

Modern Heuristics Review for PID Control

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Abstract: A set of modern heuristic techniques is reviewed in the context of PID control structures optimization. The selected techniques are: simulated annealing, genetic algorithm, population based incremental learning algorithm, particle swarm optimization algorithm and the differential evolution algorithm. An introduction to each algorithm is provided followed by an illustrative example based in a simulation assignment of an evolutionary algorithms course. Some conclusions are presented about the effectiveness of the reviewed heuristics based on the simulation results.

References

- [1] Åström, K. J. and Hägglund, T. (1995). PID Controllers: Theory, Design and Tuning, Instrument Society of America, Research Triangle Park, 2nd edition.
- [2] Åström, K. J. and Hägglund, T. (2000a). The Future of PID Control, IFAC Work. on Digital Control: Past, present and future, Spain, Terrassa, pp. 19-30.
- [3] Baluja, S., (1994). Population Based Incremental Learning: A Method for Integrating Genetic search Based Function Optimization and Competitive Learning, Technical report CMU-CS-95-163, School of Computer Science, Carnegie Mellon University, USA.
- [4] Ender D. B. (1993). Process Control Performance: not as Good as you Think, Control Engineering, September, pp. 180-190.
- [5] Goldberg E D, (1989). Genetic Algorithms in Search, Optimization and Machine Learning, Adison Wesley P.C.
- [6] Greene J. R., (1997). A Role for Simple, Robust 'Black-Box' Optimisers in the Evolution of Engineering Systems and Artefacts., Second IEE Conference on GAs in Eng. Systems: Innovations and Applications (GALESIA'97), No. 446, pp. 427-432 , September, Sheffield, UK.
- [7] Holland J. H., (1975). Adaptation in Natural and Artificial Systems, 1st MIT Press ed.
- [8] Kennedy J. and Eberhart R.C. (1995). Particle swarm optimization. Proc. IEEE Int. Conf. on Neural Networks, Perth, Australia, pp. 1942-1948.
- [9] Metropolis, N., Rosenbluth A. W., Rosenbluth M. N., Teller A. H. and Teller, E., (1953), Equation of state calculation by fast computing machines., J. of Chem. Phys., 21, pp. 1087-1091.