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Procedia CIRP 00 (2021) 000–000

www.elsevier.com/locate/procedia

54th CIRP Conference on Manufacturing Systems

Real-time combination of material flow simulation, digital twins of manufacturing cells, an AGV and a mixed-reality application

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Abstract

The integration of material flow simulation and digital planning solutions raises new challenges for the methodology and technical implementation of simulation models. The paper describes the use of a material flow simulation, which is controlling an AGV and interacting with digital twins of manufacturing cells. The digital twins determine the exact machining times. In addition, a mixed-reality application visualizes the entire system, while the communication via MQTT ensures a quasi-synchronous behavior of the different models and the AGV. The paper provides a literature review on similar solutions, describes the concept of our approach and specifies the technical implementation.

Keywords: material flow simulation; digital twin; mixed-reality; digital manufacturing system; online simulation; DES; MQTT; AGV