VirCA NET: A Collaborative Use Case Scenario on Factory Layout Planning

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Abstract for plenary demonstration

***Abstract*—In this demo a remote collaboration tool involving networked VR systems will be introduced. The demonstration is performed with the contribution of MTA SZTAKI, FBK - University of Kaiserslautern and the Antal Bejczy Intelligent Robotics Center - Óbuda University. Thereby a typical use-case coming from the Manufacturing Engineering field will be addressed. Users at Budapest, Hungary and Kaiserslautern, Germany will come together in a shared virtual environment provided by VirCA NET (Virtual Collaboration Arena Network). They will be able to investigate a joint digital shop floor model, interact with intelligent virtual agents, and identify and solve problems as if they were co-located in an immersive visualization system.**

I. Introduction

The scenario is composed by three spatially distributed planning entities, which are each pursuing a special point of view towards the factory layout planning problem. Budapest (Óbuda University) will represent a robotic specialist, providing a virtual robot that is implemented in a hardware-in-the-loop setup. Kaiserslautern (FBK - University of Kaiserslautern) will represent the local production plant, where the shop-floor to be optimized is located and local knowledge is bundled. Kosice, as central planning unit, will represent the head office, where a central Industrial Engineering division is located. The three collaborators are participating in a shared virtual environment provided by the VirCA NET framework. For details about VirCA please be referred to [1].

II. Use-Case Definition, Objectives and Challenges

The specialists in Budapest and Kaiserslautern will perceive the shared virtual environment by the possible usage of full immersive CAVE systems. This allows them to analyze the future shop floor and its objects at scale 1:1, while Kosice head office will use a laptop instead. In this cooperative session all three entities will work in the online live-demo on the optimization of the shop floor layout. Thereby Budapest Partners will focus on the integration of a robot. Kaiserslautern partners will take care to address requirements coming from the machine tools and Kosice will be in charge of a balanced overall performance. The joint positioning and relocation of objects will be the main task to carry out. But also functions related to robotics will be performed in real-time. Three main focuses, the system structure, the shop floor layout and the operation of the manufacturing system are managed within the VirCA NET framework.

This setup is typical for evolving worldwide markets and the industrial reaction on this trend. Globally dislocated production facilities require spatially dislocated planning teams, if planning relevant specialists are distributed within a production network. The need to support such planning teams by distance collaboration tools is identified throughout the research community. The approach introduced in this demo aims at transferring existing VR-enhanced work-flows for factory layout planning activities to a shared virtual environment. Hence planners can reuse their already learned skills and adopt them to the spatially distributed planning network, as if partners were co-located. To enable such a flexible and synchronous collaboration system three main challenges have to be taken into account.

- shared model visualization
- human-model interaction features
- human-human interaction features

Complementary to the challenges coming from the field of Mechanical Engineering, corresponding demands out of computer science and Cognitive Infocommunications [2] can be identified. To go deeper into these topics we refer to [3], [4]. Figures 1 and 2 shows screen shots from the virtual scene and the underlying System Editor window.

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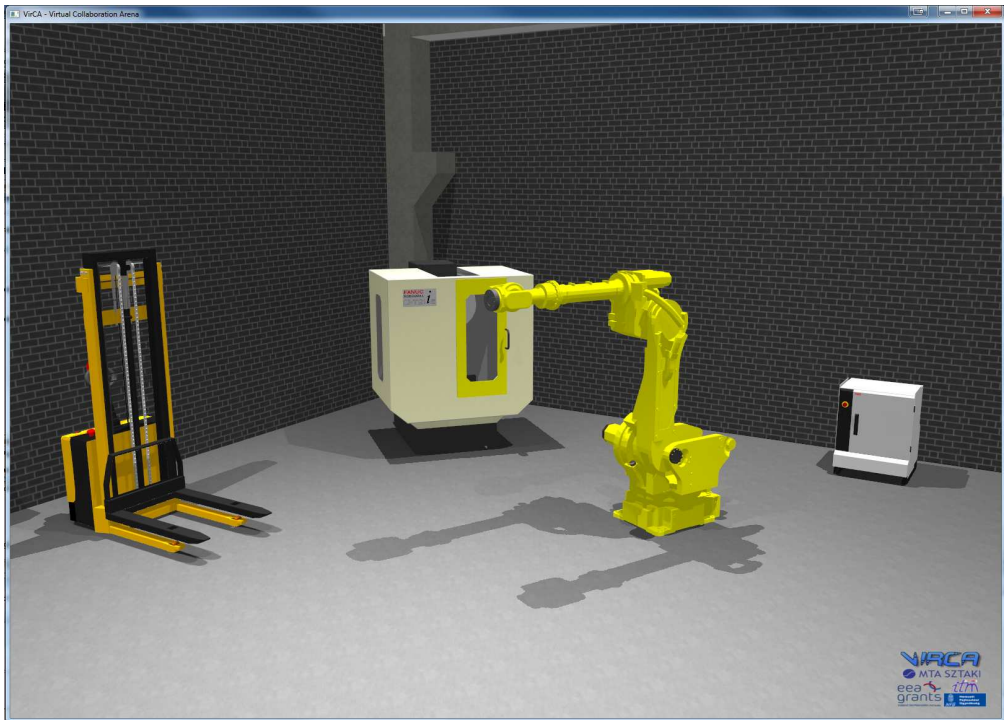

Fig. 1. A screen shot from the viewpoint of a collaborator

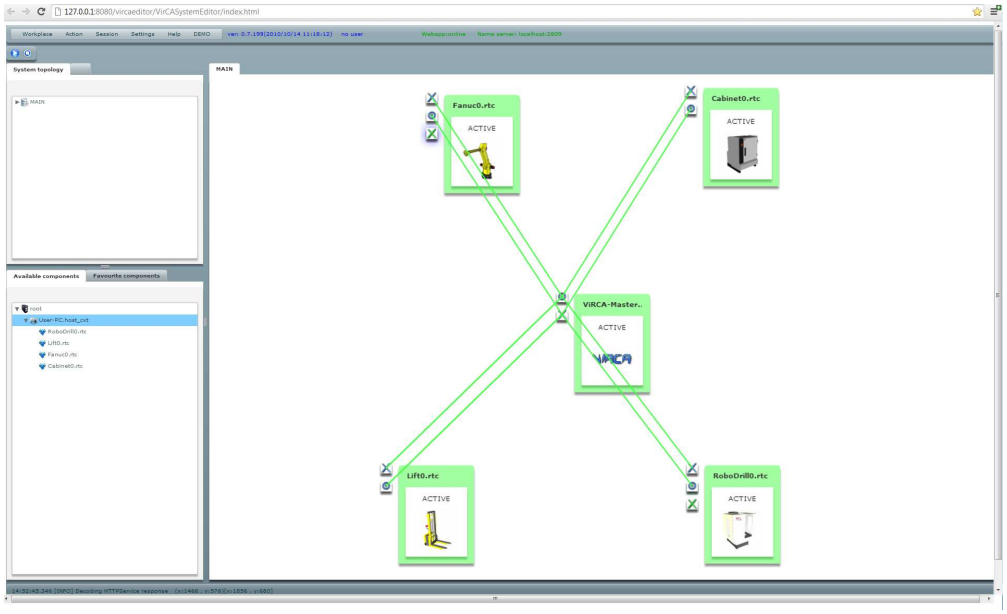

Fig. 2. The virtual shop floor is populated with machines as virtual building blocks in the VirCA System Editor

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