

Collaborative Mobile Manipulator Solution for CNC Machine Tending and Intralogistics Tasks

Degree programme : Master of Science in Engineering

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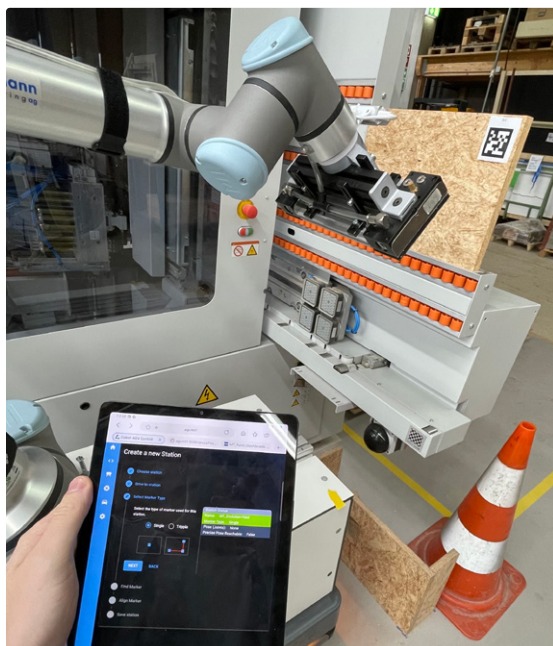
Switzerland's machining industry need for automation has increased due to labor shortages and high costs. This is being addressed by a collaboration between BFH, Bachmann Engineering AG, vonRickenbach.swiss AG, and Weinig Holzher AG. An integrated solution is being developed combining Autonomous Mobile Robots (AMRs) and Collaborative Robots (Cobots) for CNC machine tending. This project improved system precision and created a no-code, friendly interface.

Context

Collaborative Robots and Autonomous Mobile Robots are increasingly popular in various industries due to their potential to improve automation and efficiency. However, their adoption in smaller enterprises is slow due to the complexity of programming and operational challenges. Addressing this is essential to enable smaller enterprises to use this technology effectively.

Motivation

Simplifying programming interfaces for cobotic systems is crucial to enable automation technologies for small and medium enterprises. The goal is to simplify programming and solve the complexity with the interaction of mobile robots. If the time required for reprogramming intralogistic tasks is reduced, it will increase profitability.



Demonstration of station setup via Web-App

Approach

Collaborative mobile manipulators must be reliable and precise to load CNC machines. The process involves employees working alongside cobots, guiding them to approximate positions, after which onboard vision systems and tags handle the precise fine-tuning and adjustments. The process is tested and enhanced to achieve simplicity while maintaining flexibility for operations.

Result

A method using multiple markers at defined positions is used to improve the precision of the calibration. A Universal Robot, a MIR platform, and an Intel RealSense Camera are combined in a cobot-AMR set-up to showcase a real solution. An application running on a web browser controls the cobot-AMR through a tablet. This interface greatly simplifies task reprogramming, reducing the time and technical skills required, making automation simpler and more practical for SMEs.

Outlook

In the future, the application can be adapted to suit a broader range of industrial scenarios. This will involve enhancing the block programming functionality and developing specialised interfaces. Introducing an automated scheduler will enhance task management and overall system efficiency.



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Cobot-AMR system loading a CNC-Machine