2003

[13] Ming Wang, Bo Cheng , and Chau Yuen, " Joint Coding-Transmission Optimization for a Video

[14] Surveillance System With Multiple Cameras",IEEE Transactions on multimedia, Vol. 20, No. 3, March 2018

[15] Venkata Krishna PavanKalubandi, HemanthVaddi, Vishnu Ramineni, AgilandeeswariLoganathan, "A Novel Image Encryption Algorithm using AES and Visual Cryptography ",IEEE 2nd International Conference on Next Generation Computing Technologies, 2016

[16] P.Geetha, Dr.V.S.Jayanthi, Dr. A.N. Jayanthi, "Optimal Visual Cryptographic Scheme with multiple share creation for

[17] Multimedia Applications", Computers & Security, Volume 78, 2018, Pages 301-320

[18] Ram Gopal Sharma, PritiDimri&HitendraGarg, "Visual cryptographic techniques for secret image sharing: a review", Information Security journal : A global perspective, https://doi.org/10.1080/19393555.2019.1567872,2019.

[19] JiaxiGu , Jiliang Wang, Zhiwen Yu , KeleShen, "Traffic-Based Side-Channel Attack in Video Streaming", IEEE/ACM Transactions on Networking,2018

[20] RinaldiMunir, Harlili, " Video Encryption by Using Visual Cryptography Based on Wang's Scheme", 4th International Conference on Electrical, Electronics and System Engineering,ICEESE,2018

[21] Nikhil C. Mhala, Rashid Jamal, Alwyn R. Pais, "Randomised visual secret sharing scheme for grey-scale and colour images", IET Image Processing, 2018

[22] Hussain M.J. Almohri, Layne T. Watson, Danfeng (Daphne) Yao, Xinming, "Security Optimization of Dynamic Networks with Probabilistic Graph Modeling and Linear Programming", IEEE Transactions on Dependable and Secure Computing, 2015

[23] RajatBhatnagar, Manoj Kumar," Visual Cryptography: A Literature Survey ", IEEE 2nd International conference on Electronics, Communication and Aerospace Technology ICECA,2018

[24] Xiaochun Cao, Na Liu, Ling Du, Chao Li, "Preserving privacy for video surveillance for visual cryptography", 978-1-4799-5403-2/14/$31.00 IEEE 2014

[25] Santos Merino Del Pozo, Francois-Xavier Standaert, Dina Kamel, Amir Moradi, "Side-Channel Attacks from Static Power:When Should we Care?", Automation & Test in Europe Conference & Exhibition (DATE),2015

[26] Pei-Ling Chiu and Kai-Hui Lee, "A Simulated Annealing Algorithm for General Threshold Visual Cryptography Schemes", IEEE Transactions on Information Forensics and Security, Vol. 6, No. 3,2011

[27] Pei-Ling Chiu, Kai-Hui Lee, "Optimization Based Adaptive Tagged Visual Cryptography", GECCO'18, July 15-19, 2018,

[28] Roberto De Prisco, Alfredo De Santis, "Color visual cryptography schemes for black and white secret images", Theoretical Computer Science ,2013

[29] Ran Dubinz, AmitDvir, OfirPeley, OferHadarz, "I Know What You Saw Last Minute -Encrypted HTTP Adaptive Video Streaming Title Classification, IEEE Transactions on Information Forensics and Security,2017

[30] AbulHasnat, Dibyendu Barman, Satyendra Nath Mandal , "A Novel Image Encryption Algorithm Using Pixel

[31] Shuffling and Pixel Intensity Reversal",IEEE International Conference on Emerging Technological Trends 2016

[32] Naoki Kita, Kazunori Miyata, "Magic sheets: Visual cryptography with common shares", Computational Visual Media Vol. 4, No. 2, 2018, 185–195

[33] AlIaLevina, DariaSleptsova, Oleg Zaitsev, "Side-Channel Attacks and Machine Learning Approach " 18TH Conference Of Fruct Association,2016

[34] KirtiDhiman, Singara Singh Kasana, "Extended visual cryptography techniques for true color images " , Computers and Electrical Engineering, https://doi.org/10.1016/j.compeleceng.2017.09.017,2017

[35] Young-Chang Hou, "Visual cryptography for color images", Pattern Recognition 36 , 1619 – 1629, 2002

[36] Imon Mukherjee, RitamGanguly, "Multiple video clips preservation using folded back audio-visual cryptography scheme", Springer Science+Business Media New York 2017

[37] Xiaokuan Zhang, Jihun Hamm, Michael K. Reitery, Yinqian Zhang, "Statistical Privacy for Streaming Traffic", Network and Distributed Systems Security (NDSS) Symposium, https://dx.doi.org/10.14722/ndss.2019.23210, 2019

[38] Ching-Sheng Hsu, Shu-Fen Tu, and Young-Chang Hou, "An Optimization Model for Visual Cryptography Schemes with Unexpanded Shares" Springer-Verlag Berlin Heidelberg,2006

[39] Allan Pintoa, William Robson Schwartzb, HelioPedrinia, and Anderson Rocha, "Using Visual Rhythms for Detecting

[40] Video-based Facial Spoof Attacks", IEEE Transactions on Information Forensics And Security, 2015

[41] P. Punithavathi , S. Geetha Visual cryptography: A brief survey, Information Security Journal : A Global Perspective, 26:6, 305-317, DOI:10.1080/19393555.2017.1386249,2017

[42] Ming Tang, MaixingLuo, Junfeng Zhou, Zhen Yang, ZhipengGuo, Fei Yan, Liang Liu, Side-Channel Attacks in a

Real Scenario", Tsinghua Science and Technology, 2018, 23(5): 586–598
[43] Raphael Spreitzer, VeelashaMoonsamy, Thomas Korak, Stefan Mangard, "Systematic Classification of Side-Channel Attacks: A Case Study for Mobile Devices, IEEE Communications Surveys and Tutorials,2017
[44] Shuo Chen, Rui Wang, XiaoFeng Wang, Kehuan Zhang, "Side-Channel Leaks in Web Applications: a Reality Today, a Challenge Tomorrow", IEEE Symposium on Security and Privacy,2010
[45] Bin Yan, Yong Xiang, GuangHua," Improving the Visual Quality of Size-Invariant Visual Cryptography for Grayscale Images: An Analysis-by-Synthesis (AbS) Approach, IEEE Transactions on Image Processing,2019
[46] Ching-NungYang,Dao-Shun Wang," Property Analysis of XOR-Based Visual Cryptography", IEEE Transactions On Circuits And System For Video Technology, VOL. 24, NO. 2,2014
[47] ZHAO Dongmeia,b, LIU Jinxing, "Study on Network Security Situation Awareness based on Particle Swarm Optimization Algorithm", Computers & Industrial Engineering , doi: https://doi.org/10.1016/j.cie., 2018
[48] Ross, A., & Othman A , " Visual cryptography for biometric privacy. IEEE Transactions on Information Forensics and Security, 2011
[49] Chettri L, GurungS,"Recursive information hiding in threshold visual cryptography scheme" International Journal of Emerging Technology and Advanced Engineering, 3(5):536–540, 2013
[50] Liu F, Wu C , " Embedded extended visual cryptography schemes", IEEE Transactions on Information Forensics and Security , 2011
[51] Lin SJ, Chung WH ,"A probabilistic model of (t,n) visual cryptography scheme with dynamic group." IEEE Transactions on Information Forensics and Security, doi: 10.1109/TIFS.2011.2167229,2012
[52] R. Gayathri, Dr. V. Nagarajan "Secure data hiding using Steganographic technique with Visual Cryptography and Watermarking Scheme",IEEE ICCSP conference2015
[53] Z. Zhou, G. R. Arce, and G. Di Crescenzo, "Halftone visual cryptography," IEEE Trans. Image Process., Aug. 2006.
[54] Wang, D. S, Zhang, L., Ma, N., et al. "Two secret sharing schemes based on Boolean operations", Pattern Recognition, 2007
[55] Yuanfeng Liu, Zhongmin "Halftone Visual Cryptography with Color Shares", IEEE International Conference on Granular Computing (GrC), 2012
[56] Liu, F., Wu, C. K., Lin, X, "Some extensions on threshold visual cryptography schemes". The Computer Journal,
[57] Wang D. S, Yi, F, "On converting secret sharing scheme to visual secret sharing scheme ", EURASIP Journal on
[58] F. Liu and C. Wu,"Embedded extended visual cryptography schemes", IEEE Transactions on Information. Forensics Security, 2011.
[59] K.-H. Lee, P.-L. Chiu, "Sharing visual secrets in single image random dot stereograms," IEEE Transactions on Image Processing, 2014.
[60] W. Ran-Zan, H. Shuo-Fang, "Tagged visual cryptography," Signal Processing Letters, IEEE, 2011
[61] M. Iwamoto, "A Weak Security Notion for Visual Secret Sharing Schemes",IEEE Transactions on Information Forensics and Security, 2012
[62] Munir, R, "Comparison of Secret Color Image Sharing Based on XOR Operation in RGB and YCbCr Color Space", Proceeding of ICEEI, 2017
[63] KulvinderKaur , VineetaKhemchandani, "Securing Visual Cryptographic Shares using Public Key Encryption", Advance Computing Conference, Feb, 2013
[64] D.Wang, L. Dong, X. Li, "Towards Shift Tolerant Visual Secret Sharing Schemes", IEEE Transactions on Information Forensics and Security , 2011
[65] H. Abdolrahimpour, E. Shahab, "A Short Survey of Visual Cryptography and Secret Image Sharing Techniques and Applications", International Advanced Research Journal in Science, Engineering and Technology, 2017
[66] Shivani, S.: 'Vmvc: verifiable multi-tone visual cryptography', Multimedia Tools Appl., 2017, https://link.springer.com/article/10.1007/s11042-017-4422-6
[67] B. Shrivas, S. Yadav, "Visual Cryptography in the Video using Halftone Technique", International Journal of Computer Applications, 2015
[68] X.Wang, "Intelligent multi-camera video surveillance: A review," Pattern Recognition, Jan. 2013.
[69] D. S. Wang, L. Zhang, N. Ma, and X. Li, "Two secret sharing schemes based on Boolean operations," Pattern Recognition, 2007.
[70] Yan, X., Wang, S., &Niu, X, "Threshold construction from specific cases in visual cryptography without the pixel expansion", Signal Processing, doi: 10.1016/j.
[71] sigpro.2014.06.011
[72] Sridhar, S, Sathishkumar R, Sudha, "Adaptive halftoned visual cryptography with improved quality and security", Multimedia Tools Appl.,2017
[73] Hou, Y. C., Wei, S. C., Lin, C. Y, "Random-grid based visual cryptography schemes. IEEE Transactions on Circuits and Systems for Video Technology", 2014
[74] doi:10.1109/TCSVT.2013.2280097
[75] M. Ulutas, G. Ulutas and V. Nabiyev, "Medical image security and EPR hiding using Shamir's secret sharing scheme", The Journal of Systems and Software, 2011
[76] Weir, J.,Yan, W, "A comprehensive study of visua cryptography. In Transactions on data hiding and multimedia security ",Berlin, Heidelberg: Springer, 2010
[77] Yan, X., Wang, S., El-Latif A, Niu, X.,"Random grids-based visual secret sharing with improved visual quality via error diffusion", Multimedia Tools and Applications,2015.doi:10.1007/s11042-014-2080-5
[78] Roberto De Prisco, Alfred De Santis, "Color visual cryptography schemes for black and white secret images", Theoretical Computer Science , 2013

★★★

REBUILDING THE EMOTIONAL CAPITAL OF ADOLESCENT REFUGEES AND MIGRANTS AN EDUCATIONAL FRAMEWORK BASED ON MENTAL HEALTH, FOR REALIZING ADOLESCENT INCLUSION AND RIGHT TO EDUCATION AND HUMAN RIGHTS IN EDUCATION

BENEDICTE GENDRON

Prof. Dr.University Montpellier III-LIRDEF, France
E-mail: [1]Benedicte.gendron@univ-montp3.fr

Abstract - On both the Eastern and Central Mediterranean routes many adolescents have left their countries of origin due to violence, deprivation and conflict, and most did not initially aim to travel to Europe. However, among those who eventually did undertake the journey to Europe, education was a key factor shaping their decision. Education is also a key element for refugee and migrant young people's social inclusion into host communities. Nevertheless, number of international research on migration outlines the prevalence of psychopathology, and particularly post-traumatic stress symptoms, among young and adolescents refugees. Nevertheless, certain risk and protective factors appear to exist that temper or exacerbate poor psychological health. These include family cohesion, individual dispositional factors such as adaptability, self-confidence and positive self-esteem, but also environmental factors such as peer, community and emotional supports. In this paper, using a framework employing a lens of transformative agency and the emotional capital (Gendron, 2004),development programthrough the Bienvivance paradigm (Gendron, 2016) and its approachesthe research shows that young people who faced trauma can overcome those turbulences byrebuilding their emotional capitalas the EKD program is focused on their "potentials", their assets instead of their lack, or pains. The Bienvivance paradigm applied in education, is looking at what "we have" and what "we are" is exploring and recognizing the potential of everyone. It focused at creating opportunities and enabling environments to boost everyone's potential to find their own fulfilled way of living by developing or rebuilding their Emotional Capital. The special educational program Emotional Capital Development–EKD- aims at rebuilding people self-confidence and esteem, self and others' acceptance, others differences… Its feeds their Bienvivance to empower them to overcome their trauma focus on their «potentials » instead of their lack or former life and trauma, helping them at reinventing themself their life with a positive creative and rebuilding perspectives. The paper will be focus on this new promising and holist paradigm, looking at Bienvivance as an Human Right.

Keywords - Emotional capital, Bienvivance, Human Right, Refugees, Migrants

I. INTRODUCTION

On both the Eastern and Central Mediterranean routes many adolescents have left their countries of origin due to violence, deprivation and conflict, and most did not initially aim to travel to Europe. However, among those who eventually did undertake the journey to Europe, education was a key factor shaping their decision. Education is also a key element for refugee and migrant young people's social inclusion into host communities. Nevetheless, number of international research on migration outlines the prevalence of psychopathology, and particularly post-traumatic stress symptoms, among young and adolescents refugees. Nevertheless, certain risk and protective factors appear to exist that temper or exacerbate poor psychological health. These include family cohesion, individual dispositional factors such as adaptability, temperament and positive self-esteem, but also environmental factors such as peer, community and emotional supports. In this paper, using a framework employing a lens of transformative agency and the emotional capital (Gendron, 2004) development program through the Bienvivance approach (Gendron, 2016), the research shows that adolescents who faced trauma can rebuild their emotional capital. Through a special educational program « Emotional Capital Development–EKD- focus at rebuilding their emotional capital, they recover their self-confidence and esteem, acceptance of Others differences….. Its feeds their Bienvivance to empower them to overcome their trauma,focused on their «potentials » instead of their lacks or former lifes and trauma, helping them at reinventing themself their life with a positive creative and rebuilding perspectives.The paper will be focus on this new promising and holist paradigm, looking at Bienvivance as an Human Right.

II. BIENVIVANCE PARADIGM AND APPROACH AND EMOTIONAL CAPITAL CONCEPT

Innovative and Emerging Paradigm of Bienvivanceand its Approaches

I suggest we abandon the distinction between conventional and alternative education and adopt a comprehensive new psycho-socio-economics human and societal development paradigm, the bienvivance, for modelling changes in human fulfillment. Rooted in humanistic, existential, and phenomenological approaches and positive psychology, I defined Bienvivance as "the vitality of life, its intensity and dynamics: I live well -present state- and I am going well -the right direction-(…). It is a state of mind that refers to the ability of a person, an organization, a society, an entity of various natures, to live, flourish, grow and evolve with vitality, possible in the situation of misery, disease, disability, handicap, scarcity, oppression… (Gendron, 2016) This paradigm and the concept of «bienvivance » I

develop,get inspired by the individual approach of the neuropsychiatric research on consciousness of the Columbian PrCayedo[1] using theterm "vivencia" to improve the quality of lifeof his patients suffering from burnout and depression because ofthe era world of work in the 70s dominated by productivity predominance, mass consumption, money…destroying traditional societal' values. Beyond patient's pathological state of consciousness, for Cayedo, the patient is a human being who have resources and "Instead of only taking care of what is wrong with the human being, let's take care of what's goes well! ".

As the burnout or trauma of patients, people as young people facing trauma, problems or difficulties, they are also 'first' individuals who can learn to "Be". Starting from an individual perspective, I named the paradigm Bienvivance as people by revealing their consciousness, accepting and recognizing their potentials and valuing and valorizing their assets can rebuild or reinforce their emotional capital to allow their bienvivance. Indeed, as emotional competencies help individuals (Goleman and Cherniss, 2001) perform better socially, economically and personally, I regarded as capital, an Emotional Capital (Gendron, 2004). Thus, it is "the set of social and personal emotional competencies, inherent to the person, useful for personal, professional, organizational and societal developments, participates to social cohesion and has personal, economic and social returns" (Gendron, 2004:2008).Those transversal competencies are cruciallife skills for bienvivance.

"Bienvivance defers from the well-being approach" as it's not a state neither an objective to reach. World Heath Organization defines « wellbeing as a state of complete physical, mental and social well- being and not merely the absence of disease or infirmity ». What it means when illness, handicap, jobless, lockdown situations occurs? How many people have reached a particular factor of WHO well-being indicator, how stable this achievement? If material well-being, health, longevity, literacy, and education are undoubtedly factors for creating opportunities and abilities to objective well-being, however, this objective reached today it's not guarantee for life, and does not secure prosperity for future generations. An excessive obsession with the creation of material wealth can obscure the ultimate objective of enriching human lives".

The bienvivance approach suggests to embrace this positive perspective focus on the vitality of one's life. As a state of mind inducing a way and an art of living, bienvivance manifests itself through various vital experiences, variations, ups and downs throughout existence with structuring impacts: meetings, ruptures structuring or soothing constitutive of the quality of the time lived. Possible in destitution, illness, scarcity, oppression, handicaps ..., it refers to a state of mind, a balanced posture, a mode of operation and evaluation in alignment with our values (V), our expectations (Expectations) and the field of possibilities (Enabling Environments) that we schematized for all areas of life (couple, family, elderly, politics in Gendron's VEE-Model of Bienvivance, 2016 p. 192).

Inspired from research on psychological illness, by metaphorical transposition, bienvivance calls us to better understand and act to keep the vitality of our life, and in this call for a humble step, step by step. And the awareness and mindfulness stage are necessary to participate in the bienvivance stage (Gendron, 2016). Change must take place and begin humbly at our level; what Plato gave us as a message "know thyself".

In this, bienvivance nourishes our reflection to propose it as a new paradigm approaching education, organizations, and societies. It differs from that the wellbeing or happiness approaches. It is not a question of living at 100 km per hour but of fully living 100% of what one "has", such as enabling teachers or leaders (Gendron, 2016) look at their learners' potential or collaborators and not so much on their lacks. It is to start from what we have and what we are and to value it in order to be fulfilled; for enabling teachers or leaders, it means looking at the learner's strengths, potentials, assets and boosting them and supporting them in their development, instead of traditionally focusing on their shortcomings, lacks and its objective of filling or compensating their gaps (Gendron, 2017). Bienvivance unlike happiness and well-being is not a quest or a goal. It differs from happiness and its individual hedonic approach, and well-being as a state of mental, physical and social balance in the common sense of "good" health, wealth and comfort. Bienvivance as a state of mind, inducing a way and art of living, manifests itself through various vital experiences, variations, ups and downs throughout existence with structuring impacts: meetings, ruptures ... structuring or soothing (failure, event bringing about a rebirth, reconciliation, reunification… constitutive of the quality of the time lived, the kairos ("before and after my cancer…" after the birth of my 1st child…). Possible in destitution, illness, scarcity, oppression, lockdown ..., it refers to a state of mind, a balanced posture, a mode of operation and evaluation in alignment with our values (V), our expectations (Expectations) and the field of possibilities (Enabling Environments) that can be schematized (see Figure 1

[1]Pr. Cayedo, neuropsychiatrist used the term "vivencia" for his study of consciousness which tries to improve the quality of life of patients suffering from burnout and depression linked to destructuring traditional values occuring in the 1970s in the era of productivity predominance, mass consumption, money, and a world of work. Beyond his pathological state of consciousness, the patient is a human being who possesses resources, values . Prof. Caycedo will gradually orient his methodology towards the preventive, social and educational world: "Instead of only taking care of what is wrong with the human being, let's take care of what's goes well! ". The patient is an individual who learns to Be by revealing his consciousness.

) for all areas of life (below in the illustration, applied to the field of work).The Bienvivance Model can be applied to different spheres (couple, family, migrants, refugees, elderly, politics …).

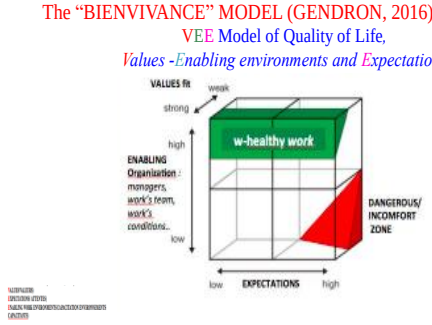


Figure 1

Bienvivance is part of a paradigm of eudemonic economics and positive psychology: to live fully from what we are and what we have. If the term associates "well", "life" and the suffix "ance", the concept indicates the result of an action, which is the attention paid to the phenomena which emerge from our consciousness, what is experienced within us in the purity of emotion even before moving on to an explanation. The adjective "well" gives the term "vivance" an additional force reinforcing its power as a social 'p-act' which commits to working for a better world, where people are at the heart of this new societal model.

This commitment involves, among other things, full presence and awareness, the practice of which leads to psychological flexibility. "Knowing yourself is the beginning of all wisdom" said Aristotle. It is by getting to know ourselves as Plato already advised us, and by accepting to love ourselves, that we will be able to love others. If we manage to tame this ego according to the philosopher and Buddhist monk, Ricard (2013), then "altruism will emerge as the solution to give meaning to our lives and cure contemporary ills. ". In life, as at work, we all seek a quality of life that satisfies us and are all in search of meaning (meaning, values and direction): bienvivance. Like the Little Prince and his rose who learns, through his initiatory journey, that to be happy, you have to learn to look with the heart, and learn to know how to appreciate and protect your rose. Bienvivance can be learned. And education is not so much a preparation for life, it is above all, learning our way and an art of living which allow sustainable development (one's own, that of Others and what surrounds it); there will be no change of society without a change of men and women, and that requires Education.

Contemplative and Collaborative education

To develop EK's young people and their agency and empowerment, requires to "Do thine own work, and know thyself" as Plato. This introspection and reflexive skills can be developed through contemplative education as mindfulness practices. Contemplative education is a "set of pedagogical practices designed to cultivate the potentials of mindful awareness and volition in an ethical-relational context in which the values of personal growth, learning, moral living and caring for others are also nurtured" (Roeser and Peck, 2009, p.127). As a holistic and experiential approach, it explores the mind, and the heart enlarging perspectives, leading to lasting solutions to cope with problems confronted. It develops social and emotional competencies that increases focus and metacognition, improve attention, cognitive flexibility (Moore, 2009), reduce stress and anxiety (Shapiro et al., 1998) and support student attention, emotional balance, empathetic connection, compassion, and altruism (Zajonc, 2013) supporting self-awareness development required for ethical and empathic engagement in the world. To get exposed to Other's differences to develop students' social emotional competencies, collaborative learning will enable learners agency and empowerment, as teachers recognize learners' individuality and grasp formal and unformal learning environments (peers, families, communities..) as opportunities to influence students learningin a co-agency learning. As interactive, mutually supportive relationships, it helps learners to progress towards their valued goals and together explore significant questions and create meaningful projects.

III. EMOTIONAL CAPITAL DEVELOPMENT PROGRAM: PROTOCOL AND METHODOLOGIES

Objectives, targets, goals of the Bienvivance and EKD program

The development of young people emotional capital aims at learning about themselves, and others, to be able to regulate their own emotions and to help others' emotional regulations. Combined with a positive education perspective, some exercises works at training their mind to assess situations in a positive way: metaphor of "half-full/ half empty glass" for a positive outlook/vision (positive psychology), to be aware of difficult psychological situations or events in exercises that include thoughts. Instead to avoid or seeking at controlling painful emotions, the Acceptance and Commitment Training-ACT' aims at training the young people to (re-)gain flexibility in the presence of some painful events, their trauma, their emotions by « accepting » them.

Target groups and Data

The EKD program is a 24 hours educational program based on enabling and collaborative pedagogy and mindful practices. Run since 8 years in the South of France, funded by a national research grant (ANR-IDEFI-UM3D- "Emotional Capital, Success and Well-being"), the program is addressed to young

people (in total 450 persons).The Emotional Capital Development Program-EKDP addressed to 450 young people, with promising positive outcomes has been honored of two national prize.

Emotional Capital Development Program and Protocol of intervention

The Emotional Capital Development Program – EKDP is based on 2 tools: a collaborative project management methodology training and Acceptance and Commitment Training -ACT'-derived from Mindfulness program. The training with both tools is about 12 hours of intervention. The training methodology is organized around interactive workshops of 3 x 2 sessions of 4hours (2x12hours) per groups

Methodology of data collection and measurement

Based on quasi-experimental protocol, the quantitative data were collected from tests passedtwo times measures: prior to EKDP at the first session, and at the end of the EKDP sessions. Several psychological tests were used: Profile of Emotional Competence (Brasseur &Mikolajczak, 2013), Psychological health and flexibility tests: General Anxiety Disorder (Spitzer et al., 2006), Patient Health Questionnaire (Kroenke & Spitzer), 2003Psychological stress measure (Lemyre&Lalande, 2009) Five Facet Mindfulness Questionnaire (Baer et al.,2008), the Multidimensional Experiential Avoidance Questionnaire (Gamez et al., 2014) and Academicengagement Academic engagement scale (Brault-Labée et Dubé,2008)

To collect the qualitative data, the participants were provided with a personal diary to report daily their emotional experience and regulation following the ACT' protocol and a collective learning journal as a story board following the PIA2 protocol. Those diaries and journal were given to the participants during the first session and had to be completed daily until the end of the training and during their groups work meetings. Participants ofcontrol groups (not being exposed to training) completed also the tests measures as Exp. groups.Participants daily reports were used to capture students 'perception regarding their emotional competence-based learning training progress regarding their interaction with their peers groupand classmates: Personal Story board of Mindful Exercised; Students' Collaborative andPersonal feedback in learning journal; Peers and educators perception interviews andnarrative feed-back on EKDP perceived impact in general, and for the 2 tools.

To analyze the data, we follow the methodologies of data analysis as usual: to explore the date distribution, the Exploratory Data Analysis –EDA and test the homogeneity via Independent t-tests for students' homogeneity. A Mixedmodel group (EXP groups vs. Control group) in time 1- pre, time 2- post) and repeated measures ANOVAs on each measure, with group as between-subject factor and time as within subject factor were conducted. In each case, we looked for a group time interaction, which could indicate a differential change for the group from period 1 and 2 (INTRA-group analysis) and then, between group (INTER-group analysis). ANOVA statistical treatment and regression analysis using a proper experimental design and a theoretically grounded training program was used to investigate whether EK has been rebuilt among young people. The qualitative data were analyzed through lemmas and frequencies textual data analysis.

IV. CONCLUSION: OUTCOMES AND TRANSFER TO OTHER TARGETS' GROUPS

The Bienvivance paradigm and approaches, rebuilding people Emotional Capital, demonstrated enthusiastic and promising positive outcomes regarding first the psychological issues (the experimental group tests scores after the training e,g, compared with the control group, showed that they significatively reduced their negative process of evaluation of life events for a more positive one, helping them at reducing their anxiety).

Second, the Bienvivance approaches supports and helps at recovering creativity, freedom and empowerment which helps to realize equity and social justice embedded in Human Rights. The Bienvivance paradigm used several educational approaches: collaborative education and contemplative or meditative practices.

Third, part of eudemonic economics and positive psychology, living fully from what we are and what we have, the trainees, learners and teachers' bienvivance focus as school bienvivance go together. As a dynamic process of exploration of consciousness, as an art of being alive and living fully our life, Bienvivance is a path of entities evolution, issued from a reflexive,meditative and spiritual practice which consists in discovering and realizing the essential aspect of human being. Realizing ourselves, our true nature, magnificence, it is to live this essence in order to blossom, flourish and fulfill our existence according our capacities and potentials, in an inner and outer harmony and peace.

Based on research outcomes about educational collaboration (Biswas, 2014), contemplative education via meditation practices (Orr, 2002), developing emotional capital using collaborative and enabling pedagogy increase people consciousness of their possibilities and their self-confidence to valorize their potential which empower them and develop their agency, as developing their acceptance of others' differences. Gathering diversity and inclusion it provides a process by which excellence and equity at educational centers as school as at the workplace can be achieved. The adolescents migrants and refugees are a specific public at the interface of labor

market ; focus on people «potentials », rebuilding their emotional capital, overcoming their trauma to reinvent themself their life with a positive creative perspective, the methodology is transferable to other targets groups with vulnerabilities; as an Educational framework based on mental health, for realizing adolescents' migrants and refugees inclusion and right to education Bienvivance can be seen as an Human Right in education to be explored with enthusiastic and promising outcomes and value .

REFERENCES

[1] Biswas, A. E. (2014). "Lessons in citizenship: Using collaboration in the classroom to build
[2] community, foster academic integrity, and model civic responsibility." Journal on Excellence
[3] in College Teaching, 25(1), 9-25
[4] Dewey, J. (1938). Experience and education. New York: Macmillan.
[5] Baer, R.A., Smith, G.T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., et al., (2008)
[6] Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating
[7] samples. Assessment 15, 329–342.
[8] Brasseur S, Grégoire J, Bourdu R &Mikolajczak M. (2013). The Profile of Emotional
[9] Competence (PEC): Development and Validation of a Self-Reported Measure that Fits
[10] Dimensions of Emotional Competence Theory. PLoS ONE 8(5).
[11] Brault-Labbé A. (2006). Engagement psychologique et bien-être personnel : présentationd'un modèle tridimensionnel appliqué à l'univers académique. Thèse de doctorat inédite,Université de Montréal, Montréal, Canada.
[12] Cherniss C. &Goleman D. (eds.) (2001), The Emotionally Intelligent Workplace, SanFrancisco: Jossey-Bass.
[13] Dannenberg S, Grapentin T (2016) Education for sustainable development – learning for
[14] transformation. The example of Germany. J Futur Stud 20(3):7–20
[15] De Munck J. et Zimmermann B. (dir.)(2008), La liberté au prisme des capacités, AmartyaSen au-delà du libéralisme. Raisons Pratiques, n° 18, Ed de l'EHESS, Paris, 2008.
[16] Gámez, W., Chmielewski, M., Kotov, R., Ruggero, C., Suzuki, N., & Watson, D. (2014). TheBrief Experiential Avoidance Questionnaire: Development and initial validation. PsychologicalAssessment, 26, 35-45.
[17] Gendron B. (2004) Why Emotional Capital Matters in Education and in Labour? Toward an
[18] Optimal Use of Human Capital and Knowledge Management, Les Cahiers de la Maison desSciences Economiques, série rouge, 113 (Paris: Université Panthéon-Sorbonne).ftp://mse.univ-paris1.fr/pub/mse/cahiers2004/R04113.pdf.
[19] Gendron B. (2008) Capital émotionnel et éducation, in Van Zanten (dir.), Dictionnaire de
[20] l'éducation, Paris: PUF.
[21] Gendron B. (2015) Mindful management et capital émotionnel, L'humain au coeur d'une
[22] performance et d'une économie bienveillantes. Bruxelles : De Boeck.
[23] Gendron B. (2016), Management des risques psychosociaux dans le secteur du soin et de
[24] l'éducation, Thèse doctorat de Psychologie, Sp. Neurospsychologie, Université Paul-Valéry.
[25] Gendron B. (2017). Emotional Capital: the Set of Emotional Competencies as Professional
[26] and VocationalSkills, .RevistaEspañola de EducaciónComparada, 29, p. 44-61, jun. 2017.
[27] Gendron B. (2018), Capital émotionnel, Pleine Conscience ou Mindfulness et "Bienvivance"
[28] au travail : quel lien pour une entreprise réussie ? conférence de recherche de la chaire
[29] Mindfulness, Bien-être au travail et Paix économique. Grenoble École de Management, 27
[30] février, Grenoble.
[31] Gendron B. (2019), Les compétences transversales : les nouvelles compétences
[32] académiques à l'université, n°218-1, "Quelle reconnaissance des compétences
[33] transversales ?".Revue d'Education Permanente.
[34] Gendron B., Khazaei, M., Holder, M., Sirois F., Gallagher M. (2021 subtmitted), Development
[35] and Assessment of the PersonalEmotional Capital Questionnaire PECQ for Adolescents,
[36] Psychological Assessment Journal, American Psychological Association.
[37] Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). Acceptance and commitment therapy:
[38] An experiential approach to behavior change. Guilford Press.
[39] Kroenke K, Spitzer RL, Williams JB. (2003), The Patient Health Questionnaire-2: Validity of a
[40] two-item depression screener. Med Care;41(11):1284-92
[41] Lemyre L. et Lalande MP (2009), Psychological stress measure (PSM-9): Integration of an
[42] evidence-based approach to assessment, monitoring, and evaluation of stress in physical
[43] therapy practice',Physiotherapy Theory and Practice,25:5,453-462.
[44] Mezirow, J. (1978). Perspective Transformation. Adult Education. 28, 100-110.
[45] Moore, A. (2009). Meditation, mindfulness and cognitive flexibility. Consciousness and
[46] Cognition, 18(1), 176–186.
[47] OECD (2018), The Future of Education and Skills: Education 2030.
[48] Orr, D. (2002). The Uses of Mindfulness in Anti-Oppressive Pedagogies: Philosophy and
[49] Praxis. Canadian Journal of Education / Revue Canadienne De L'éducation, 27(4), 477-497.
[50] Roeser, W. R., Peck, S. (2009). An education in awareness: Self, motivation, and selfregulated
[51] learning in contemplative perspective. Educational Psychologist, 44 (2), 119-136.
[52] Sen A. (1985) Commodities and Capabilities. Amsterdam: North-Holland
[53] Shapiro, J., Brown, K., &Astin, J. (2011). Toward the integration of meditation into higher
[54] education: A review of research evidence. Teachers College Record, 113, 493–528.
[55] Spitzer RL, Kroenke K, Williams JB, Löwe B. (2006) A brief measure for assessing
[56] generalized anxiety disorder: the GAD-7. Arch Intern MedMay 22;166(10):1092-7.
[57] Unesco (2017), Education for Sustainable Development Goals : Learning Objectives, Paris :
[58] UN (2015), Ensure inclusive and equitable quality education and promote lifelong learning
[59] opportunitie for all. United Nations Press.
[60] Zajonc, A. (2013). Contemplative pedagogy: A quiet revolution in higher education. New
[61] Directions for Teaching and Learning, 134, 83–94.

★★★

BRAND PERSONALITY AND MARKETING COMMUNICATION STRATEGIES FOR PROMOTING BRANDS OF VNU-HCM MEMBER UNIVERSITIES

NGUYEN THI BICH NGOAN

PhD**,** University of Economics and Law
E-mail: ngoanntb@uel.edu.vn

Abstract –
Purpose: Massification in education has triggered the establishment of many higher education institutions (HEIs) in Vietnam. With assigned quotas of student intakes and new regulations on students' admission and the high number of private universities; therefore competition among universities is increasing. Consequently, HEIs need to stay competitive so that students can be aware of them with a preferred choice. In order words, HEIs have to manage their marketing communication and strengthen their brand personality in order to attract prospective learners. A strong brand personality, conveyed through different media, can increase brand equity and organization performance (Opoku, Fournier, & Rutter et al.,2016). This study aims to identify the strategic of integrated marketing communication (IMC) and its application to build their brand personality at public universities in Vietnam. The further aim is to explore how IMC could play the role in enhancing brand personality of HEIs.
Design/ Methodology/Approach: Using 4 public universities (the members of Vietnam National University) as a sample for multiple cross-case study. First, quantitative content analysis was used to count the frequency of brand personality words used in their prospectuses and PR materials. Second, quantitative survey research was conducted to analyze how IMC could contribute to heightened student selectivity and institutional brand recognition. Third, a qualitative analysis of the answers from in-depth interviews conducted with leaders, marketing employees of these universities was used to explore how the institutions plan and implement ICM in their organizations.
Sample: The research was conducted to seek feedback from both internal and external stakeholders to the effectiveness of IMC and perception of brand personality of 4 institutions by triangulation method. The participants for this study included PR and marketing employees, leaders and students of the participating universities.

Keywords - Brand Personality, Marketing Communication, University Branding

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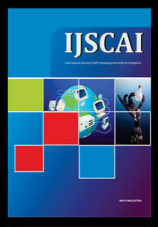

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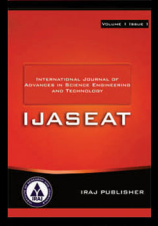

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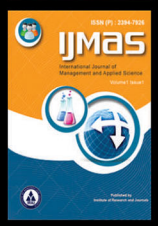

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