Robust PID Controller Design Using Particle Swarm Optimization

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Abstract

This paper proposes a novel method to synthesize robust proportional-integral-derivative (PID) controllers using particle swarm optimization (PSO). Robust control is well known for its ability in dealing with system uncertainties and disturbances. Standard robust control design, however, can result in controllers that are high-order and complicated and can be difficult to implement in practical applications. PID controllers are advantageous because of their simple structures and wide acceptance in engineering practice, but they lack profound theorems in dealing with system uncertainties and disturbances. Therefore, combining the advantages of these two control algorithms, robust PID-structure controllers are proposed to optimize system performance using PSO. Finally, an example is used to illustrate the design procedures. Simulation results show the proposed method to be effective.