Exploring Specialized Skill Training in Virtual Reality

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Abstract

Demonstration Training is one of the most primordial methods of training known. But this method of show and tell has its limitations in modern industries. Manufacturing industries, for instance, can't teach workers and staff, the working and operations of colossal machinery through demonstration, leading to them only absorbing surface level knowledge or inefficient operation method. We propose a training method in which two or more individuals, one of whom assume the role of the instructor, co-habitate a Virtual Reality environment and learn through interactions on a fully operational digital twin.

Design and Key Features

- The prototype comprises a room in Virtual Reality that is simple, spacious, and free of distractions.
- The room is shared by a trainer and N trainees. They can remotely join the room through the Internet.
- A "digital twin", a 3D model resembling and connected to a machine in the real world, also exists in this room.
- As the trainer interacts with the digital twin, the trainees can observe and also interact with it.
- This can also facilitate ad-hoc remote maintenance by streaming diagnostic data in real-time using IOT.
- Each session can be recorded and replayed for re-training or reference.

Methodology

- The trainer first logs into the application. They host a room over the Internet that trainees connect to.
- The trainee(s) then connect to the corresponding room.
- All the users are able to use their VR headsets and controllers to look and move around the room, and interact with the digital twin model on the pedestals.
- The trainer can communicate with the trainees using third-party voice conferencing software.
- The trainer can dissect elements of the model and freely manipulate them while explaining its functionality.
- The trainees can also interact with the digital twin is a similar fashion.

Fig. 1: Interiors of the VR Training Room with Digital Twin of an Engine

Fig. 2: Trainer (left) and Trainee (right) in VR Training Room

User Feedback

From the limited testing performed by the team, the candidates reported that they clearly understood the concepts explained to them, adding that it was more effective than conventional methods.

Future Work

- The experiment serves as a proof of concept that Virtual Reality can serve as a viable platform for demonstration training on the Industrial Scale.
- Future plans include conducting more in-depth user testing and analyzing their experience juxtaposed against conventional training methods.
- Additionally, the team would like to explore the effect of various kinds of input mappings on the learning experience along with the possibility of including more tactile elements like haptic responses to make the environment more immersive.

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