Low-Cost Hybrid of 3D Printing Processes through Digital Manufacturing System Integration Approach

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Abstract

Hybrid manufacturing in this research is a process that combines additive and subtractive manufacturing in the same equipment. The integration of various manufacturing processes into a single process has been the subject of this study. The goal is to reduce the amount of space, time, cost and labour required for production. While much hybrid manufacturing research has concentrated on expensive and high-level decision-making activities like service composition and scheduling, the link between field-level manufacturing data and the cloud manufacturing platform has yet to be developed. The development of cloud manufacturing systems is hampered by the inefficiency of data gathering, communication, storage, query, and analysis of field-level manufacturing equipment. In order to solve this difficulty, this research will analyze the use of developing Industrial Internet of Things (IIoT) technologies in a cloud manufacturing system. Based on a general system architecture of IIoT-supported cloud manufacturing system offer a service-oriented plug-and-play (PnP) IIoT gateway solution. Manufacturing equipment service-oriented data schemas are being created to capture just-enough data about field-level manufacturing equipment and allow for efficient data storage and query in a cloud time-series database (TSDB). Through the practical deployment of IIoT gateways on a 3D printer and laser marking tool, the feasibility and benefits of the suggested solution as a framework result with overall production nearly 30% reduction. According to findings by using PnP IIoT technologies to connect field-level manufacturing equipment to a cloud platform, purposefully built service-oriented data schemas that capture the critical information for high-level hybrid manufacturing decision-making are a solid solution. Finally, this can be increased productivity of making components by using low cost hybrid 3D printing process which can support the digital manufacturing integration approach in the future.

Keywords
3D Printing, Emerging Technologies, Digital Manufacturing, Proses integration