

Combining Spatial Augmented Reality Interface with Mixed Reality Head-mounted Display to Enhance User Understanding of Robotic Programs

Daniel Bambušek



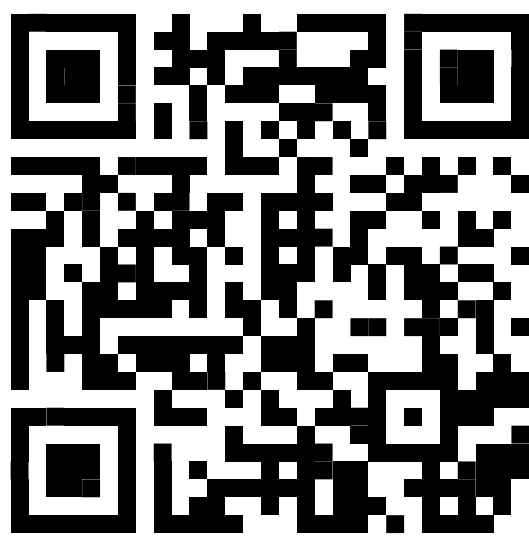
Abstract

This work focuses on usability of mixed reality head-mounted display – Microsoft HoloLens – in human-robot collaborative workspace – ARTable. Use of the headset is demonstrated by created user interface which helps regular workers to better and faster understand the ARTable system. It allows to spatially visualize learned programs, without the necessity to run the robot itself. The user is guided by 3D animation of individual programs and by device voice, which helps him to get a clear idea of what will happen if he runs the program directly on the robot. This approach could be also helpful when the user wants to verify that he programed the robot as he wanted or just wants to quickly overview what will be the result of the current program. Using mixed reality displays enables to visualize valuable spatial information, such as robot perception.

Key Features of the Extended Spatial User Interface

- Integrates mixed reality head-mounted display – the Microsoft HoloLens – into a human-robot collaborative workspace – the ARTable.
- Extends current projected 2D interface over 3D spatial information visualization mode.
- Draws bounding boxes over detected objects to indicate what robot actually sees.
- Enables to visualize learned robot programs in order to eliminate user's uncertainties in programming such programs or to get a quick overview of an outcome of such program without the necessity to run the robot itself.
- User is guided by headset's speech synthesizer.
- Visualization is fully controllable with user's voice or with provided buttons of the extended projected interface.

Demonstration Video:



GitHub Repository:



Visualization of “Stool Assembly” program

