Chapter 3

Virtual Standardized Patients for Interactive Conversational Training: A Grand Experiment and New Approach

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ABSTRACT

The USC Standard Patient is a virtual human-based conversational agent serving in the role of a simulated medical patient, also known as a virtual standardized patient (VSP). This research identified deficiencies of extant VSP systems, defined a robust set of requirements, and successfully achieved nearly all of them. Markedly impressive advancements were made in virtual human technology, techniques to apply natural language processing, automated assessment artificial intelligence, and pedagogical design. The effort succeeded with performance parameters of high conversational performance, accurate assessment, and strongly demonstrated user training effect. Although working well within its confined area of expertise, the ability for computers to create authentic mixed initiative conversations remains elusive. This effort leaves behind many lessons for interactive serious games, clinical virtual humans, and conversational virtual human training applications.

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INTRODUCTION

The advent of Virtual Standardized Patients (VSPs) as a conversational training tool is a recent, yet an evolutionary development from use of human patient actors for the training and assessment of medical interviewing skills. The use of human actors has considerable benefits but at high cost and with narrow availability. Advances with interactive technologies has furthered exploration of computer-based conversational approaches though sometimes with limited success. In this Chapter, we explore a large-scale and well-funded effort by the University of Southern California to make significant advances in VSPs along with the important technical, practical and pedagogical lessons that resulted from their experience. The implications success are relevant to virtual human avatar conversational training of all types and applications, and are certainly not exclusive to medical education.

The VSP itself is a conversational agent and is shown in Figure 1. Typically, the VSP features a three-dimensional avatar which simulates a conversation. With this format, there is typed or speech recognition-based input from the user which is processed by artificial intelligence-based (AI) natural language understanding (NLU) systems. The NLU system interprets the meaning of the user statement and matches it to the post appropriate response possible. In this manner, it is possible to create a simulated doctor-patient conversation, though typically it is limited to one side posing questions and the opposite one responding to them.

In 2013, the University of Southern California (USC) began a nearly eight-million-dollar US Defense Department research project to develop a new type of VSP which promised to overcome the operational limitations of prior approaches and build upon lessons from both failures and successes. The effort is called USC SimCoach Standard Patient Studio (cf. https://standardpatient.org) aka “Standard Patient”. Five years, twelve-million-dollars and several studies later, the Standard Patient team is ready to share lessons learned and results of this ongoing experiment.

With the goal to create a viable Virtual Standardized Patient (VSP). The Standard Patent project successfully created a working prototype that is both a VSP experience and authoring tool. The prototype was designed to function through regular web browsers. As it is cloud based; it was modular and capable of multiple types of interactions, including natural language interviews, structured encounters (choice-based), physical exam, medical tests and an interactive after-action report (AAR). The VSP was designed to be physiologically static, as opposed to extant dynamic medical simulations. The authoring system, Standard Patient Studio, is an open-source sharing community that was created to foster a volunteer research base, as a use case exploratorium and for the creation of a critical mass of educational content. Standard Patient cases are modeled closely after human standardized patients, yet are designed for repetitive use for deliberate practice targeting diagnostic interviews.
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