UNIVERSITY OF CENTRAL FLORIDA

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"Enabling Natural Human Interaction in Immersive Virtual Environments"
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ABSTRACT

Advances in virtual worlds, augmented reality and human computer interaction technologies are enabling the creation of immersive and interactive virtual learning environments suitable for training soft skills like leadership, cultural awareness, negotiations, and decision making. A key challenge, however, is to capture and understand human (trainee) behavior at a fidelity sufficient to estimate trainee's cognitive and affective state as manifests through multiple mediums including speech, body pose, gestures, gaze etc. We present an approach that uses a multitude of sensors (Kinect, Camera, Microphone) to estimate mid and low level cues such as Head Pose, Gaze, Facial Muscle Movements, Facial Gestures, Body Pose and Para-linguistics. However, analyzing each of these modalities in isolation may result in incongruities. In addition, the affective state of a person shows significant variations with time and therefore its temporal dynamics need to be effectively modeled. To address this issue our approach for multi-modal affect analysis integrates data from multiple modalities while also taking into account temporal dynamics. Our fusion approach, Joint Hidden Conditional Random Fields (JHRCFs), combines the advantages of purely feature level (early fusion) fusion approaches with late fusion to simultaneously learn the correlations between features from multiple modalities as well as their temporal dynamics. We demonstrate our approach in the context of simulated intelligent tutoring systems where a detailed understanding of human/trainee behavior is used to customize and drive the flow of training scenarios.

BIOGRAPHY

Saad Khan is a Senior Scientist at SRI International with expertise in developing computer vision and human machine interaction algorithms. He has led the design and development of advanced military training systems that can adapt to both training scenarios and learners' behavior. He serves as Principal Investigator on programs in multimodal sensing algorithms for immersive training for DARPA, ONR and PMTRASYS. He led the development and transition of APELL (Automated Performance Evaluation and Lessons Learned) training system. APELL is an immersive, interactive, Mixed Reality training system that has been successfully deployed at the Marines Camp Pendleton training facility. Prior to joining SRI Sarnoff, Dr. Khan conducted research on 3D model based object tracking and human activity analysis. His work in automated image based localization earned an Honorable Mention award at the International Conference of Computer Vision 2005. He has authored over 20 papers and has 2 issued patents. He received his PhD in Computer Science from University of Central Florida.