ICT Mission Rehearsal Project

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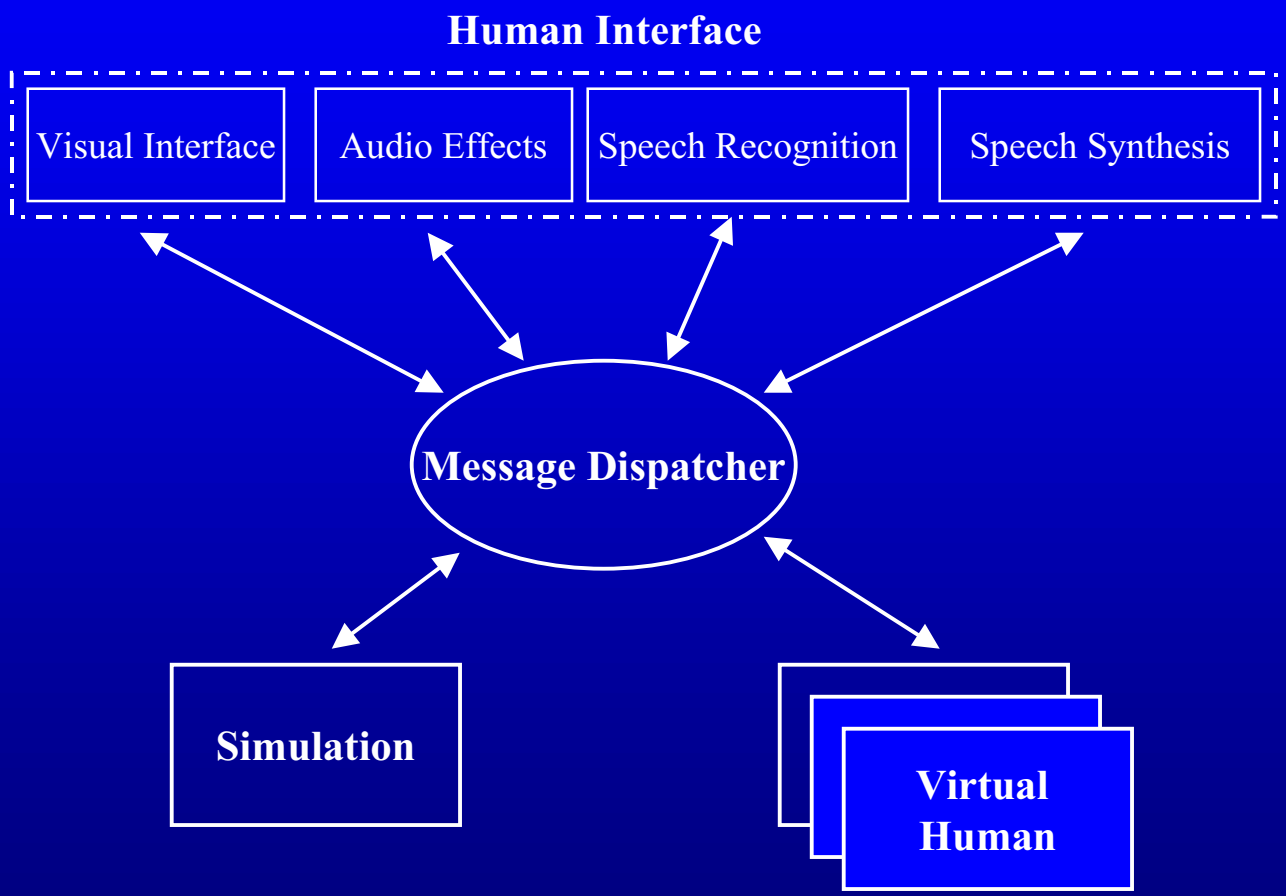
Mission Rehearsal Objectives

- Team training in virtual reality
  - Rapid, low-cost creation of virtual mock-up and training scenarios
  - Teammates can train together anywhere, anytime
- Virtual humans play the role of missing people
  - Instructors
  - Teammates
  - Adversaries and “extras”
- Focus on scenarios that require face-to-face interaction
  - Complements prior work in battlefield simulations

Virtual Reality Architecture

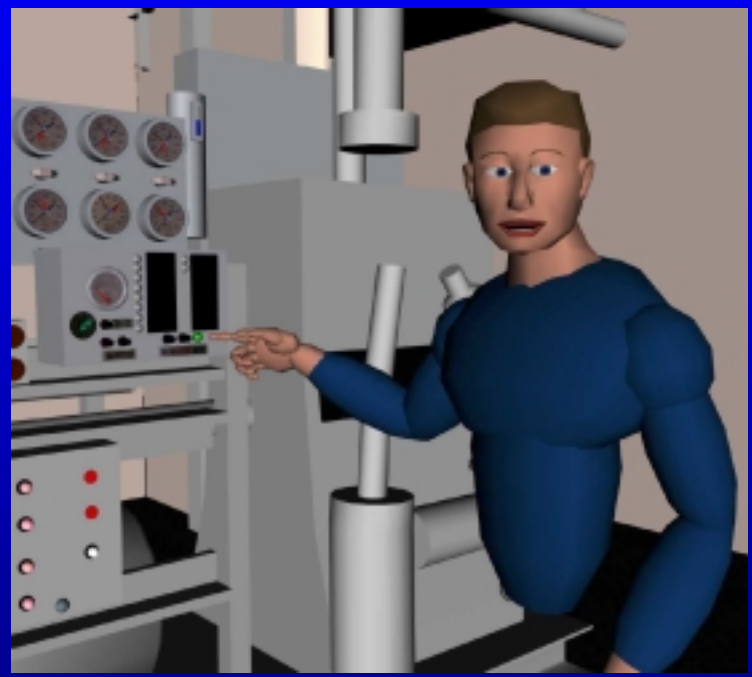


Building Blocks for Virtual Humans

- Virtual human bodies
  - e.g., Badler, Thalmann, Raibert
- Virtual human instructors and teammates
  - Rickel and Johnson
- Spoken task-oriented dialogue
  - e.g., Allen, Smith and Hipp
- Model of human perception and attention
  - e.g., Chopra, Hill
- Task-oriented model of emotion
  - e.g., Gratch

STEVE: A Virtual Human for Training

- Cohabits virtual world with students to serve as instructor or teammate
- Supports face-to-face interaction
  - Navigational guidance
  - Interactive demonstration and monitoring
  - Team collaboration
- Behavior not scripted
  - General capabilities for task-oriented collaboration (e.g., planning, dialogue)
  - Domain-specific task knowledge represented as hierarchical plans



Spoken Task-Oriented Dialogue

- Spoken dialogue is crucial for team training
  - Tutorial interaction
  - Team coordination
- STEVE uses commercial speech recognition and synthesis, but no natural language understanding
  - Range of acceptable utterances is too small
  - Interpretation insensitive to context
- Spoken task-oriented dialogue systems are now available as research prototypes
  - Multiple research labs (e.g., Allen, Smith and Hipp)
  - Unrestricted, continuous speech
  - Relies on same basic task representation as STEVE

Human-like Perception and Attention

- VR offers a perceptually realistic training environment
  - Teach people how to exploit perceptual cues
  - Model the information available to teammates
- STEVE is currently omniscient
- Elements of a more realistic model
  - Model of limited perception (Hill)
  - Combine task-related gaze (Chopra) with social uses of gaze (Cassell)

Task-Oriented Models of Emotion

- Emotions play a key role in decision making
- STEVE is unrealistically rational
  - Should be more motivational as an instructor
  - Should be more realistic as a teammate
- Research on computational models of emotion has exploded over the last ten years
- Gratch's work on task-oriented emotion is especially applicable to virtual humans for team training
  - Relies on same basic task representation as STEVE
- Personality should be configurable

Next-Generation Virtual Humans

- Integrate and extend the state of the art in core technologies into a single integrated architecture
  - Virtual human bodies (Boston Dynamics Inc.)
  - Virtual human instructor and teammates (Rickel and Johnson)
  - Spoken task-oriented dialogue (Hovy and Knight)
  - Human-like perception and attention (Hill)
  - Task-oriented models of emotion (Gratch and Marsella)
- Apply such virtual humans to Army mission rehearsal scenario
  - Illustrate and evaluate their capabilities

Mission Rehearsal Milestones

- 6 months: Illustrate the vision
  - Mock-up demo to show target capabilities of system
- 1 year: Integrate core technologies
  - Immersive graphics, spatial audio, virtual humans
- 2 years: Principled team training
  - Teaching task skills and team skills
  - When and how to provide instructional feedback
  - Instructionally useful mistakes by teammates
- 3 years: Perceptual fidelity
  - Feeling of full immersion
  - Appropriate perceptual cues from environment & virtual humans