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Mathematical Modeling and an Adaptive PID Control of Quadrotor

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Abstract: The objective of this paper is to develop an adaptive proportional-integral-derivative control for a nonlinear quadrotor system. we start by modeling of this system with state space and presenting the idea of this adaptive control. We presented the theory of the type 2 fuzzy logic, in order to use in the adaptation of the gains parameters of the PID control. The adaptive PID (T2FAPID) technique are applied to the unmanned aerial vehicle (UAV) system, their performance results are compared to a designed non adaptive PID controller. The effectiveness of the suggested adaptive methods is demonstrated in simulations with a quaternion-based nonlinear dynamic model of a quadrotor derived in this work. The results of the study prove the higher performance of the T2FAPID technique in regulating the attitude stabilization of the quadrotor.

Keywords: Interval type 2 fuzzy logic technique, Adaptive PID control, PID control, state space system, quadrotor.

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