

## Virtual Humans

Interactive virtual worlds provide a powerful medium for experiential learning. The overarching goal is to enrich such worlds with virtual humans—autonomous agents that support face-to-face interaction with people in virtual environments—thereby making them applicable to a wide range of training tasks that currently require labor-intensive live exercises, role playing or are taught non-experientially. ICT's virtual human work promotes fundamental advances in artificial intelligence, graphics and animation. Agents must perceive and respond to events in the virtual world, they must have and express realistic emotions, and they must be able to carry on spoken dialogues with humans and other agents, including all the non-verbal communication that accompanies human speech. The virtual human effort consists of seven closely linked sub-efforts. These efforts include:

**Cognition and Emotion:** Research and development relating to the cognitive reasoning of a virtual human, emphasizing the close connection between cognition and emotion posited by current psychological and neuroscience findings (Gratch & Marsella, Project Leaders).

**Natural Language Processing:** Research and development of sophisticated natural language processing (NLP) capabilities to allow virtual humans to both understand and produce English speech in the context of a coherent ongoing task (Traum, Project Leader).

**Nonverbal Perception and Learning:** Research and development efforts to recognize, model and predict human nonverbal behavior in the context of interaction with virtual humans, robots and/or other human participants (Morency, Project Leader).

**Virtual Human Embodiment:** Research and development of virtual human physical behaviors including when behaviors are exhibited, their communicative function, and how to effectively realize the motion in a virtual human body (Marsella, Project Leader).

**Integrated Virtual Humans:** Development to support the integration of basic research efforts into a coherent, common and shared architecture for virtual humans. This effort contributes primarily to the challenge of building a modular and authorable virtual human through the development of core tools and infrastructure (Hartholt, Project Leader).

**A New Breed of Cognitive Architectures:** Research and development of a new breed of virtual human architecture that is broad-spectrum, tightly integrated, prediction-oriented and functionally elegant (Rosenbloom, Project Leader).

**Assessing the Social Effects of Virtual Humans:** Evaluation of virtual humans with the aim to understand the relationship between virtual human fidelity (both visual and behavioral) and learning outcomes within the domain of interpersonal-skills training (Gratch, Project Leader)

**Character Animation and Simulation:** Investigate, discover and develop methods for the synthesis of motion on a virtual character. Efforts include development of a large motion database primary from motion capture, identification of animation and synthesis methods suitable for photorealistic characters, as well as control over hand postures and gestures. (Shapiro, Project Leader)



This research is funded by the U.S. Army as part of the core mission of the USC Institute for Creative Technologies.

At the University of Southern California Institute for Creative Technologies leaders in artificial intelligence, graphics, virtual reality and narrative advance low-cost immersive techniques and technologies to solve problems facing service members, students and society.