Augmented Reality for Quick and Intuitive Robotic Packing Re-programming

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***Abstract*—Current manufacturing applications are subject to constant changes in production orders for their robotic systems to adapt to the dynamic nature of the market. Hence, re-programming robots needs to be a fast, easy and effective process. In this demonstration, we present an augmented reality (AR) interface using HoloLens. Our interface provides an intuitive platform to re-program a robotic packing application through simple hand gestures and the information gathered by the HoloLens' spatial mapping functionality.**

***Index Terms*—Augmented reality; robot programming; intuitive interfaces**

I. Introduction

This table-base demonstration makes use of Hololens in-built capabilities such as hand or voice commands and spatial mapping, to parametrize a packing application through an AR interface. Other recent works have also proposed an AR interface to command or program robots [1]–[3], the novelty of this approach is the use of external sensors in combination of the information acquired through the AR device for accurate waypoint location and orientation.

II. Setup

The demonstration setup, as shown in Fig. 1, comprises: a UR10 robot, a multi-finger suction gripper, a wrist Robotiq camera, two types of objects (sugar sachets, and coffee pods), two trays (green and blue) with distinct QR markers, and a HoloLens. The wrist camera complements HoloLens camera's capabilities, for high accuracy pick and place. The objects and QR markers were trained through Robotiq vision software.

III. AR Interface

In the AR interface, the location of the robot base with respect to the HoloLens is calibrated using a marker. This calibration is only necessary in the first use unless the robot position is changed. Then, the 3D location of the QR markers is specified through hand gestures pointing at grid cells produced by the HoloLens spatial mapping. Subsequently, objects are matched to a tray each for placing by ticking a box with hand gestures. Upon confirmation, the resulting pick-and-place program is produced and sent to the robot for execution. The robot will move to a predefined location to pick objects of a certain type. Then, the robot will move to the correspondent QR marker location, to find the tray center and place the specified objects accurately. A similar pick and place operation is performed to pack the objects of the second type in the other tray. The program uploaded onto the robot can be executed indefinitely if new objects are loaded or changed after completion of each packing task if the location and/or content of the trays must be changed.

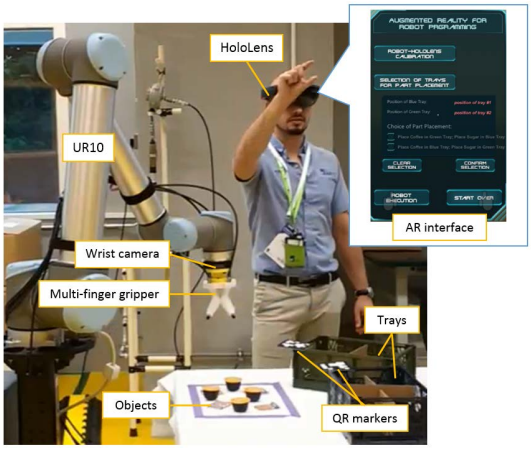

Fig. 1. Demonstration setup and AR interface.

IV. Conclusions

The proposed demonstrator allows quick and easy re-configuration of the packing application without requiring previous robot programming knowledge. The system could be enhanced to allow even further parametrization by allowing the selection of the picking area or mixed content of the trays.

Acknowledgments

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References

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