Rzeszów University of Technology
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ABSTRACT OF DOCTORAL DISSERTATION

Title: MEX additive manufacturing automation process methodology using network infrastructure

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The subject of this dissertation is focused on the automation of the incremental manufacturing process using the MEX method with the utilization of network infrastructure. The main goal of the research is to analyze the incremental manufacturing process in order to develop solutions for production automation and process management using network structures. As a result of this analysis, a methodology for the automation and informatization of the 3D printing process based on material extrusion was developed.

The initial part of the work involved an analysis of the current state of the art, which revealed a diversity of approaches to automation, with some solutions focusing only on specific elements of the incremental process without include a comprehensive automation, informatization, and production management approach for additive manufacturing machines.
The second part of the work was dedicated to developing a methodology for the automation of the incremental manufacturing process, particularly concerning pre-processing and post-processing operations. This involved the analysis of network integration methods for 3D printers, remote control and monitoring mechanisms for the manufacturing process, material availability control, and methods for transferring the produced models using collaborative robots. Based on this methodology, a research station was built in the form of an automated 3D printing station with web based supervisory application.
The research component of the work includes an analysis that justifies the implementation of the developed automation methodology. The results of the study showed a significant reduction in operator work time and manufacturing costs.
Key words: 3D print, additive manufacturing, automation, 3D printers network connectivity, industry