Alghazi, Anas; **Kurz, Mary E.**

Mixed model line balancing with parallel stations, zoning constraints, and ergonomics. (English) Zbl 1414.90233

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Summary: Assembly lines are cost efficient production systems that mass produce identical products. Due to customer demand, manufacturers use mixed model assembly lines to produce customized products that are not identical. To stay efficient, management decisions for the line such as number of workers and assembly task assignment to stations need to be optimized to increase throughput and decrease cost. In each station, the work to be done depends on the exact product configuration, and is not consistent across all products. In this paper, we propose a mixed model line balancing integer program (IP) that considers parallel workers, zoning, task assignment, and ergonomic constraints with the objective of minimizing the number of workers. Upon observing the limitation of the IP, a constraint programming (CP) model is developed to solve larger assembly line balancing problems. Data from an automotive OEM are used to assess the performance of both the MIP and CP models, including sensitivity analysis to measure the computational cost of enabling the different constraints. To the best of our knowledge, we are the first paper to incorporate the different realistic mixed model assembly line constraints and develop a CP model based on the scheduling module of the IBM ILOG Optimizations Studio. Using the OEM data, we show that the CP model outperforms the IP model for bigger problems.

MSC:

90C11 Mixed integer programming
90B30 Production models

Keywords:

assembling line balancing; mixed model assembly lines; mixed integer programs

Software:

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