Dynamic Modeling and Minimum-Energy Trajectory Planning for the Mechatronic Elevator System

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ABSTRACT: The mechatronic elevator system driven by a permanent magnet synchronous motor (PMSM) is modeled by both the mechanical and electrical equations. The dimensionless forms are also derived for the purpose of practicable upward and downward movements. In this paper, the high-degree normalized polynomial trajectory (NPT) is designed by the particle swarm optimization (PSO) and self-learning particle swarm optimization (SLPSO) methods to search for its coefficients by minimizing the input absolute electrical energy (IAEE). It is found that the nineteen-degree (19-D) NPT by the SLPSO has the minimum IAEE for the mechatronic elevator system.

Keywords: Mechatronic elevator system, Minimum-energy Trajectory Planning, Particle swarm optimization (PSO), Polynomial trajectory design.