Chapter 15
Affect-Sensitive Virtual Standardized Patient Interface System

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ABSTRACT

Virtual Standardized Patients (VSPs) are advanced conversational virtual human agents that have been applied to training of clinicians. These interactive agents portray standardized patient scenarios involving VSPs with clinical or physical conditions. VSPs are capable of verbal and nonverbal interaction (receptive and expressive communication) with a clinician in an effort to enhance differential diagnosis of psychiatric disorders and teach interpersonal skills. This chapter describes the design and development of both software to create social interaction modules on a VSP platform and individualized affective models for affect recognition. This author describes clinically relevant scenarios for affect elicitation and protocols for reliable affect recognition. Further, there is an elucidation of a VSP interface system that has the capacity to monitor the trainee's affective response using physiological signals. Research findings will be summarized from studies on (1) the usability and applicability of VSPs with training clinicians on various mental health disorders (e.g., adolescent male with conduct disorder; adolescent female who has recently been physically traumatized); and (2) preliminary use of the affect-sensitive system to systematically assess and manipulate aspects of VSPs to more fully develop cognitive and affective models of virtual humans with pathological characteristics.

INTRODUCTION

Traditional approaches to training clinicians in the interpersonal communication skills needed for assessment, diagnosis, and interview performance rely upon a combination of classroom learning and role-playing with human standardized patients. The importance of interpersonal communication is reflected in recent requirements

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for communication evaluation in medical schools. The Accreditation Council for Graduate Medical Education (ACGME; 2007) has emphasized the importance of interpersonal and communication skills in training clinicians. Residents are expected to: (1) create and sustain a therapeutic and ethically sound relationship with the patient; (2) use effective listening skills, eliciting and providing information using effective nonverbal, explanatory, questioning, and writing skills; and (3) work in an efficient manner with others. However, evaluation studies have revealed methodological deficiencies in many cases (Chant et al., 2002) and limited positive training effects (Hulsman et al., 1999). In an effort to increase interpersonal communication assessment, standardized patients (paid human actors) have been recruited and trained to exhibit the characteristics of an actual patient, thereby affording novice clinicians a realistic opportunity to practice and to be evaluated in a mock clinical environment. Although a valuable training approach, there are limitations with the use of human standardized patients that can be mitigated through simulation technology. For example, human standardized patients are expensive and cost several thousand dollars per student. Further, given the fact that there are only a handful of sites (for over 130 medical schools in the U.S.) providing standardized patient assessments of the clinician in training's communication ability as part of the U.S. Medical Licensing Examination (USMLE), the current model provides limited availability. Another concern is the issue of standardization. Despite the expense of standardized patient programs, the standardized patients themselves are typically unskilled actors. As a result of common turnover, administrators face considerable challenges for offering psychometrically reliable and valid interactions with the training clinicians. A related issue is the limited scope that the actors are able to portray. As a result, there tends to be an inadequate array of developmentally, socially, and culturally appropriate scenarios. For example, when a clinician has a pediatric focus and needs access to children, it is difficult for the clinician to pretend that the actor is a child. Finally, many clinical cases (e.g., traumatic brain injury) have associated physical symptoms and behaviors (e.g., dilated pupils, spasms, and uncoordinated movements) that simply cannot be accurately portrayed by human actors.

Design and Simulation of Pathologies

One proposed answer to some of the difficulties inherent in training persons with standardized patients, hence human actors, is to use virtual humans as patients. Virtual humans (VH) are developing into powerful interfaces that can enable greatly increased intuitive human like interactions. These virtual human systems consist of characters that have realistic appearances, can think and act like humans, and can express themselves both verbally and non-verbally. Additionally, these virtual humans can listen and understand natural language and see or track limited user interactions with speech or vision systems. Advances in simulated virtual humans afford the possibility of virtual standardized patients that reduce cost, ensure standardization and faithfully model physical symptoms. Virtual standardized patients (VSPs) are artificially intelligent (AI) virtual human agents that control computer generated bodies and can interact with users through speech and gesture in virtual environments (Gratch, et al., 2002). Advanced virtual humans are able to engage in rich conversations (Traum et al., 2008), recognize nonverbal cues (Morency et al., 2008), analyze social and emotional factors (Gratch and Marsella, 2004) and synthesize human communication and nonverbal expressions (Thiebaux et al., 2008). Building virtual humans requires fundamental advances in AI, speech recognition, natural language understanding and generation, dialog management, cognitive modeling and reasoning, virtual human architectures and computer graphics and animations. All of these technologies need to