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Nonverbal indicators of malicious intent: affective components for interrogative virtual reality training

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Abstract

Models of affective behavior are critical for the development of training systems that are designed to exercise social interactions. Potential applications include various security-oriented operations such as police interrogation, airport security, border crossings, and military peacekeeping. Aside from speech, humans also communicate through vocalizations and inflections, as well as with body language. Such nonverbal communication can convey affect such as anger or nervousness that is important in identifying deception. In this research, a trainee is asked to perform checkpoint duty and question drivers of vehicles about their identity and reasons for entering a secured area. Most of the encounters are routine and innocuous, but occasionally a scenario unfolds that requires additional interrogation and rapid decision-making the part of the trainee. These special scenarios require the individual to draw upon his/her knowledge of social interactions in order to make the proper decisions and act appropriately. Virtual environments that address this form of training are few. Accordingly, the present paper describes an ongoing program of research designed to generate affective states for intelligent agents, create affective component behaviors to convey cues for anger, nervousness, and deception, and provide a complex interrogative training

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environment to exercise judgment-based decision-making.

Keywords: Affective models; Virtual environments; Emotion; Body language; Deception

1. Introduction

Old Dominion University (ODU) has been performing research in the area of training using virtual environments. The research involves computer-controlled virtual humans and live human participants taking part in an interrogative scenario, whereby various tasks are trained and evaluated in a virtual environment. The encounters include interchanges where affective states exhibited by the virtual humans are vital to the success of complex training tasks. These complex training tasks require individuals to exercise judgment regarding social interactions and make quick decisions based upon those interactions. The scenario used is a checkpoint operation in a typical third world urban area. The trainee is presented with a series of innocuous routine encounters. Occasionally, a scenario unfolds that appears slightly different but incorporates one of several fundamental training objectives. The participant must react or risk injury to himself or others. Importance is placed on cues that are precursors to aggression and/or hostile activities.

There are numerous nonverbal cues that convey information. The most obvious source of information is the face (Ekman, 1999). Beyond the face, body posture and movements can also convey information. Although individuals may learn to control their facial expressions, they rarely mask their body language. The focus of this paper is to describe the use of affective computing in the development of higher fidelity behaviors that include the aspect of emotion in order to create a more complex environment for the trainee—an environment more conducive to the training of judgment-based decision-making in social interactions.

Research has shown that humans are quite adept at identifying emotions in static line drawings (Wehrle et al., 2000) and remarkably proficient at gleaning critical information from even the most impoverished dynamic displays (Barclay et al., 1978). Thus, even a low fidelity simulation can result in positive training benefits, provided that the critical cues are present and the key behaviors are exercised. A goal of this research is the integration of intelligent agent technologies with virtual environments. As a consequence, instead of concentrating on the fidelity of the graphical models, this research concentrates on the fidelity of the behavioral models. Thus, high-fidelity human agents have been utilized from the Jack project at the University of Pennsylvania. Using Jack as its base of human physical movement, the research team has been developing an architecture that supports the incorporation of affective component behaviors into virtual environments.