

Optimal Number of Reconfigurable Robots in a Transport System

Authors : Mari Chaikovskaia, Jean-Philippe Gayon, Alain Quilliot

Abstract : We consider a fleet of elementary robots that can be connected in different ways to transport loads of different types. For instance, a single robot can transport a small load, and the association of two robots can either transport a large load or two small loads. We seek to determine the optimal number of robots to transport a set of loads in a given time interval, with or without reconfiguration. We show that the problem with reconfiguration is strongly NP-hard by a reduction to the bin-packing problem. Then, we study a special case with unit capacities and derive simple formulas for the minimum number of robots, up to 3 types of loads. For this special case, we compare the minimum number of robots with or without reconfiguration and show that the gain is limited in absolute value but may be significant for small fleets.

Keywords : fleet sizing, reconfigurability, robots, transportation

Conference Title : ICCIE 2023 : International Conference on Computers and Industrial Engineering

Conference Location : Stockholm, Sweden

Conference Dates : July 06-07, 2023