Integrating a Crisis Stages Model into a Simulation for Training Law Enforcement Officers to Manage Encounters with the Mentally Ill

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Abstract

We describe ongoing research to improve the emotion engine underlying the behavior of responsive virtual humans. The work is being applied to a training simulation for law enforcement personnel learning to manage encounters with the mentally ill.

Overview

We are engaged in modeling the linguistic, cognitive, emotional, and gestural components of behavior for paranoid, schizophrenic, suicidal-depressed, and normal virtual humans. Our emotional model is being refined based on the Crisis Stages work of one of the authors (Dupont), a clinical psychologist who has been lead consultant to a team of Memphis, TN police officers, known as the Crisis Intervention Team (CIT), that is specially trained to work with citizens undergoing a mental illness crisis. The work is grounded in an application called JUST-TALK (Figure 1), a simulation intended for use by law officers undergoing training in managing encounters with the mentally ill. Past versions of JUST-TALK have been tested during training at the North Carolina Justice Academy (Frank, et al., 2002) and with the CIT in conjunction with the University of Memphis.

Architecture Details

Emotion engine. Our current emotion models were built using several emotion and personality theories, including the Five Factor Model, Circumplex theory, and cognitive theory of emotions (see Hubal, Frank, and Guinn, 2003, for references and implementation details). The latter model underscores most of our work, providing a scheme for labeling common emotions to guide how our virtual humans react to inputs and events.

Figure 1. JUST-TALK Screenshot

Through an emotion reasoning architecture, mood can change over the course of an interaction. After user input or other events (e.g., passage of time), we update emotional state based on input characteristics (e.g., the format, lexical analysis, semantic content, and timing of the input) and on expectations the virtual human holds for input characteristics. We keep track of a base set of emotions and personality traits for each virtual human in the simulation. Combinations of values from this base set are used to define all emotional state descriptions. We then define other emotions based on these, and emotional states iteratively based on emotions and other emotional states. The emotional state of each virtual human is dynamic and depends on current state, environmental constraints, and user performance. The choice of base set is somewhat arbitrary, though we used as its core a commonly accepted set. The equations used to define emotional states derived where possible from past research, otherwise from expert advice, common intuition, application demands, and experimentation. (See Guinn and Hubal, 2003, for references and implementation details.)

The Crisis Stages model describes escalation stages that roughly correspond to emotional states (see Table 1). At each stage the model specifies good and bad user actions. We are beginning to test this model by equating escalation stages with emotional states and forcing gestural, expressive, and verbal output based on the current stage. We plan to relax this constraint in later testing to allow multiple emotional states, and consequently different types of gestures, expressions, and utterances, at each escalation stage.

Granularity. The level of granularity at which we're focused is primarily where emotion meets cognition and action. That is, our emotion models provide outputs that feed into models of language use, gesture, planning, and

Stage	What to Try	What to Avoid
Uncertainty	Provide structure.	Passivity, counter-transference.
Questioning	Address relevant questions.	Defensiveness.
Refusal	Use a simpler request.	Power struggle.
Demanding	Provide legitimate support.	Intervening prematurely.
Recovery	Reinforce calm behavior.	Re-escalation.
Post-crisis	Rebuild rapport.	Blame, guilt-inducement.

Table 1. Crisis Escalation Stages

whole-body movement. To the extent possible, to model behavior we avail ourselves of empirical data, mostly derived from law enforcement trainers but also from videotape, literature reviews, and direct observation. We are undergoing a nearly-complete revision of the interaction among our JUST-TALK behavior models to involve the planning, linguistic behavior, and gestural behavior exhibited by schizophrenics, paranoids, depressed individuals, and others that the latest data support.

A limitation to our architecture has been its reliance on a transition network, thereby largely losing state information and making little use of planning and goal-setting. So the representation of our behaviors is being adapted to better incorporate planning in particular. For instance, we recognize that the control of a conversation alternates between the two participants, yet the officer should be trained to generally be in charge of the conversation. A goal for the consumer (i.e., the virtual human) might be to gain control of the conversation, with the limited means available (refusing or questioning the officer, issuing demands, and diverting the topic of the conversation). Currently, we don't have the consumer exploit an officer's response. If the officer responds to a question with an informational statement, then the consumer should try to maintain control of the conversation (e.g., by asking another question). Similarly, through multiple, rapid utterances, the consumer could take control of the conversation (e.g., by responding to the officer's question and then immediately following that with a question), forcing the officer to learn to respond to the right question; Dupont has found this empirically to be a typical consumer strategy. If the officer responds to a refusal with verbal force, then the consumer might escalate into a demanding stage. Emotion modeling is important here for tracking emotion levels and using information about emotion levels to determine changes in escalation states.

Physiological model. We have not yet incorporated a physiology model into these emotion models, but have in other, similar virtual human applications (Kizakevich, et al., 2004). For our line of emergency medical trainers, we employ a multiple-compartment transport architecture that represents physiological functions and pharmacological actions and interactions. The physiology model centers around a cardiovascular model with compartments for the brain, heart, and liver. A blood transport model conveys numerous materials into and out of compartments. The physiology model outputs could feed naturally into our emotion models, and vice versa, and would be expected to lead to increased realism for our virtual humans. As just one example, a probabilistic model designed to improve a pedagogical agent's performance in engaging a student playing an educational game (Conati, 2002) might be adapted to instead guide transitions between escalation stages depending on the user's engagement and training requirements.

Validation. We intend to validate our architecture, and the Crisis Stages model, in coordination with the University of Memphis, with a modified JUST-TALK application given to law enforcement personnel undergoing CIT training. Validation processes will comprise scripted animations, unscripted simulations, and (as before) user debriefing. How we handle transitions between escalation stages will be what determines the consumer's – and thus training – difficulty level. For instance, for experienced officers, we could require a very skilled response before de-escalating, and may escalate on any neutral or negative response. Similarly, we could also vary the consumer's likelihood of escalating or even the intensity of the escalation, depending on how "hard" or realistic we want it to be. We make the distinction between validation for training and validation for realism, and we will focus on both. Training requires controlled scenarios so that the simulation will reinforce a desired behavior, being consistent about rewards, especially for inexperienced officers. Realistic scenarios, in contrast, reflect reality where the law officer won't get consistently rewarded, and offer promise for experienced officer training and for assessment. Part of our validation will be to assess the effects on the Crisis Stages model and emotion processing as we evolve the simulation from training towards greater realism.

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