

# Robotics Assembly System with Digital Twin Approach

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**Abstract.** Assembly may be an undesirable but unavoidable step for most manufacturers. Industrial robots are commonly used for repetitive tasks in large-scale mass production, but customized medium-sized products with wide variations in small batch production for robot-to-robot collaborative manipulation assembly tasks demand increased dexterity, which comes at a higher cost due to limited sensing capabilities. The utilization of collaborative robots or cobots in robot-to-robot collaborative in hand manipulation assembly tasks will not only enhance flexibility and dexterity but also provide cost-effectiveness. This paper presents the development of a collaborative multi robots assembly system with a digital twin approach to support robot-to-robot collaborative assembly process for various products with small batch sizes. A digital twin is adopted to enable human workers to supervise and train the collaborative multi-robotics assembly system virtually to determine the assembly sequences whenever new orders arrive without interrupting the operation of the physical system to minimize downtime for setting up the assembly line and commissioning process. Besides, image processing is applied to recognize parts that come to an assembly station in random orientations to provide flexibility during the physical assembly further.

**Keywords.** Digital twin, Cobots, pattern recognition, assembly process

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