A KUT Virtual Training System for Technology Education

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Abstract

VR opened the possibility of moving beyond the 2-D world of conventional desktop systems to an immersive, multi-sensory environment generated by computer graphics. In this paper, a system developed for the purpose of technology education training is presented. The presented system is the VR-based training system for training automation engineers in the field of factory automation (FA).

Introduction

Virtual reality (VR) is defined as a high-end user-computer interface that involves real-time simulation and interaction through multi-sensory channels, such as the visual, auditory, haptic, smell, and taste ones[1]. VR opened the possibility of moving beyond the 2-D world of conventional desktop systems to an immersive, multi-sensory environment generated by computer graphics. The interaction component of this user interface involves multi-sensory channels, The majority of today's VR simulations use the visual (3-D stereo displays) and auditory (interactive or 3-D sound) modalities. Haptic feedback (Haptics) is now starting to get recognition and use in intensive applications for manipulation, while smell and taste feedback are at the stage of early research. This sensorial channel complements the visual and auditory feedback modalities used in current VR simulations [2]. The resulting complex system is more expensive than present PCs, but simulations with haptics are more realistic and more useful. Applications of haptics went beyond teleoperation into the more general and expansive field of data exploration and manipulation. Current commercial interfaces give users the ability to touch and feel virtual objects. In this paper, a system developed for the purpose of technology education training is introduced. The presented system is the VR-based training system for training automation engineers in the field of factory automation (FA). Next section gives a brief description on the virtual training system developed for technology education at Korea University of Technology and Education (KUT), and followed by conclusions.

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In this section, a brief description on the virtual training system developed for technology education at KUT (KUT VT system) is presented. The presented KUT VT system is the VR-based training system for training automation engineers in the field of factory automation (FA). Based on VR technology, the ultimate objective of the KUT VT system is to develop and provide an universal training platform which allows for 3C training environments: contents-upgradable, contents-changeable, and contents-reusable. With rapid advance of ICT, various types of devices (systems) used in today's industries have become more expensive and more cutting-edge, which thus makes trainees hard to experience. The KUT VT system can provide following technology education opportunities to trainees:

- virtual experience for highly-expensive technology system
- virtual experience for cutting-edge technology system
- virtual experience for accident-free technology system
- virtual experience for infinite and repeated education
- virtual experience without additional material cost

By maximizing the reality, the KUT VT system can provide the immersion and presence to trainees as if they feel

being at the place they work and have similar realistic and natural experience as if they do in real world. The KUT VT system has following features:

- 3-D stereo display with high resoulution (1200x1080 pixels) and updating rate (60hz)
- 3-D sound
- PLC (programmable logic control)-based 10 VR contents for training FA technology education.

Figure 1 shows the snapshot of conducting training using the prototype of the KUT VT system. Figure 2. A wiring training of Virtual PLC system. Figure 3 and 4 show some examples of PLC-based 10 VR contents for training FA technology education. In current stage, 3D stereo visual cues are used for providing immersion and presence to trainees, the haptic and motion cues to enhance the interaction between the VT system and the trainees will be added in upgrading the VT system in the next stage.

Figure 1. The prototype of the KUT VT system

Figure 2. A wiring training of virtual PLC system

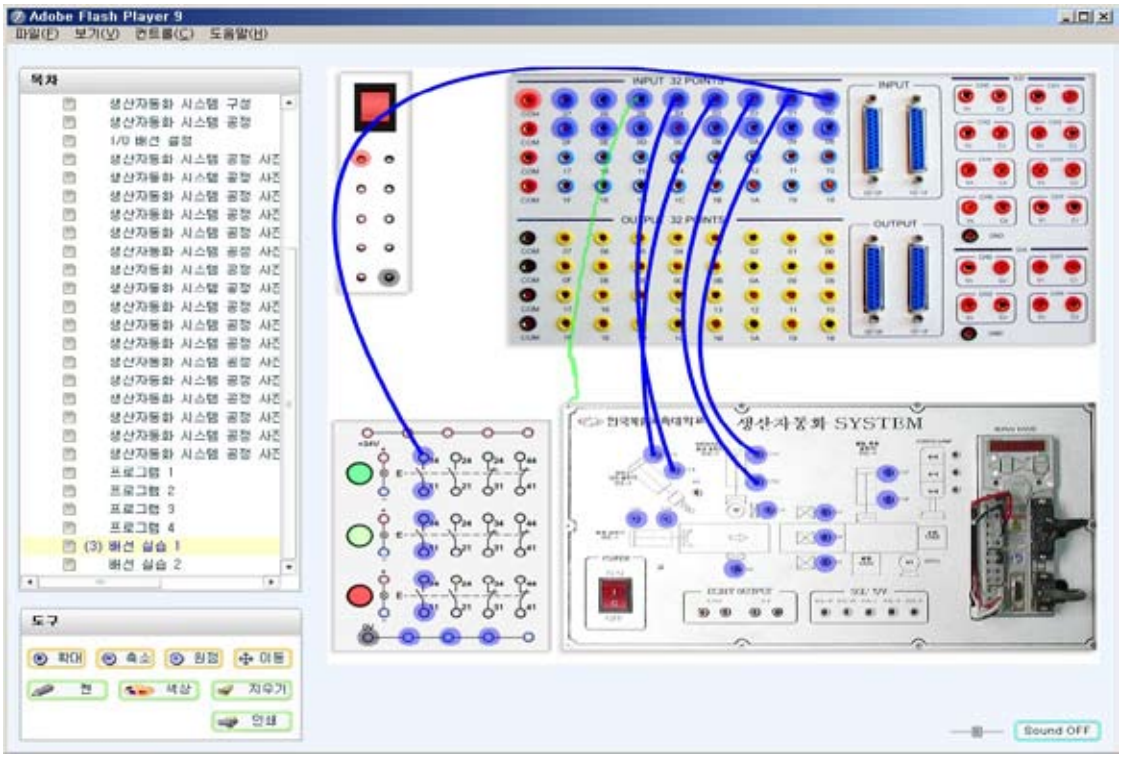

Figure 3. An example of PLC-based 10 VR contents for training FA technology education

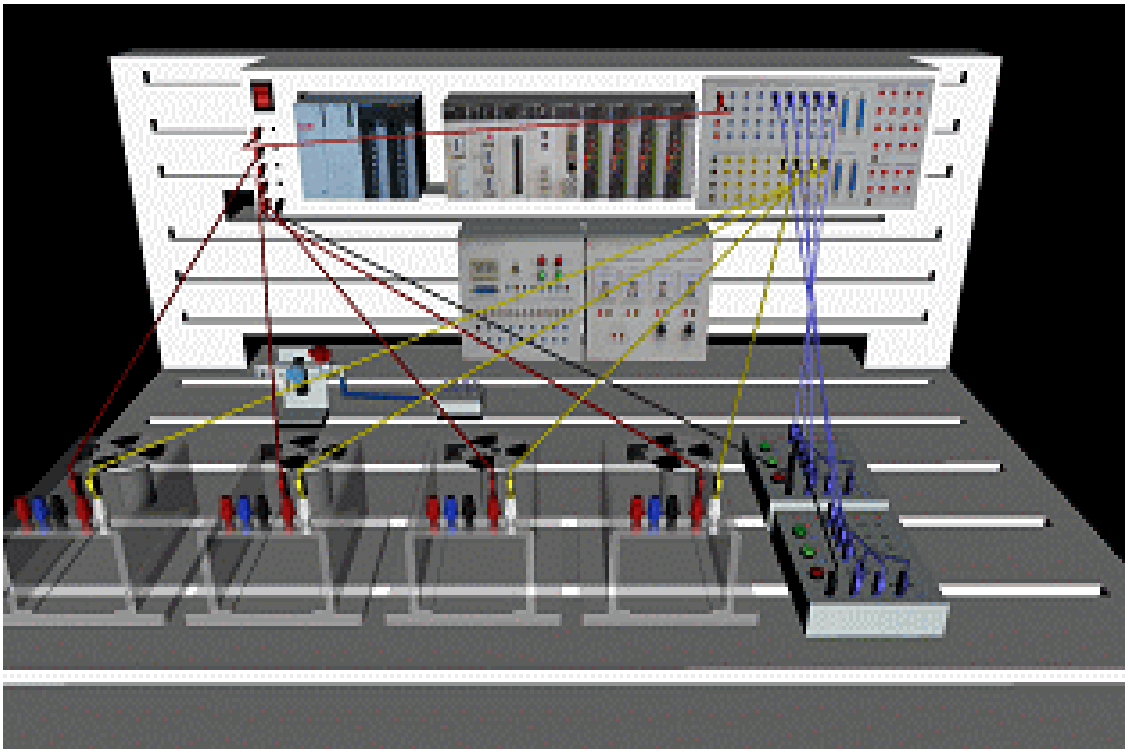

Figure 4. An example of PLC-based 10 VR contents for training FA technology education

Conclusion

Some of current works on the KUT VT system developed for technology education is introduced in this paper. VT systems based on VR technology have been rapidly disseminated in our daily training and education for either general purpose or special purpose such as military, medicine and space. The bottom line is the increased multi-sensory feedbacks, such as the visual, auditory, haptic, smell, and taste ones, with those VT systems to support more realistic and natural environment like real world to trainees no matter what the purpose is.

Acknowledgements

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References

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