Stable Matching-Based Selection in Evolutionary Multiobjective Optimization

Multiobjective problems are always aroused in our daily life in that we have to make decisions based on many different objectives. Recently, Multiobjective evolutionary algorithm based on decomposition (MOEA/D) decomposes a multiobjective optimization problem into a set of scalar optimization subproblems and optimizes them in a collaborative manner. This approach has been proved to be the state of the art method in solving multi-objective/many objective problems. In MOEA/D, subproblems and solutions are modelled as two sets of agents for matching. Thus, this kind of selection of promising solutions for subproblems can be regarded as a matching between subproblems and solutions. This problem could be viewed as a Stable matching problem as for school admission, hospital residents problems. Also, it can effectively resolve conflicts of interests among selfish agents in the economic market. In this talk, I will advocate the use of a simple and effective stable matching (STM) model to coordinate the selection process in MOEA/D. In this model, subproblem agents can express their preferences over the solution agents, and vice versa. The stable outcome produced by the STM model matches each subproblem with one single solution, and it tradeoffs convergence and diversity of the evolutionary search. In addition, a two-level stable matching-based selection is proposed to further guarantee the diversity of the population. More specifically, the first level of stable matching only matches a solution to one of its most preferred subproblems and the second level of stable matching is responsible for matching the solutions to the remaining subproblems. Experimental studies demonstrate that the proposed selection scheme is effective and competitive comparing to other state-of-the-art selection schemes for MOEA/D.

Enhancing Video Coding by Data-driven Techniques and Advanced Models

In June 6th 2016, Cisco released the White paper, VNI Forecast and Methodology 2015-2020, reported that 82 percent of Internet traffic will come from video applications such as video surveillance, content delivery network, so on by 2020. It also reported that Internet video surveillance traffic nearly doubled, Virtual reality traffic quadrupled, TV grew 50 percent and similar increases for other applications in 2015. The annual global traffic will first time exceed the zettabyte (ZB;1000 exabytes[EB]) threshold in 2016, and will reach 2.3 ZB by 2020. It implies that 1.886ZB belongs to video data. Thus, in order to relieve the burden on video storage, streaming and other video services, researchers from the video community have developed a series of video coding standards. Among them, the most up-to-date is the High Efficiency Video Coding (HEVC) or H.265 standard, which has successfully halved the coding bits of its predecessor, H.264/AVC, without significant increase in perceived distortion. With the rapid growth of network transmission capacity, enjoying high definition video applications anytime and anywhere with mobile display terminals will be a desirable feature in the near future. Due to the lack of hardware computing power and limited bandwidth, lower complexity and higher compression efficiency video coding scheme are still desired. For higher video compression performance, the key optimization problems, mainly decision making and resource allocation problem, shall be solved. In this talk, I will present the most recent research results on machine learning and game theory based video coding. This is very different from the traditional approaches in video coding. We hope applying these intelligent techniques to vide coding could allow us to go further and have more choices in trading off between cost and resources.