

PhD project

## Agile service-based programming of multi-robot systems

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## Abstract

The goal of the project is to simplify the process of programming robotic systems used in the manufacturing industry for assembly and disassembly operations.

In cases of high-mix and low-volume production, it is difficult to automate manufacturing tasks because of the great variation of products and processes. Robotic systems can increase efficiency and production speed in high-volume scenarios, but reconfiguring work cells and programs take a considerable amount of time. To bring the advantages of robotic systems into cases of high-mix production it is required to develop ways to program robots in an agile manner.

In the PhD project, a virtual description of the robot systems is created in the form of a Digital Twin in a software tool that allows to run simulations of assembly tasks and execute the same logic using physical components. Robot tasks are represented as Services and visualized as ServiceBlocks in a Visual Programming interface. Programs are automatically generated starting from a digital description of the assembly task and can be easily modified thanks to the simplified programming interface, reducing the complexity of handling product variants.

The project is part of the MADE initiative and involves the partner companies KUKA, LEGO, and Danfoss.