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Deep Reinforcement Learning as an Optimization Method for the Configuration of Adaptable, Cell-Oriented Assembly Systems

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Abstract

This paper investigates the feasibility and performance of Deep Reinforcement Learning (RL) as a method for optimizing assembly cell configurations in adaptable cell-oriented assembly systems (ACAS). ACAS can be as productive as conventional assembly lines, while offering greater flexibility and resilience. However, optimizing their layout configuration and resource assignment poses a complex challenge for conventional optimization methods. A RL and simulation-based method is evaluated in an ACAS use-case setting, including a benchmark with metaheuristics. The findings show the limitations of RL for static aspects of the optimization problem, but also indicate RL's considerable benefits for dynamic optimization tasks in ACAS.

Keywords: Reinforcement Learning; Modular Assembly System; Configuration; Simulation-based Optimization;