

Designing of Tooling Solution for Material Handling in Highly Automated Manufacturing System

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Abstract : A flexible manufacturing system is an integral part of a smart factory of industry 4.0 in which every machine is interconnected and works autonomously. Robots are in the process of replacing humans in every industrial sector. As the cyber-physical-system (CPS) and artificial intelligence (AI) are advancing, the manufacturing industry is getting more dependent on computers than human brains. This modernization has boosted the production with high quality and accuracy and shifted from classic production to smart manufacturing systems. However, material handling for such automated productions is a challenge and needs to be addressed with the best possible solution. Conventional clamping systems are designed for manual work and not suitable for highly automated production systems. Researchers and engineers are trying to find the most economical solution for loading/unloading and transportation workpieces from a warehouse to a machine shop for machining operations and back to the warehouse without human involvement. This work aims to propose an advanced multi-shape tooling solution for highly automated manufacturing systems. The currently obtained result shows that it could function well with automated guided vehicles (AGVs) and modern conveyor belts. The proposed solution is following requirements to be automation-friendly, universal for different part geometry and production operations. We used a bottom-up approach in this work, starting with studying different case scenarios and their limitations and finishing with the general solution.

Keywords : artificial intelligence, cyber physics system, Industry 4.0, material handling, smart factory, flexible manufacturing system

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