IUPUI
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
SCHOOL OF ENGINEERING AND TECHNOLOGY
A Purdue University School
Indianapolis

Electrical and Computer Engineering
Research Seminar

Analysis and Applications of Particle Swarm Optimizer

Date/Time: Thursday, January 17, 2007, Noon-1:00pm
Place: SL 165 (723 West Michigan Street)
Speaker: Dr. Feng Pan, Visiting Research Scholar, IUPUI

ABSTRACT

Evolutionary computation, an important the computational intelligence method, is a kind of self-organization and self-adaptation intelligent computational technique for solving optimization and searching problem by imitating the nature biological evolution process and principle. Particle swarm optimizer (PSO) algorithm, a high-efficient optimization method, is one of the evolutionary computation methods based on the swarm intelligence. However, there is the lack of completely theoretic analysis and research of engineering application for the PSO algorithm. Here, three typical kinetic models of PSO are built and analyzed. The largest covering space based on simplex information of the three models is deduced. The result explains the reason of premature convergence of particle optimization without new information introduced. Moreover the stability of PSO is analyzed as a time-varying dynamic system. The sufficient conditions for asymptotic stability of parameters are proved and the inertia weight parameter value is enhanced. It provides a theoretic foundation for the parameter selection and stability of PSO. According to the analysis, several improvements have been proposed. The improved PSO algorithm is applied to the controller design and system identification of a servo system driven by the linear motor. A new fitness function is designed for the system identification, which can achieve the order selection and parameter estimation at the same time. The design work of PID, changing integration rate PID, single neuron PID and fuzzy PID controller, demonstrate the effectiveness. And it provides a new method for the design and optimization of control system.

BIOGRAPHICAL SUMMARY

Feng Pan was born in Kunming, P.R. China. He received the B.S. degree in Control Theory and Control Engineering in 2000 and PHD degree in Pattern Recognition and Intellectual System in 2005, from Beijing Institute of Technology, P.R. China. Now he is currently a faculty in the School of Information Science and Technology in Beijing Institute of Technology. His currently research interests include evolution computation, artificial intelligence, servo system, intelligent control, optimization methods, etc

********** **Refreshments will be served at 11:30am** **********