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Optimizing smart manufacturing systems using digital twin

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ABSTRACT

Presented paper investigates the application of digital twins for the optimisation of intelligent manufacturing systems and focuses on the comparison between simulation modelling results and real-world production conditions. A digital twin was created in the Simio software environment using a data-driven simulation model derived from a real-world production system. Running the digital twin in real time, which was displayed graphically, facilitated the analysis of key parameters, including the number of finished products, average flow time, workstation utilization and product quality. The discrepancies were attributed to the use of random distributions of input data in the dynamic digital twin, as opposed to the long-term measurements and averages in the real-world system. Despite the limitations in the case study, the results underline the financial justification and predictive capabilities of digital twins for optimising production systems. Real-time operation enables continuous evaluation and tracking of parameters and offers high benefits for intelligent production systems. The study emphasises the importance of accurate selection of input data and warns that even small deviations can lead to inaccurate results. Finally, the paper highlights the role of digital twins in optimising production systems and argues for careful consideration of input data. It highlights the importance of analysing real-world production systems and creating efficient simulation models as a basis for digital twin solutions. The results encourage extending the research to different types of production, from job shop to mass production, in order to obtain a comprehensive optimisation perspective.

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