Tuning FLCs

Bouallègue et al. (2012) use PSO to tune fuzzy logic controllers.

Questions

1. Explain the principle of FLCs. Where have these been used? Give at least two realistic examples and explain the advantages and shortcomings of these controllers. Why is optimization needed?

2. Implement the standard PSO algorithm and use it to tune a PID-type FLC for a second order system (e.g., a spring-mass-damper system). Compare the results with those obtained by using a classic PID-tuning procedure. Comment on the results.

References

Bouallègue, S., Haggège, J., Ayadi, M., and Benrejeb, M. (2012). Pid-type fuzzy logic controller tuning based on particle swarm optimization. *Engineering Applications of Artificial Intelligence*, 25:484–493.