Title:	A Reconfigurable robot workCell for fast set-up of automated assembly processes in SMEs
Acronym:	**ReconCell**
Type of Action:	Innovation Action
Contract Number:	680431
Starting Date:	1-11-2015
Ending Date:	31-10-2018
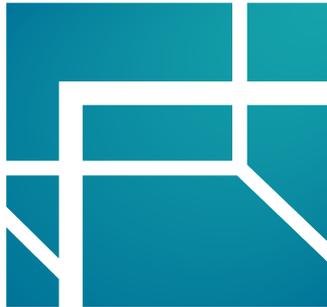
Deliverable Number:	D2.1
Deliverable Title:	Software environment for visual programming of assembly skills
Type (Public, Restricted, Confidential):	PU
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Contributing Partners:	MMI

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1 Content

Demonstration D2.1 consists of a video which shows the capabilities of the Visual Programming environment of the VEROSIM® software:

http://www.reconcell.eu/deliverables/D2-1.mp4

Starting from existing developments, the Visual Programming environment was largely restructured and enhanced for the ReconCell project. The Visual Programming environment is based on the concept of so-called ActionBlocks, which are described in detail in Deliverable D4.1. Using the given means of Visual Programming, the user first programs a simple robot motion by selecting a corresponding ActionBlock from an extensible library of ActionBlocks. On the canvas for Visual Programming, the user then connects this ActionBlock to an activity signal (to switch on the action at a given moment in time), to an agent (to define the robot or other automated instance executing the action) and relevant input parameters (here the target position in Cartesian coordinates). The result is then visualized in a detailed 3D simulation model of the ReconCell installation.

In a second step, the user extends the motion to a full pick-up cycle of a given object by adding and arranging corresponding ActionBlocks for three additional motions for approach, departure and transport as well as an ActionBlock for grasping on the Visual Programming canvas. The video then shows the resulting 3D simulation side-by-side with an animation of the ActionBlock network (see fig. 1). In a third step, the user uses another type of Action-Blocks to trigger a camera sensor in the cell. Based on the ActionBlock framework, similar sensor ActionBlocks will be developed for the ReconCell installation in order to coordinate the projection of structured light, sensing with stereo and depth cameras as well as triggering of processing algorithms such as pose estimation. In the simplified example here, the agent is a sensor that –upon receiving the activity signal– produces simulated 2D images which are then made available (e.g. based on ROS) for data processing algorithms in the project. In the video, the resulting image (of the grasped object) is directly displayed as an overlay to the 3D simulation.

Finally, the video shows the full assembly use case of partner ELVEZ, where the whole assembly sequence was implemented using the Visual Programming environment in VEROSIM®. This last part of the video was presented as part of the ReconCell appearance at Automatica 2016 fair in Munich. With further explanations, this video for Automatica was also made available on YouTube: https://www.youtube.com/watch?v=Qs-0zBPyPIA.
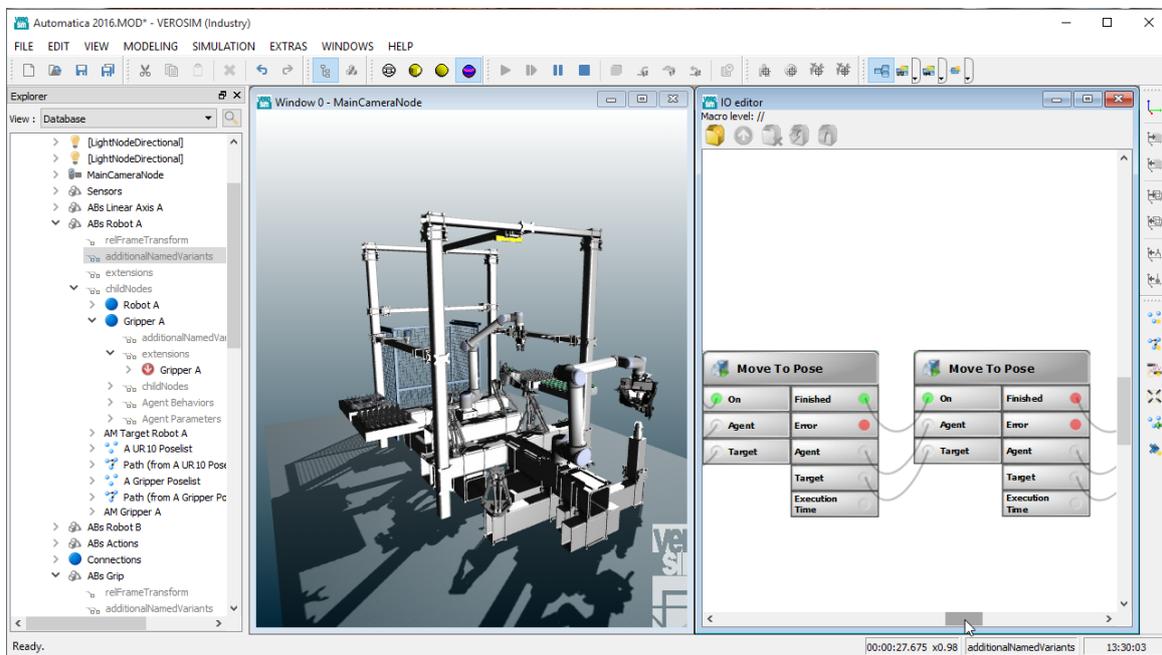
Figure 1: Side-by-side view of ActionBlocks and the corresponding 3D simulation.