論　文　要　旨

Sub-optimally Solving the Multiple Watchman Route Problem
(複数の警備員によるグリッド警備問題に対するアルゴリズム)

広域科学専攻　広域システム科学系
学生証番号　31-216835
劉　冠廷

Multiple Watchman Route Problem (MWRP) is a classical optimization problem in computational geometry. The task is to find a path for each of the watchmen such that every point inside the map is visible from at least one of the routes. MWRP has been proven to be NP-hard and has been addressed with sub-optimal methods such as the Self-Organizing Map method and the decoupling method, which are based on the combination of the Art Gallery Problem and the Multiple Traveling Salesman Problem. However, these methods are still limited by constraints such as the visibility constraint and the requirement of a cyclic solution, where the path must begin and end at the same point. By formulating MWRP as a search problem on a grid map, we propose a new method for computing watchmen routes that cover map with MinMax criterion (minimize the longest route among the watchmen routes). Our method is independent of the visibility constraint and does not necessarily generate cylic solutions. Our method consists of two stages. In the first stage, we use a multi-class clustering algorithm to classify all cells in the grid into different clusters. In the second stage, we then apply a generate-and-repair search algorithm. At the route generation level, we use a WRP solver to find a watchman path at each cluster. At the route repair level, using an iterative repairing search algorithm, we repeatedly repair paths until no further improvements can be made to maximize the solution quality. We conduct an extensive experimental analysis of our method's performance, our method appears to perform well on many small to medium-sized maps compared to the optimal solutions of the single-agent WRP, which we use as a baseline for comparison. However, there are still many potential directions for future work to improve our method.