

Simple And Intuitive No-Code Robot Programming and Configuration Interface

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In industrial automation, the development of user-friendly interfaces for robot programming is pivotal. This work introduces an innovative, no-code interface designed to make robot programming and reconfiguration accessible to workers without extensive technical skills, particularly benefiting small and medium-sized enterprises with flexible production needs.

Motivation

This work aims to empower operators by developing an intuitive, no-code interface for creating and configuring robot programs. While several no-code interfaces exist, they are usually robot and hardware dependent and not customizable. This innovation seeks to enhance the adaptability and responsiveness of manufacturing processes, reducing the need for specialized programming knowledge.

Approach

A block-based, hardware independent user interface offers blocks in several hierarchical layers (Fig. 1). Simple Primitives and Services, designed by experts, reflect the robotic cell's fundamental capabilities. Technicians can assemble these blocks into advanced Skills and Operators can create and modify complete Tasks using a touchscreen interface, adapting the manufacturing process without writing any code.

Results

The interface was successfully integrated and tested with a Cobotic Base Cell (Fig. 2) at the Swiss Cobotics Competence Center (S3C), demonstrating advanced lab automation techniques. In collaboration with CSEM's VISARD interface, the cell can automati-

cally locate input racks, pick and identify vials, and determine appropriate actions. The system discards vials or places them into a centrifuge for processing and sorts them into appropriate output racks. Directly from the interface, the operator can modify the cell's workflow, calibrate equipment and key positions, and add new vial or rack types, thus enhancing the operational efficiency and adaptability of the cell.

Outlook

Future work will focus on enhancing the interface for broader applications across different settings. The goal is to refine the system based on user feedback, making Cobots' programming and configuration increasingly user-friendly and adaptable, ultimately supporting the continuous evolution of smart lab and factory automation.



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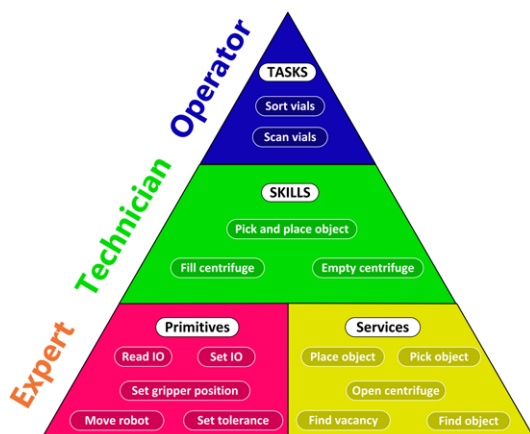


Figure 1: Developed hierarchy with some examples blocks



Figure 2: The cobotic cell demonstrating lab automation tasks