博 士 論 文 の 内 容 の 要 旨

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論文題目	Dynamic compartmental and performance models for analysis and configuration of multi-objective evolutionary algorithms (多目的進化型アルゴリズムの分析と設定のための動的区画及び性能モデル)

（博士論文の内容の要旨）

Evolutionary algorithms can solve complex optimization problems in science and engineering. However, increasing problem size and complexity demand constant improvement. On the other hand, their automatic configuration and selection given a problem instance is also a pending task. Both tasks require a deeper understanding and way to characterize their behavior and performance on a problem instance. This work proposes Dynamic Compartmental Models as a step forward in both tasks. The model allows analyzing, comparing, and configuring evolutionary algorithms. Inspired by epidemiological models, they track population changes modeling them as exchanges between compartments. Each compartment contains part of the population, and the rules to assign them are based on Pareto dominance, recentness, and membership to the Pareto Optimal Set or the Non-dominated solution set. Given the size for each compartment, the model can estimate their change over time. The behavior of an algorithm with its configuration on a problem instance is represented by one set of parameters. Small and large instances of the MNK-landscape problem solved by representative multi- and many-objective algorithms generate the data to train and test the models. In small instances, the trained models' estimations follow the trend of the data. Using the models' parameters and equations to explain how algorithms can keep discovering good solutions when the population is full, gave an example for algorithm analysis. Finding a correlation between one of the compartments' change and the hypervolume, a performance metric, created a way to use them for comparison between algorithms. For algorithm configuration, an instance was created and solved with one algorithm but several configurations. However, only some sample configurations were used to create models. The remaining configurations' models were obtained through interpolating the parameter of the sampled configurations' models. The results showed that both trained and interpolated models obtain estimations that can help decide a user which configuration to choose. In larger instances, a different compartment definition around only the non-dominated set was used. This also demanded the creation of an auxiliary model that links these compartments to the growth of the hypervolume to be able to compare and select between algorithms and configurations. The results indicate that these new features are also able to capture the changes in the population, even on unseen problem instances.