Chair for Integrated Systems
TUM Department of Electrical and Computer Engineering
Technical University of Munich

Forschungspraxis

Preference-Based Multi-objective Optimization using Genetic Algorithms

Multi-objective Optimization (MOO) is inevitable in many real-world applications for effective trade-off analysis between the competing objectives. The MOO results in the formation of Pareto Optimal points that allows the decision-maker to select the points based on his desired trade-off in an application. One typical example for MOO is a Genetic Algorithm based on NSGA selection [1]. However, NSGA algorithms often lead to the exploration and optimization of the entire design space in each objective dimension. This is not necessary for many cases and a significant computational effort is wasting for regions outside the threshold values in the decision maker's mind.

This research work aims to investigate different genetic algorithm-based multi-objective optimization approaches which form Pareto Optimal solutions based on the preference given by the designer (e.g. [2]) and test an appropriate approach on benchmark problems.

[1] K. Deb, S. Agrawal, A. Pratap and T. Meyarivan, "A Fast Elitist Nondominated Sorting Genetic Algorithm for Multi-objective Optimization: NSGA-II", Parallel Problem Solving from Nature PPSN VI ser. Lecture Notes in Computer Science, pp. 849-858, 2000.

[2] Kalyanmoy Deb and J. Sundar. Reference point based multi-objective optimization using evolutionary algorithms. In Proceedings of the 8th Annual Conference on Genetic and Evolutionary Computation, GECCO ‘06, 635–642. New York, NY, USA, 2006.

Prerequisites

- Basic understanding of optimization techniques
- Good programming skills in Python or Matlab
- High motivation and ability to work independently

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