

PLENARY TALK
CULTURAL-BASED PARTICLE SWARM OPTIMIZATION
FOR MULTIOBJECTIVE OPTIMIZATION

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Evolutionary computation is the study of biologically motivated computational paradigms which exert novel ideas and inspiration from natural evolution and adaptation. The applications of population-based heuristics in solving constrained and dynamic optimization problems have been receiving a growing interest from computational intelligence community. Most practical optimization problems are with the existence of constraints and uncertainties in which the fitness function changes through time and is subject to multiple constraints. In this study, we propose the cultural-based particle swarm optimization (PSO) to solve these problems with real-world complications. A cultural framework is introduced that incorporates the required information from the PSO into five sections of the belief space, namely situational knowledge, temporal knowledge, domain knowledge, normative knowledge, and spatial knowledge. The archived information is exploited to detect the changes in the environment and assists response to the change and constraints through a diversity based repulsion among particles and migration among swarms in the population space, also helps in selecting the leading particles in three different levels, personal, swarm, and global level. Comparison of the proposed cultural based PSO over numerous challenging constrained and dynamic benchmark problems demonstrates the competitive, if not appreciably much better, performance with respect to selected state-of-the-art PSO heuristics.



Biography

Gary G. Yen received the Ph.D. degree in electrical and computer engineering from the University of Notre Dame, Notre Dame, Indiana in 1992. He is currently a Professor in the School of Electrical and Computer Engineering, Oklahoma State University (OSU). Before he joined OSU in 1997, he was with the Structure Control Division, U.S. Air Force Research Laboratory in Albuquerque, New Mexico. His research is supported by the DoD, DoE, EPA, NASA, NSF, and Process Industry. His research interest includes intelligent control,

computational intelligence, evolutionary multiobjective optimization, conditional health monitoring, signal processing and their industrial/defense applications.

Gary was an associate editor of the *IEEE Transactions on Neural Networks* and *IEEE Control Systems Magazine* during 1994-1999, and of the *IEEE Transactions on Control Systems Technology*, *IEEE Transactions on Systems, Man and Cybernetics* and IFAC Journal on *Automatica* and *Mechatronics*. He is currently serving as an associate editor for the *IEEE Transactions on Evolutionary Computation* and International Journal of Swarm Intelligence Research. He served as the General Chair for the 2003 *IEEE International Symposium on Intelligent Control* held in Houston, TX and 2006 *IEEE World Congress on Computational Intelligence* held in Vancouver, Canada. Gary served as Vice President for the Technical Activities, IEEE Computational Intelligence Society in 2004-2005 and is the founding editor-in-chief of the *IEEE Computational Intelligence Magazine* from 2006 to 2009. He is currently serving as President of the IEEE Computational Intelligence Society in 2010-2011. He is a Fellow of IEEE.