

SC42050 Literature Assignment

Particle Swarm Optimization for PID Controller Design

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Description

In (Gaing, 2004), the author describes an application of the Particle Swarm Optimization (PSO) algorithm to the tuning of a PID controller. For this assignment, the focus is on the comparison of PSO with Genetic Algorithms and their practical applicability.

Questions

1. Write down in a concise and ordered manner the steps in the PSO algorithm. Clearly explain the variables involved. Remember that visualizing some of the steps may be a useful way of understanding them yourself and explaining it to others.
2. The tuning of the PID parameters is treated as an optimization problem. Briefly discuss some other optimization algorithms that could have been used instead. What would be the benefit of using PSO over these methods?
3. In the paper, PSO is compared to a Genetic Algorithm (GA). Describe the steps in a GA, explain the variables involved, and indicate the similarities and differences with PSO.
4. Explain the procedure of finding the optimal PID parameters using PSO and GA. Is PSO superior to AG? In what ways? What could be a reason for this?
5. Find other applications of PSO in the literature. In what way is PSO found to be superior to other methods?

References

Gaing, Z.-L. (2004). A particle swarm optimization approach for optimum design of PID controller in AVR system. *IEEE Transactions on Energy Conversion*, 19(2):384–391.