

A 3D Virtual Reality Hand Hygiene Compliance Training Simulator

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Abstract

Background: man observers are commonly used to monitor hand-hygiene compliance, but there is no standard approach to training these observers. Instructional videos exist, but they are primarily geared toward educating healthcare workers, not compliance monitors. Also, they represent a passive form of learning and they do not include a mechanism to evaluate how or even if participants learn.

Objective: To build a 3D virtual reality hand hygiene simulator that teaches all of the WHO 5 moments in an interactive environment.

Methods: The hospital architectural computer aided design (CAD) files were imported into the Blender development environment to create accurate 3D models of the hospital environment. A visual database of objects such as doors, beds, and medical equipment was used to populate every scene according to the locations of objects in the real clinical setting. Poser Pro was used to create realistic virtual character geometries as well as clothing and accessories (e.g., hair). To create high-fidelity animations for the virtual characters in the training simulation we imported motion capture files from the Carnegie-Mellon Motion Database pertaining to walking, and key-framed animations associated with hand washing and patient interventions. Virtual characters representing healthcare workers and patients move about in the pedagogical scenarios and perform activities based on the movements of people in the actual hospital ward.

Results: Below are the three main phases of the training simulation: (1) A tutorial phase in which the trainee learns the 5 Moments of hand hygiene in succession from the virtual instructor. The instructor teaches the trainee the situations pertaining to each moment with demonstrations, using speech, gestures and expressions. (2) An interactive training phase in which the trainee experiences ten randomly generated scenarios consisting of a virtual nurse "Simon" interacting with virtual patients and the hospital environment. The trainee has to evaluate if Simon follows the proper hand-hygiene procedures. The trainee records his or her observations via an evaluation interface. (3) A feedback phase in which the trainee receives a score for his or her performance in accurately identifying if Simon acted in accordance with the 5 Moments of hand hygiene.

Conclusions: The novel contribution of this work is an interactive simulation to teach and train users in the 5 Moments of hand hygiene. This simulation can be

used to evaluate and train observers and may increase inter-rater reliability. In addition, this simulator could be used in the same way that hand-hygiene videos are currently used to help educate healthcare workers, patients and families about hand-hygiene opportunities.

Playable Online Demo Available at:

<http://people.clemson.edu/~jbertra/WebPlayer.html>