A multiobjective model and evolutionary algorithms for robust time and space assembly line balancing under uncertain demand

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Abstract

Changes in demand when manufacturing different products require an optimization model that includes robustness in its definition and methods to deal with it. In this work we propose the r-TSALBP, a multiobjective model for assembly line balancing to search for the most robust line configurations when demand changes. The robust model definition considers a set of demand scenarios and presents temporal and spatial overloads of the stations in the assembly line of the products to be assembled. We present two multiobjective evolutionary algorithms to deal with one of the r-TSALBP variants. The first algorithm uses an additional objective to evaluate the robustness of the solutions. The second algorithm employs a novel adaptive method to evolve separate populations of robust and non-robust solutions during the search. Results show the improvements of using robustness information during the search and the outstanding behavior of the adaptive evolutionary algorithm for solving the problem. Finally, we analyze the managerial impacts of considering the r-TSALBP model for the different organization departments by exploiting the values of the robustness metrics.

Keywords: Robust Optimization, Assembly Line Balancing, Multiobjective Evolutionary Algorithms, Uncertain Demand

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