Abstract

The tri-rotors are more recent kinds of drones, as compared with the mostly used quad-rotors because of the numerous special characteristics over the other types of multi-copters. Many technical features specialize tri-copters like small volume that is useful in slender places, light weight, extended battery existence, and agility in translation and turns. In this paper, (single tri-rotor) design is theorized and the nonlinear mathematical model is derived completely by Newton-Euler formula then the Proportional-Integral and Derivative (PID) controller is utilized to control the rotational and translational equations, six PID controllers are used for six Degrees of Freedom (DOF) equations of the model with the associated parameters are tuned by Particle Swarm Optimization (PSO) method to minimize the whole Integral Time Absolute Errors for the tri-rotor model and the effects are gained by Simulink in MATLAB. The results were satisfactory with the stability of the system and with little delay.
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**Index Terms**

Computer Science  
Data Structures

**Keywords**

Tri-rotor, Particle Swarm Optimization algorithm, Integral Time Absolute Error, Proportional-Integral-Derivative control, Cost Function
