

Farzaneh Rajabighamchi

A pre-processing procedure for graph reduction when routing in planar graphs with an application in order picking problems

This paper is dealing with graph reduction procedure for routing problems in planer graphs. We present a novel pre-processing algorithm for graph reduction in which the network size could be reduced by almost 73% on average. This allows us to solve the routing problems in planer graphs with a general TSP solver while significantly reducing running times. One of the substantial instances to apply this algorithm is the order picker routing problem within a multi-block warehouse layout with several aisles. The presented method allows us to solve adequately big (more realistic) instances exactly. In the literature, exact algorithms only exist for small warehouses with few cross aisles (typically two or three), while for larger warehouse configurations a series of heuristic and meta-heuristic methods are available.

The algorithm is implemented and evaluated experimentally on a set of problem instances from the literature. The computational results illustrate that the proposed model outperforms existing formulations in terms of simplicity, size, and calculation time. Our mathematical model gives an optimum solution for all the instances, while the calculation time could be reduced by almost 90% on average.