Varying Personality in Spoken Dialogue with a Virtual Human

Michael Rushforth, Sudeep Gandhe, Ron Artstein, Antonio Roque
Sarrah Ali, Nicolle Whitman, and David Traum

Institute for Creative Technologies
13274 Fiji way, Marina Del Rey, CA 90292
<lastname>@ict.usc.edu

To be believable, Virtual Humans must be endowed with a consistent personality. We use Tactical Questioning system (TACQ) [1] as a testbed for research in personality modeling. The TACQ system is used by soldiers to practice their questioning skills by engaging in a role-play with a virtual human. Beyond simple question answering, this dialogue system supports simple negotiations about when to answer certain questions or when to lie. It can also track subdialogues for offers/threats, model grounding behavior and maintain the affective state of the virtual human.

During tactical questioning, soldires can employ a variety of tactics to gather information of tactical value from the interviewee. Different personalities will react differently to these tactics. In order for the TACQ training to be effective, soldiers should have an experience of interacting with virtual humans with different personalities. We have been working towards developing virtual humans who have different personalities, within a given scenario of interaction. Here we report initial results of our work.

We extend the existing architecture by allowing the domain designer to author different personalities for the same character. To model the personality, we use the well known five factor model, where each factor can be further decomposed into 6 facets [2]. Here, we choose to model facets that are relevant for a tactical questioning dialogue system. The personality model is implemented by manipulating two aspects of the dialogue manager:

the affect model The affect model maintains various emotional variables which are updated in a personality dependent manner. For example, the facet of *Vulnerability (Neuroticism)* is modeled as an integer - the factor by which emotional variables such as social bonding and feels respected decrease for face-threatening dialogue moves such as insults.

the response generation subdialogue networks The dialogue manager employs a set finite state networks to model subdialogues. These networks decide the appropriate response for a given dialogue state. These networks are also used to model the personality. For example, the facet of *Honesty (Agreeableness)* is modeled as a 4-category variable, which determines the frequency and conditions under which the virtual human will lie or refuse to answer questions about sensitive information.

For a detailed description of how the facets are modeled please refer to [3].

In our first experiment, we evaluate whether the trainees can perceive the intended personality of a virtual human through a single interaction. We have implemented two personalities that differ in the traits of assertiveness, modesty, honesty, trust, positive emotion, activity, compliance and conscientiousness. 12 participants interacted in text-only modality with a virtual character twice; once with each personality. After each interaction, the participants scored the character's personality facets on a 5-point Likert scale. Results show that our model produced significant results for trust, conscientiousness and compliance; and some trends in the right direction for modesty, honesty and positive emotion. This suggests that our personality model can generate perceptible differences. This does not answer the question of which parameter changes produce differences in which perceived personality facets.

To begin addressing this, our second experiment focuses more narrowly on one of the personality facets that is salient for tactical questioning, *Assertiveness*. Two different personality conditions were tested, one being more assertive than the other. Each of the 16 participants in the experiment completed two dialogues; one for each personality condition. The interactions used speech modality along with the animated virtual human. After completing each dialogue, the participants filled out a survey, which consisted of a modified version of test items associated with *assertiveness* in the International Personality Item Pool (IPIP) [4]. The scores for the 10-item survey are in the range of 10–50, with a larger number indicating the greater amount of assertiveness. The assertive condition was perceived as more assertive than the nonassertive condition (Assertive: mean 37.4, SD 4.73; Nonassertive: mean 34.7, SD 8.77). The difference between the two conditions was significant on a one-tailed paired (within subjects) t-test ($t(15) = 1.77$, $p = 0.049$).

Subjective feedback from the participants suggested that the non-verbal behavior may have been a confounding factor. In order to avoid this effect, we asked two judges to evaluate the transcripts of these dialogues for assertiveness. The results showed a much larger significant difference with one-tailed t-test. The ratings for Judge 1 were (Assertive: mean 36.25; Nonassertive: mean 27.25; $t(7) = 2.415$; $p = 0.023$). The ratings for Judge 2 were (Assertive: mean 42.63; Nonassertive: mean 32.38; $t(7) = 4.012$; $p = 0.003$). Future work will look at incorporating gesture and facial expressiveness as part of the model.

References

1. Gandhe, S., DeVault, D., Roque, A., Martinovski, B., Artstein, R., Leuski, A., Gerten, J., Traum, D.: From domain specification to virtual humans: An integrated approach to authoring tactical questioning characters. In: Interspeech. (2008)
2. McCrae, R.R., Paul T. Costa, Jr.: A five-factor theory of personality. In: Handbook of Personality: Theory and Research. (1999) 139–153
3. Rushforth, M., Gandhe, S., Roque, A., Artstein, R., Whitman, N., Ali, S., Traum, D.: Varying personality in spoken dialogue with a virtual human. Technical Report ICT-TR-03-2009, Institute for Creative Technologies (May 2009)
4. Goldberg, L.R., Johnson, J.A., Eber, H.W., Hogan, R., Ashton, M.C., Cloninger, C.R., Gough, H.G.: The international personality item pool and the future of public-domain personality measures. Journal of Research in Personality **40**(1) (2006) 84–96