MIXED REALITY FOR ROBOT MONITORING AND OPTIMIZATION

INFINITY SPARK

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Background and Motivation

Traditional 2D robot control interfaces limit operators' spatial understanding and efficiency in industrial enviroments. This project develops a Mixed Reality solution using HoloLens 2 and ABB RobotStudio to provide intuitive, real-time robot monitoring and conrol through immersive 3D visualizations. By overlaying digital robot data directly onto the physical workspace, this approach enhances situational awareness, improves safety, and supports the digital tranformation goals of Industry 4.0 manufacturing.

Technologies Used

Unity®

MRTK MIXED REALITY TOOLKIT

Methodology

Front End:
- A standard Mixed Reality app with 3D model of the robot and User Interface (Menu). The app contains three separate sets of menu: one for manually control the robot and the other two will perform simulation will focus on specific objectives.
- All user interaction will be made via this front end module

Back End:
- All interactions from the user (buttons clicked, sliders manipulation) will then be processed by different scripts, each handling a specific tasks (connection, move, play simulation...)
- The script will then handle the user request and send the appropriate trigger via RWS API to activate a function in the corresponding RAPID task, which will handle all of the process
- The data then will be send back via EGM or RWS API connection and update the 3D model in the Mixed Reality app, ensure the synchronization.
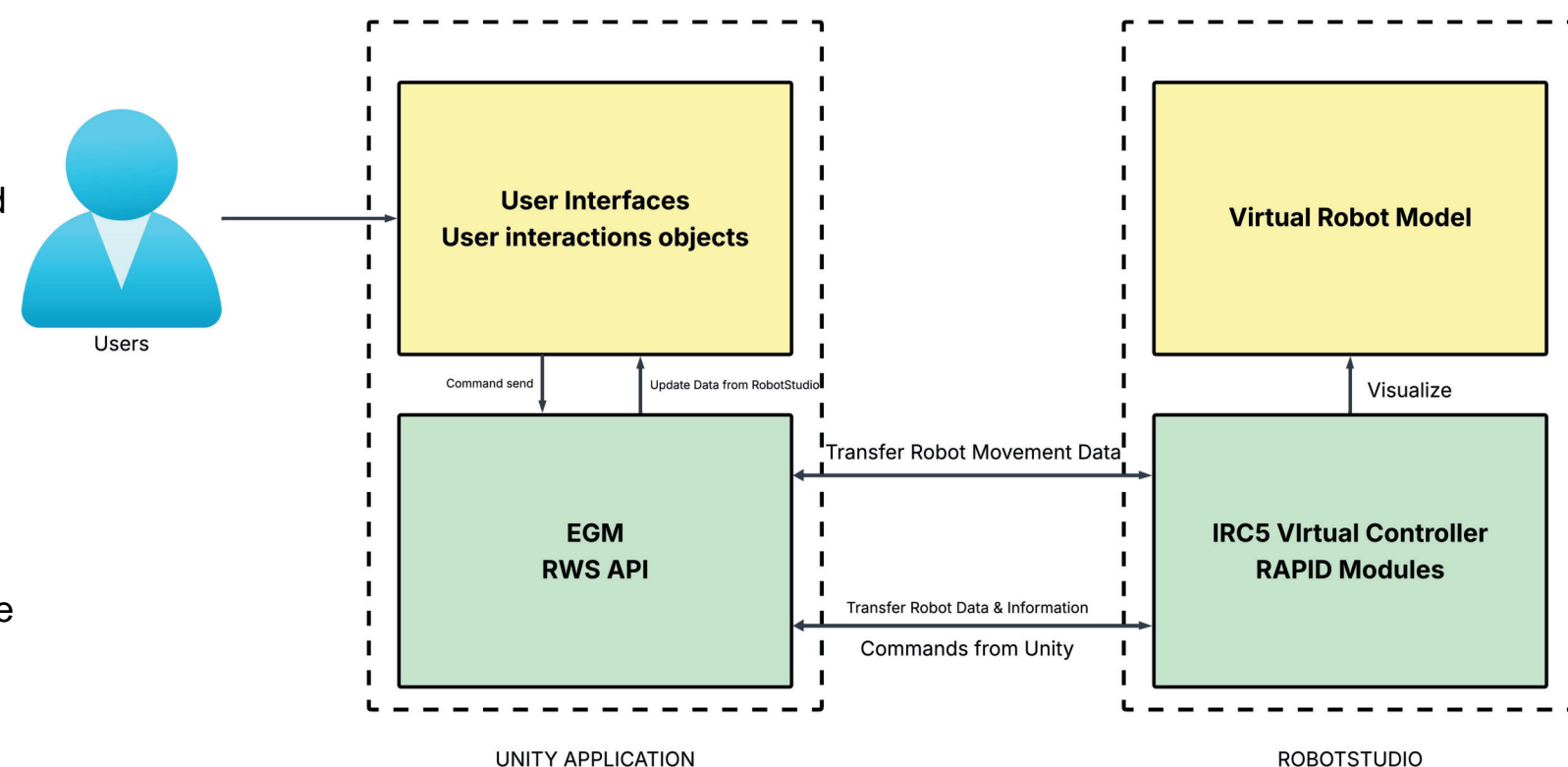
Features

- Guide and path planning robot movement
- Execute simulation program step by step for optimization efforts
- Execute virtual simulated production

Conclusion & Findings

The app foster better approach for the monitoring and optimizing process, make it more intuitive and user friendly with the usage of Mixed Reality technologies

Experiments & Result

- Alpha Testing:
  - The first integration testing focus on the execution of commands through the use of RWS API.
  - At first, RWS are implement to visualize the movement, with feedbacks from academic and industry supervisor further leads the team use EGM for transferring robot movement
- Beta testing:
  - The integration of EGM has solve the robot movement synchronization, ensure high consistency and low latency
- Results:
  - The app foster better optimization and monitoring process for robot production cell through better data visualization and easy