An Assistive Conversation Skills Training System for Caregivers of Persons with Alzheimer's Disease

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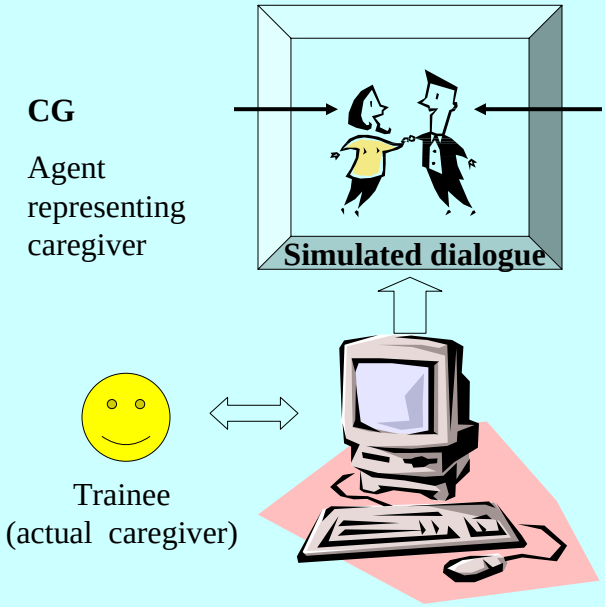
System Goals

Enable caregivers to practice conversational skills to improve conversational interaction with persons with Alzheimer's Disease (AD)

- reduce caregiver burnout
- improve quality of life of persons with AD through communication success
- leverage retained linguistic capabilities
- focus on co-construction of autobiographical vignettes from life of person with AD

Proposed Training System



Training Requirements: User Perspective

- Caregivers: family or institutional
- Improved access to training
- Improved motivation through user engagement
- Transfer of skills to real life
- Appropriate for different cultural backgrounds
- Usable for low-literacy, first-time computer users
- (in future) deliver in languages for non-English speakers

Training Requirements: Linguistic

For Alzheimer's character: realistic model of

- difficulties in comprehending caregiver, e.g.
  - direct question (***Where did you get it?***) vs. indirect question (***Your daughter gave it to you, didn't she?***)
- production difficulties, e.g. lexical vagueness
- use of dialogue coping strategies
- use of sociolinguistic variation (age, gender, ethnic)
- reaction to caregiver's part of dialogue (including positive/negative affect)
- use of autobiographical storytelling cues

Training Requirements: Linguistic

For caregiver:

- learn to respond helpfully to communication impasses, e.g., use of history and context to interpret vague referring expressions
- learn to leverage retained capabilities of conversational partner with AD
- learn strategies for co-constructing autobiographical vignettes, e.g.,
  - recognizing phrases used in previous telling
  - so-questions

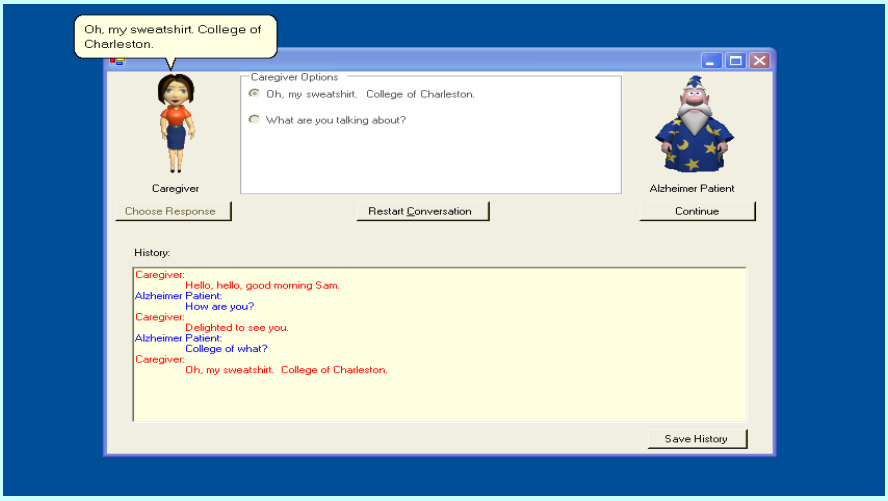
Work in Progress

• **Longitudinal data collection and analysis**: on-going project to record & transcribe monthly conversations with persons with AD; analysis of linguistic features of discourse of AD and effectiveness of different conversational interventions (Davis and various colleagues, UNC Charlotte)

• **Prototype development**: developed prototype architecture using off-the-shelf components (Prolog, MS Agent); now implementing prototypes for experimentation (Green & Lawton, UNC Greensboro)

• **Formative evaluation** of prototypes' ease of use and believability with CNAs, etc. (Davis & Green)

Screen Shot of Prototype



Dialogue Generation in Prototype v. 2

- **Script**: directed graph implementing one vignette
  - arc: (Agent, Precondition, Action, Agent-Effect, Beneficiary-Effect)
  - dialogue hand-coded based on corpus of transcripts
  - emotion mainly triggered in mental model
- **ADA** (AD agent) & **CG** (Caregiver) agent
  - rule-based mental model of dialogue and social goals, and change in emotional state (positive-negative)
- **Director**: queries mental models and script object, sends commands to animation, reads user's choice of dialogue action

Dialogue Generation Example 1

System takes arc 2 (no user choice required):

- Agent: CG
- Precondition: goal to begin-turn
  - triggers side-effect in CG model: goal to show interest
- Action: (show-regard, "That's a great shirt!")
- Agent effect: none
- Beneficiary effect: adds effect of show-regard, resulting in increase in ADA's happiness, eventually revealed by ADA's body language (looks towards speaker)

Dialogue Generation Example 2

User chooses arc 4:

- Agent: CG
- Precondition: goal to begin-turn
  - triggers side-effect in CG model: goal to show interest
- Action: (direct-question, “Where did you get it?”)
- Agent effect: adds expectation of answer
- Beneficiary effect: adds similar expectation but ADA will be unable to satisfy, resulting in decrease in ADA’s happiness, eventually revealed by ADA’s body language (looks away from speaker)

Related Work

- Graph-based script with user choice of action, narrative for user engagement: Carmen’s Bright Ideas (Marsella et al. 2000, 2003)
- Conversational training for interaction with disturbed clients: JUST-TALK (Hubal et al. 2003)
- Emotion modeling: JUST-TALK and MRE (Traum et al. 2004)
- Interactional, attitudinal, relational function of dialogue: Laura (Bickmore 2003, 2004).

Future Work

- Conversational agent
  - Computational model of story vignette co-construction
  - Computational cognitive model of Alzheimer's discourse (parameterized for stages of AD)
  - Computational analysis of effectiveness of caregiver interventions in transcripts
  - More fine-grained control of gesture and animation
  - Enhanced user input modalities (especially speech)
- Evaluation

Conclusions

- Strong potential to improve interaction between persons with AD and caregivers
- Testbed for research in AI/Dialogue, computational modeling of AD, pedagogical efficacy of virtual training environments

Effects of Alzheimer's Disease on Conversational Ability

For example (Perkins et al. 1997):

• **Turn-taking Skills**: cannot initiate conversation, failure to respond when selected as next speaker

• **Topic Management**: ability to initiate new topics, ability to maintain topic

• **Memory**: failure to remember persons or events discussed in conversation

• **Language Production**: failure in word retrieval, inability to produce referring expressions other than pronouns