Enabling Human-Robot-Interaction via Augmented and Mixed Reality System

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Introduction

- Human Robot Interaction (HRI) will be a key component towards smart factories of the future (FoF).

- HRI must strictly adhere to the industrial standard safety requirements by taking into consideration how the system communicates with the user ensuring utility and safety (distance between the operator and the robot).

- User interaction and instructions captured via AR are communicated to a Robot Operating System (ROS) powered robotic arm.

- Quality of Experience (QoE) evaluations at the user side will be performed to ensure optimum design of the HRI to ensure end user satisfaction.

- Factors impacting user QoE include Context, Human/Operator and System.

System Architecture Diagram

Window 10 Enterprise   Hyper-V Ubuntu 16

—— COMPLETED
—— REMAINING
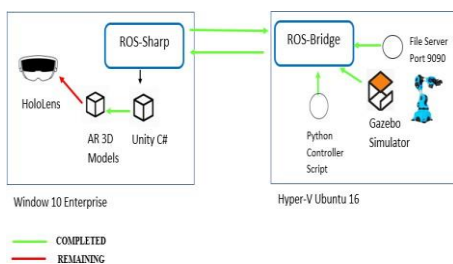
The aim of this research is to develop and evaluate based on QoE principles, a novel HRI that incorporates Augmented Reality (AR).

Use Case

This research concentrates on path planning stage of industrial robots, where AR technologies can be utilised by operators with limited background knowledge in robotic programming to:

• Plan and store end effector positions (from start to goal) of robotic arm with a HoloLens.

• Visualise the planned simulated robot arm trajectory in ROS.
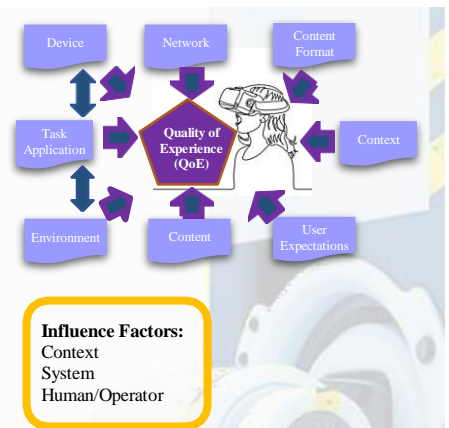
Research Problem and Methodology
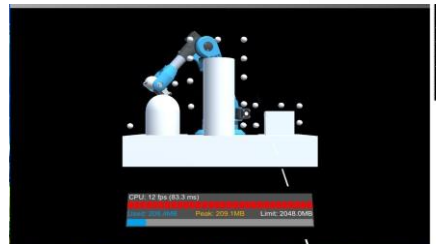
RQ: How can we design AR applications to be used as a viable HRI tool in industry 4.0?
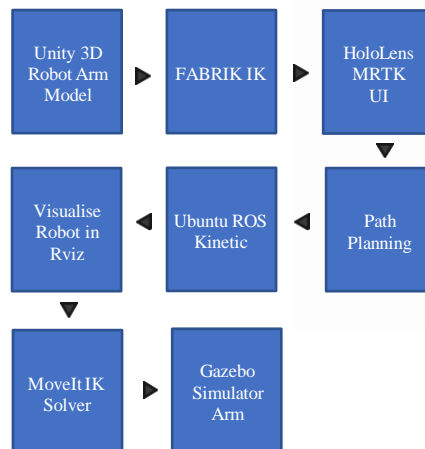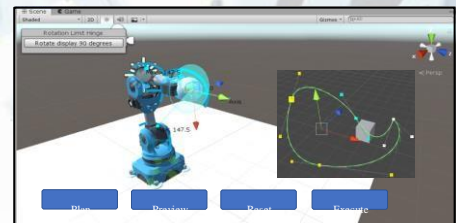

Conceptual QoE Model for Augmented and Mixed Reality

Quality of Experience (QoE) evaluation at the user side will be carried out:

Influence Factors:
Context
System
Human/Operator

Discussion

- We believe that the design of robotic paths can reduce human operator's workload.

- In future, we will be concentrating on HoloLens user interface design exploring different type of waypoint systems/robotic paths.

- We will then evaluate user QoE by using Likert Scale, Mean Opinion Score, Repeated Measure Analysis of Variance and etc.