Concept and development of Human Robot Interface using parametrized Augmented Reality

Creating Augmented Reality (AR) applications is currently a quite work intensive task since in most situations everything has to be built from the ground up based on some AR libraries. A relatively high programming skill level is required to do so. This Bachelor Thesis is aimed at creating a system that allows parametrized programming of Augmented Reality applications involving robotic systems. The main goal is to reduce the required programming skills / training to a minimum resulting in higher development speeds and thus lower over-all costs. (Parametrized AR System – PARS). PARS should be limited to a one to one system (one robot, one AR-user).

PARS input (for example): The system should act upon a certain set of input data, which can be categorized into two different types:

* Task data: Information that describes what the system should do and how it should behave. Possible datapoints could be tasks as written below:
  + Track real-world point: Define a real-world point and keep track of its position. The point’s data should be available for other tasks.
  + Track Hologram point: Define a virtual-space point and keep track of its position. The point’s data should be available for other tasks.
  + Define certain events: A set of events that will be triggered at some discrete time. Events can use tracked points as triggers.
  + Event handler: Event handler that are invoked upon an event triggering. Could for example be used to change a hologram’s colour.
  + Robot commands: Send movement commands to the robot.
  + (maybe more)
* Environment data: Information that is required for the execution of the tasks.
  + Robot’s physical configuration
  + 3D models to be used for holograms

This data could for example be organized in XML-based files.

PARS runtime task: The system should interpret the given input data and act according to the parameters defined in it.

PARS output:

* AR – Holograms projected into the real world space
* Robot moving according to the PARS task commands.

The main work focus should be on the following topics:

1. Define XML-based data structure for the input data
2. Create data interpreter that reads and understands the input data
3. Implement of all defined events and task possibilities
4. Test the system on a example use-case with a Fanuc collaborative robot.

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Optional names:   
- Human Robot Interface based on parametrized Augmented Reality  
- Proof of concept for parametrized Augmented Reality development  
- Development of a parametrized Augmented Reality system