

EVOLUTIONARY ALGORITHM FOR MULTIOBJECTIVE OPTIMIZATION

Gary G. Yen, Ph.D., IEEE Fellow
Oklahoma State University, USA
Thursday, Sept. 17, 2009, 14:00-15:00, EE Lounge

Summary

Evolutionary computation is the study of biologically motivated computational paradigms which exert novel ideas and inspiration from natural evolution and adaptation. The application of Evolutionary Algorithms (EAs) in solving Multiobjective Optimization Problems has been receiving a growing interest from computational intelligence community. To search for a family of “acceptable” solutions, a so called Pareto set, by using EA’s population-based parallel searching ability, several MultiObjective Evolutionary Algorithms (MOEAs) have been proposed. However, most of these MOEAs have difficulty in dealing with the trade-off between uniformly distributing the computational resources and finding the *near-complete* and *near-optimal* Pareto set. On the other hand, according to the No Free Lunch theorems, no formal assurance of an algorithm’s general effectiveness exists if insufficient knowledge of the problem characteristics is incorporated into the algorithm domain. In this talk, we will survey state-of-the-art developments in this area, in pursuing a uniformly distributed, near optimal, and close to complete Pareto front for a given MOP.

POPULATION STRATEGY IN MOEA AND MOPSO FOR MULTIOBJECTIVE OPTIMIZATION

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Friday, Sept. 18, 2009, 10:30-11:30, EE Lounge

Summary:

Evolutionary computation is the study of biologically motivated computational paradigms which exert novel ideas and motivate inspiration from natural evolution and swarm intelligence. The emerging use of evolutionary computation techniques has grown considerably over the past several years. During this period of time, the designs and applications of these techniques have been further enhanced resulting in a set of computational intelligence heuristics that are particularly adept for solving complex optimization problems. Moreover, they are characteristically more robust than traditional methods based on formal logics or mathematical programming in face of many real-world complications. To its extreme, these population based heuristics with a little twist have been demonstrated to solve the multiobjective optimization problems efficiently and effectively. In many scientific and engineering disciplines, it is not uncommon to face a design challenge when there are several criteria or design objectives to be met simultaneously. If these objectives are conflicting, then the problem becomes one of finding the best possible designs that satisfy the competing objectives under different trade-off scenarios. With these multiple objectives and constraints taken into

consideration, an optimum design problem in the context of Pareto optimality can then be formulated. This presentation will review state-of-the-art multiobjective evolutionary algorithms (MOEA) and multiobjective particle swarm optimization (MOPSO) techniques and their theoretical foundation and surveys the most recent developments in their use for solving complex multiobjective optimization problems.

Speaker:

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, NM. 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.

Dr. Yen was an associate editor of the *IEEE Transactions on Neural Networks*, *IEEE Control Systems Magazine*, *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*. 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. Dr. Yen 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* since 2006. Most recently, he is elected to serve as President Elect in 2009 and President in 2010-2011 of the IEEE Computational Intelligence Society. He is a Fellow of IEEE.

