

## Modelling the SOFC Power Plant Utilizing a MISO Nonlinear Auto-Regressive Model with eXogenous Input Fuzzy Dynamic Model

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### Abstract

The solid oxide fuel cell (SOFC) is extensively utilized for decentralized and renewable energy production. The primary issue of SOFC is regulating its output voltage, which is attributed to significant nonlinearity, swift load variations, and restricted fuel supply. The SOFC system control aims to sustain the output voltage at a stable level and the fuel utilization rate within a safe range. This work employs a multiple-input multiple-output (MIMO) discrete-time Takagi-Sugeno (TS) fuzzy dynamic model with feedforward input to characterize the dynamic features of the nonlinear voltage and fuel utilization rate in a tubular solid oxide fuel cell (SOFC) system. The acquired fuzzy model will be utilized to implement constrained fuzzy model predictive control. The simulation results demonstrate the precision and efficacy of the proposed technique.

**Keywords:** Solid Oxide Fuel Cell, Nonlinear Systems, NARX Model.

**2020 Mathematics Subject Classification Numbers:** 93-10, 37N35.

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## CERTIFICATE OF PARTICIPATION

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