

Sub-optimally Solving the Multiple Watchman Route Problem with Heuristic Search

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Multiple Watchman Route Problem (MWRP) is a classical optimization problem in computational geometry. Here we reformulate it as a heuristic search problem and try to solve it with A*-based search. We are given a known grid map with obstacles and find multiple paths such that all cells in the map can be seen by at least one cell along one path. In previous research, MWRP is solved by decoupling MWRP into two problems: the Art Gallery Problem and the consecutive Travelling Salesman Problem whose solvers have been proposed. However, this solution has been demonstrated non-optimal even in a single watchman scenario and with an inflexible visibility setting. In this research, we try to solve MWRP on a grid map using a clustering algorithm and 2-level search algorithm. Besides, we liberate the visibility constraint so that any type of visibility function can be adapted in this problem. we classify all cells in the grid into different groups based on a clustering algorithm then we apply a 2-level heuristic solver. The lower level finds the optimal path for each group and the higher level tries to minimize the duplication between different watchmen during the pathfinding process. We'll experimentally compare this method with existing solvers.