

turning knowledge into practice

Fun with interactive dialog systems

Studies involving conversations with little kids, surly teenagers, subject matter experts, telephone survey respondents, schizophrenics, clinic patients, impatient customers, and other regular people

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□ Support:

- Agency for Healthcare Research and Quality.
- National Cancer Institute.
- National Institute of Justice.
- National Institute on Drug Abuse.
- National Science Foundation.
- RTI Internal Research and Development.
- U.S. Army Medical Directorate.
- Others.

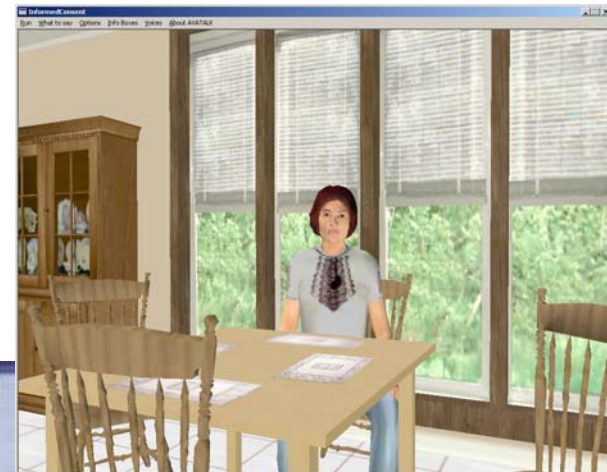
Mile-high view

- In the TAL group, it's all about the intelligent use of technology for learning or training.
- But unstructured experiential learning is not the solution.
 - Training analysis.
 - Systematic design.
 - Develop to standards.
 - Usability.
 - Assessment / analysis of AAR's.
- Individual training.
 - Can control initial conditions.
 - Graduated complexity.
- This talk focuses on one technology - synthetic characters



What is synthetic character technology?

- ❑ Character:
 - Behaves realistically in a given situation.
 - Responds to natural dialog, not pre-selected.
 - Body movement is appropriate to mental, physical state.
 - Facial expression represents emotional state.
 - Choice of verbal response is contextually appropriate.
- ❑ “responsive virtual human”, “embodied conversational agent”
- ❑ Not [typically] video-based.
- ❑ Character acts as if he/she/it is:
 - Angry.
 - Confused.
 - Sad.
 - In a pleasant mood.
 - Knowledgeable.
 - Tired.
 - Paranoid.
 - In pain.
 - Of a specific culture.
 - A child.



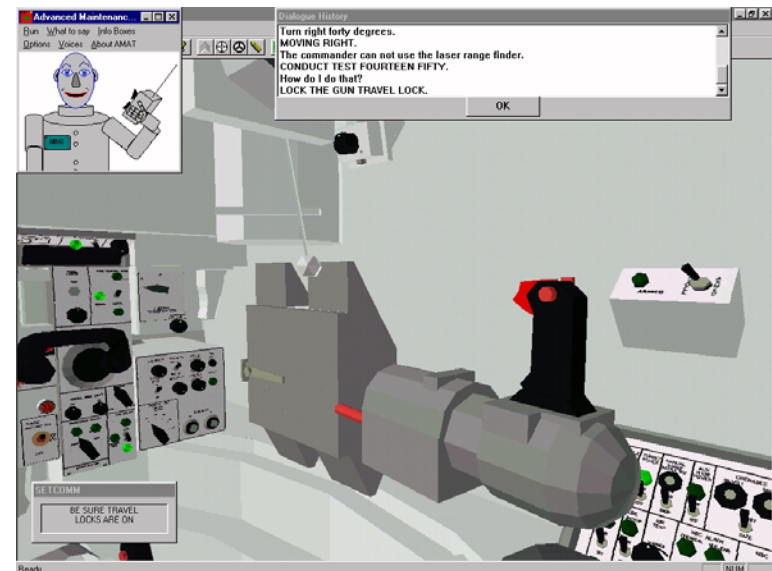
Why synthetic character apps?

- ❑ Training on knowledge elicitation for diagnostics.
 - ❑ Training on interaction skills.
 - ❑ Assessment of social competency.
 - ❑ Exposure to biased or tacit reasoning.
- ❑ Representative applications:
 - Managing encounters with the mentally ill.
 - Virtual trauma patient and bioterrorism clinical patient simulator.
 - Virtual pediatric standardized patient.
 - Assessment of demonstration of risky behaviors.
 - Development of a national intelligence estimate.
 - Telephone surveys interviewer.
 - Trade-show marketing applications.



Where did our interactive dialogs start?

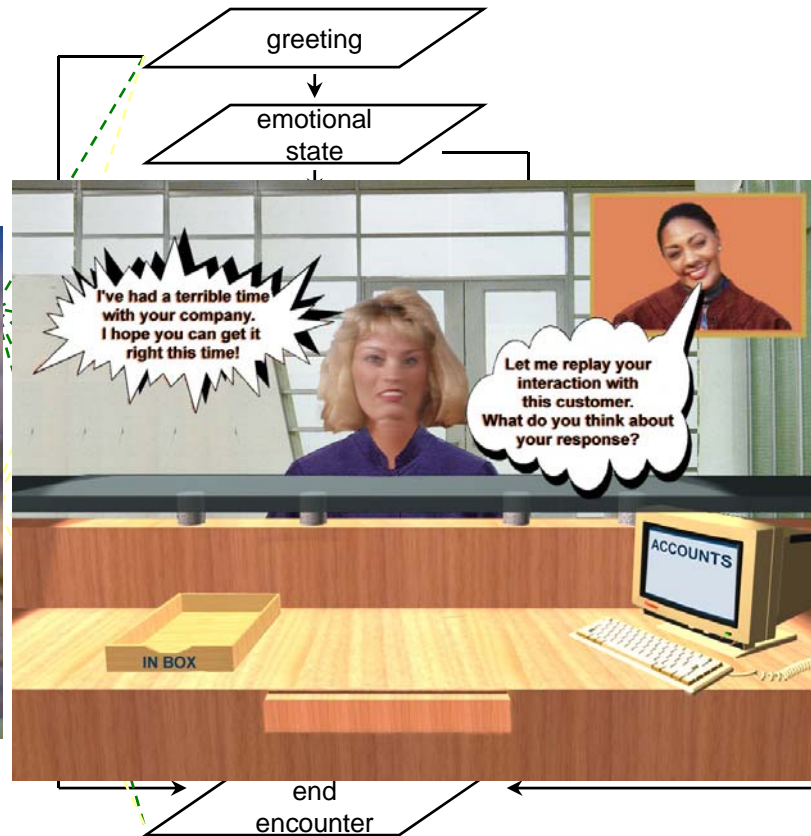
- ❑ Spoken natural language assistant for repair of the M1A1 tank.
- ❑ Employed “circuit fix-it shop” parsing technology.
- ❑ Flow controlled by technical manuals.
 - Assistant guided user in diagnostic tests.
- ❑ Users dug the tin man, so we left him.



Foray into extended dialog: Banking

❑ Visual-customer service transaction.

- Cash a check (requires verification of account and of funds).
- Institutional statement error.



Focus on key phrases and tailoring: Survey

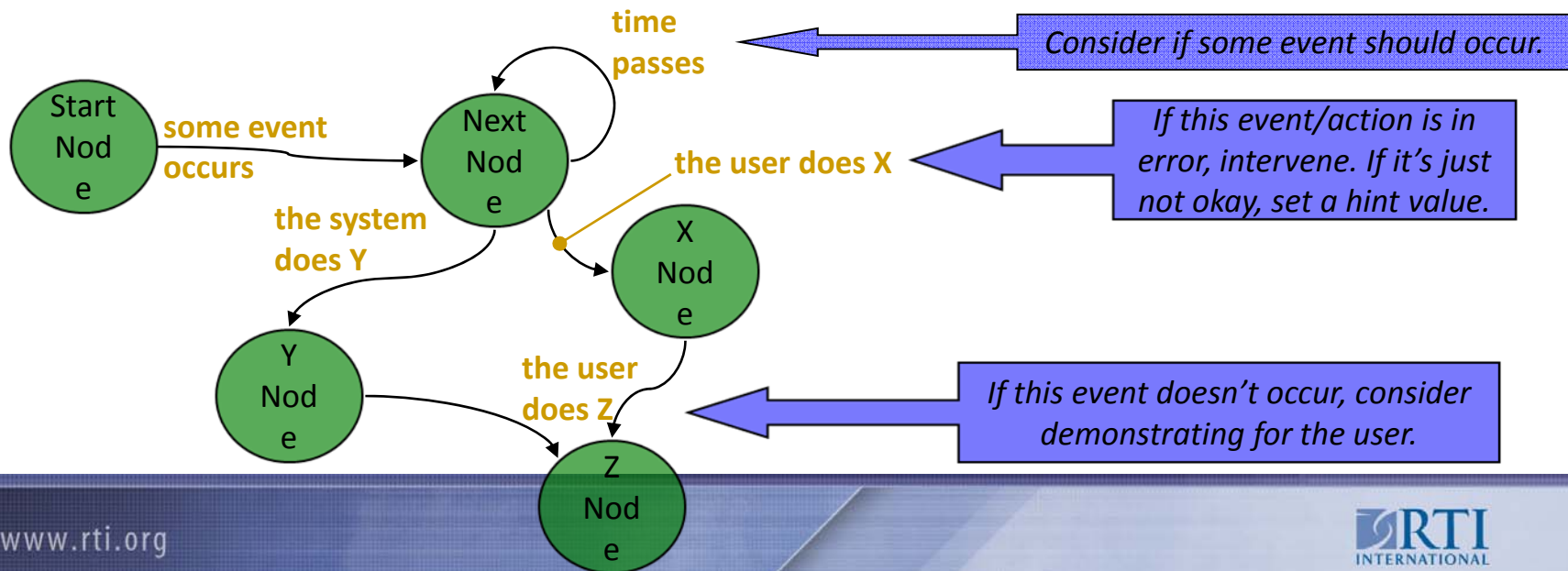
- ❑ Simulation designed to simulate first 30-60 seconds of a field/telephone interview.
 - Overcome survey non-response.
 - Allow interviewers to identify and address respondents' concerns immediately with appropriate, tailored language.
 - Use appropriate language, e.g., during introduction.
 - Extend content of conversation (e.g., reference items in environment).



- ❑ Tutor can take the role of demonstrator, coach, mentor, observer.
- ❑ Visuals started to become a limiting factor.
 - Move to game platform.

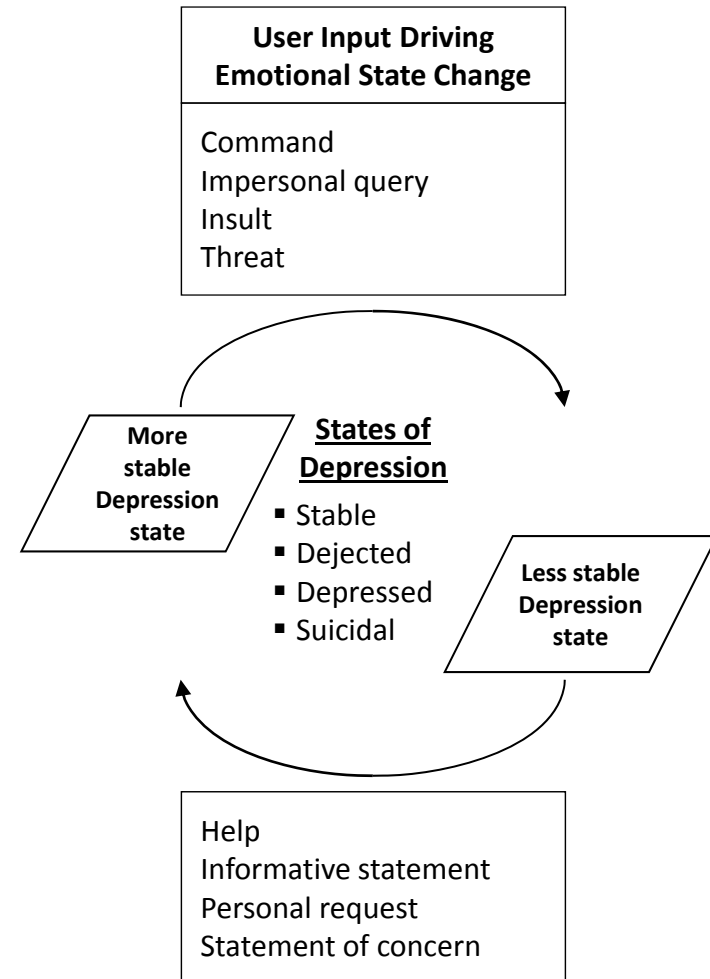
Tutoring

- ❑ Tutoring viewed as a layer atop dialog control.
- ❑ Linked actions to specific measurable events (performance measures).
 - Requires assessment of protocols and standards and subject-matter expert input.
 - Tutoring should focus students on need-to-know competencies, providing links to prescriptive training.
 - Take into account reasoning behind student actions.
- ❑ Querying virtual tutors allows strategic and reflective thinking.



Integration of emotional state into dialog model

- ❑ Needed to portray different customers:
 - Pleasant.
 - Dazed and confused.
 - Upset.
 - Hurried.
- ❑ Later extended to handle both user input and character output.



Linguistic and gestural modeling

- ❑ Need to understand structure, flow of conversations and reusability of conversational elements.
- ❑ Need to interpret inputs:
 - Commands, queries or requests, statements of appreciation or understanding, threats or insults.
 - Appropriateness to particular virtual character and situation.
- ❑ Need to generate appropriate responses.
 - Reply, question, challenge, deny, zone out.
- ❑ Need to provide informative gestural animations:
 - Whole body, head, arms/hands, facial expression.
 - Following pragmatics of conversation, as understood by particular virtual character.
- ❑ Limitation: Did not capture user vocal affect, facial expressions, or gestures.
- ❑ Again, the virtual human should act as if...



Linguistic modeling: Conversational structure

- Introduction:
 - Greeting.
 - Dispatch.
- Interview, process transactions:
 - Determine emotional state.
 - De-escalate situation.
 - Elicit information.
 - Provide assistance.
- Resolution:
 - Successful outcome to encounter.
 - Unsuccessful outcome to encounter.
- Process error.

- But the process of selecting synthetic character responses is algorithmic:
 - Schizophrenic example.

	Appeased	Ticked	Angry	Enraged
Terrified	Deny	Deny	Question	Challenge
Afraid	Deny	Deny	Question	Challenge
Scared	Reply	Zone out	Zone out	Challenge
Calm	Reply	Reply	Challenge	Challenge

- Fuzzy; does not have to be categorical.

Linguistic modeling: Lexical, syntactic, semantic analyses

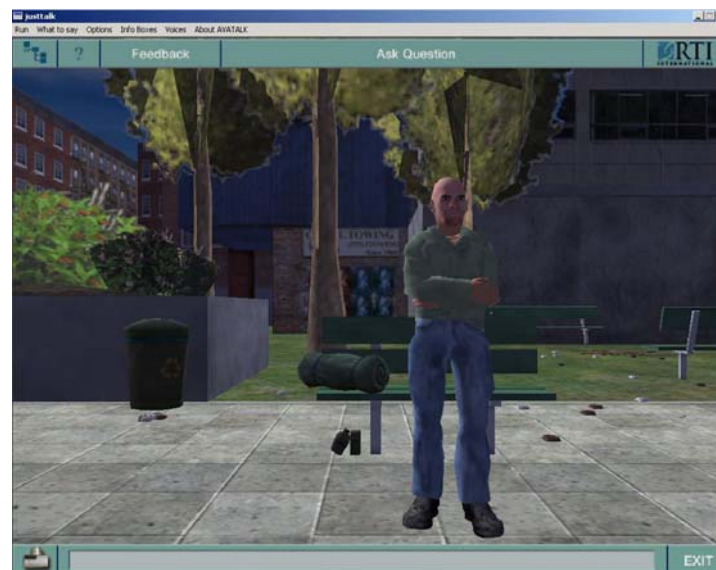
- ❑ Lexical analysis for politeness, personalization, complexity, key phrases (both positive and negative valenced).
- ❑ Syntactic analysis for format (command, query or request, informative statement, statement of appreciation or understanding).
- ❑ Semantic analysis for content (topic relevance, sensitivity).
- ❑ Required changes to language parser:
 - Enable tagging with linguistic, social variables.
 - Syntax informs what the parser returns.
 - Key word and phrase tagging.

Gesture modeling: Gesture map table

		<u>States of Anger</u>			
		Appeased	Ticked	Angry	Enraged
<u>States of Fear</u>	Terrified	n/a	Run away	Run away	Run away
	Afraid	Lean forward, look down, brace arms, stand behind bench	Lean forward, look forward, brace arms, stand behind bench	Torso upright, tilt head, arms at sides, pace	Put up dukes
	Scared	Torso upright, look down, clasp hands, stand before bench, ready to comply	Rock, tilt head, clasp hands, stand before bench	Torso upright, tilt head, cross arms, pace	Get ready to fight
	Calm	Torso upright, tilt head, clasp hands, sit, ready to comply	Torso upright, tilt head, cross arms, stand before bench, ready to comply	Torso upright, tilt head, hands on hips, pace	n/a

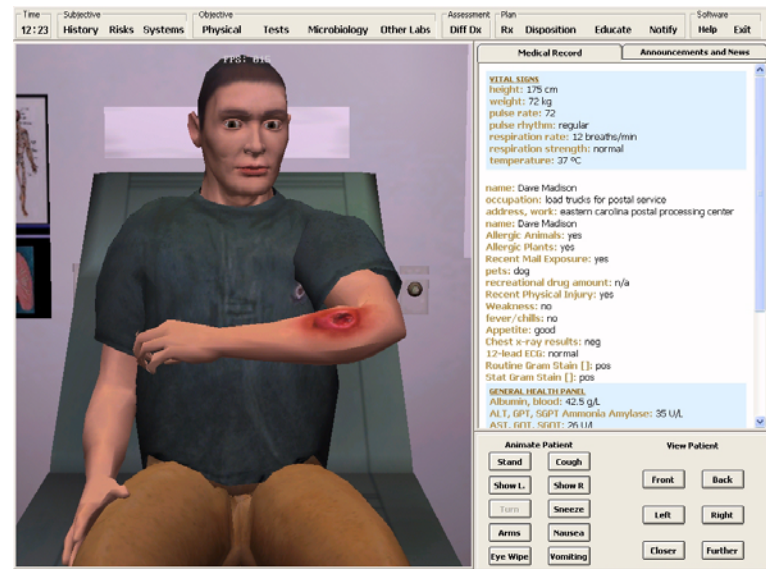
Fit of various models: Justice

- ❑ Key training that could not be accomplished using videos and/or role plays.
- ❑ Simulation integrated into North Carolina Justice Academy course titled *Managing Encounters with the Mentally Ill*.
 - Law enforcement officers:
 - ❑ Campus police.
 - ❑ Sheriff's and municipal law enforcement.
 - ❑ Division of Motor Vehicle enforcement.
 - ❑ Law enforcement agencies of mental/medical centers.
 - Evaluation supported by Memphis Crisis Intervention Team.



Introduction of diagnostic content: Clinic

- ❑ Provide clinicians with practice in diagnosing emerging infections and potential incidences of bioterrorism.
 - Practice on skills that are uncommon but potentially life-threatening.
 - Key training that cannot be accomplished using manikins.
- ❑ Dialog could elicit patient background information relevant to diagnosis.



Need for rapport-building: Pediatrics

- ❑ Simulation intended for medical school students rotating through pediatrics to train and assess their basic communications and procedural skills while interacting with kids.
 - Key training that cannot be accomplished using standardized patients.
 - Patient will not cooperate unless several rapport-building strategies are employed.
- ❑ Also the first app where social models became critical.
 - Kids are not mini-adults, and don't act so.
 - A parent in the room also changed dyadic dialog to triadic.



Situated assessment (rather than training): Adolescents

- ❑ Akin to 'authentic assessment' and 'situated judgment tasks'.
- ❑ Assess adolescents':
 - Social/cognitive skills.
 - Emotional control.
 - Decision-making ability.
- ❑ Assess technology to:
 - Determine if participants' behavior with characters mirrored real-life behavior.
 - Performance measures load on two factors corresponding to emotional control, interpersonal communication skills.
 - Some support for criterion, construct validity.
- ❑ Extended to both a different city and a different gender.
- ❑ Analogous vignettes and procedures used with prison population did not show similar results.



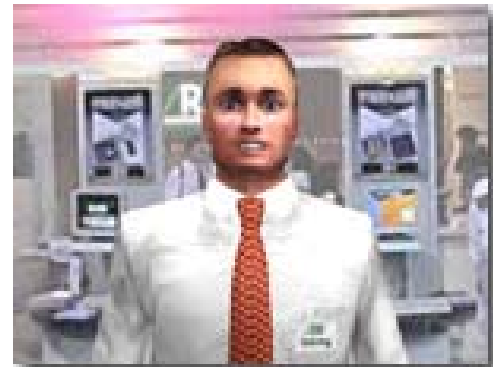
Elicitation of biased reasoning: National Intelligence Estimate

- Approach:
 - Entice biased reasoning to address 'imperfect conceptual models'.
 - For each scenario:
 - Set initial conditions.
 - Develop scripts for characters' behaviors.
 - Devise variations on the scenario's theme.
 - Provide variable reinforcement by encouraging student decisions and actions that reveal imperfect conceptual models.
- Require student to:
 - Assess the mission, collect information, analyze, decide, brief.
 - Perform intra-team, inter-team, and human-machine transactions.



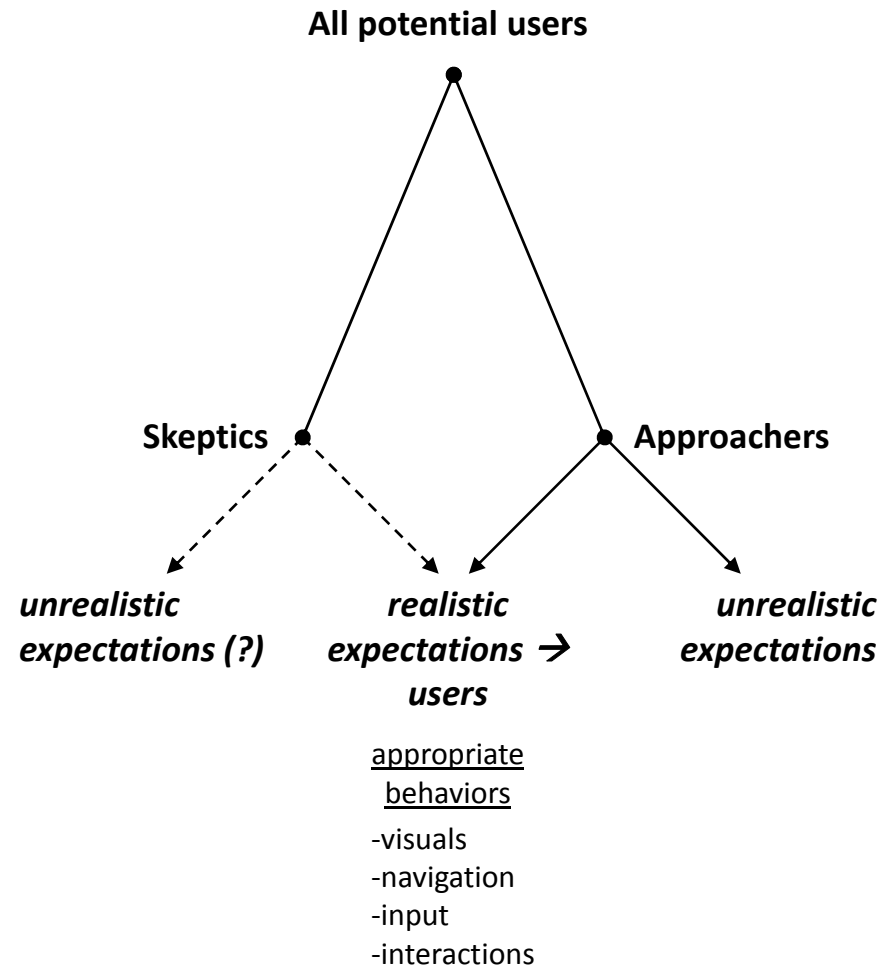
Diversion: Marketing

- ❑ Virtual tradeshow attendants.
 - Draw attention to booth.
 - Augment staff.
 - Engage visitors in dialog regarding the company and company products.
- ❑ Pitchman:
 - Synthetic character for in-store and conference kiosk.
- ❑ Lessons learned:
 - “20 questions”.
 - Prompting.
 - Prediction of ‘error’ behavior on part of visitors.



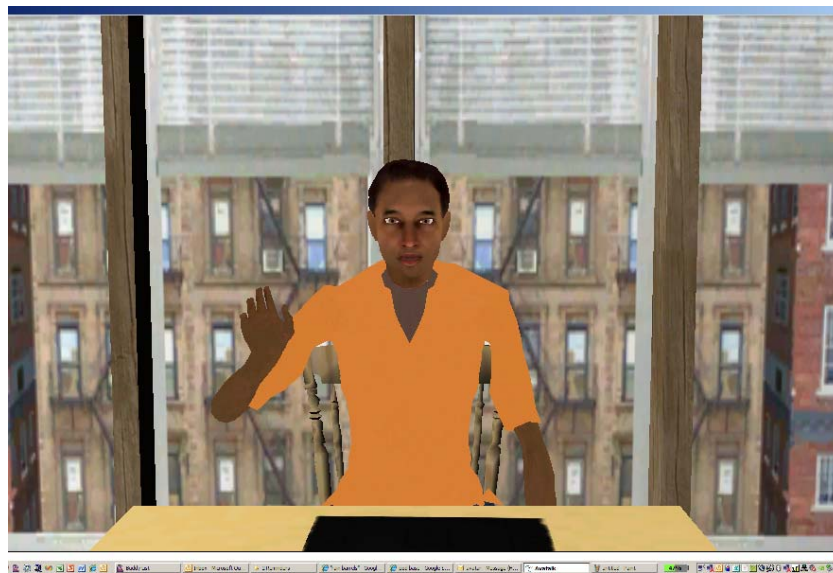
Range of users

- ❑ At-risk adolescents.
- ❑ Conference attendees.
- ❑ Consumers.
- ❑ First responders.
- ❑ Law enforcement officers.
- ❑ Pre-teens.
- ❑ Prisoners.
- ❑ Soldiers.



Next up: Sensitive topics

- Various needs (clinical, survey research) for the conduct of discussions that involve sensitive topics.
 - HIV/AIDS.
 - Alcohol/tobacco usage, usage of licit and illicit drugs.
 - Risky sexual or violent behaviors.
- Incorporate:
 - Computer-assisted survey interviewing techniques.
 - Health communications approaches for changes to health-related behaviors.
- Consider:
 - How the sensitive question is asked (e.g., assuming the behavior, prefacing the question with introductions).
 - The timing of asking these questions during the conversation.
 - The order of questions.
 - How well the interviewer has established rapport.
 - The context of the conversation (e.g., the comfort of the setting, the presence of others).



Implementation guidelines (a.k.a. lessons learned)

- Considerations:
 - Task demands.
 - User characteristics.
 - Nature of the domain.

Questions?

