

Modeling Nonverbal Behavior of a Virtual Counselor during Intimate Self-disclosure

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1 Introduction

Humans often share personal information with others in order to create social connections. Sharing personal information is especially important in counseling interactions [2]. Research studying the relationship between intimate self-disclosure and human behavior critically informs the development of virtual agents that create rapport with human interaction partners. One significant example of this application is using virtual agents as counselors in psychotherapeutic situations. The capability of expressing different intimacy levels is key to a successful virtual counselor to reciprocally induce disclosure in clients. Nonverbal behavior is considered critical for indicating intimacy [1] and is important when designing a social virtual agent such as a counselor. One key research question is how to properly express intimate self-disclosure. In this study, our main goal is to find what types of interviewees' nonverbal behavior is associated with different intimacy levels of verbal self-disclosure. Thus, we investigated humans' nonverbal behavior associated to self-disclosure during interview setting (with intimate topics).

The video sequences analyzed in our paper were recorded during the Kang & Gratch [3] study that showed a virtual agents' behavior to promote users' self-disclosure. The original study design [3] was an interview interaction between two humans communicating via a computer. In the interview interaction, the interviewee was asked to answer ten questions asked by an interviewer that required gradually increasing levels of intimate self-disclosure. We annotated six nonverbal cues: eye gazes, head nods, head shakes, head tilts, pauses (silence) and smiles. The choice of six nonverbal behaviors was motivated by a literature review and a pre-analysis by an expert in nonverbal communication. These six nonverbal behaviors were identified as having the most potential. While nonverbal behavior was annotated for both answers and questions, the analysis presented in this paper focuses on annotations of just the answers. We define two types of features for each annotated nonverbal behavior: *Normalized Duration*: Percentage of the time the nonverbal behavior was active during the answer; *Normalized Count*: Number of time a nonverbal behavior occurs divided by the length of the answer (in seconds). We normalized the duration and count features to remove any confounding effect caused by a big difference of the total lengths between interviewees' answers. The association between interviewees' answer intimacy and their nonverbal behavior was analyzed by categorizing three levels of intimacy: Low Intimacy (N = 92), Medium Intimacy (N = 91), and High

Intimacy (N = 177). The Low Intimacy included “no intimacy (0)” and “lower intimacy (1).” The Medium Intimacy included “intermediate intimacy (2).” The High Intimacy included “higher intimacy (3).”

2 Results and Conclusion

Using one way ANOVA, we explored patterns in the six nonverbal behaviors associated with three intimacy levels of self-disclosure. The results show that individual features (e.g., head nods or tilts) and co-occurrence features (e.g., head tilt occurring during a pause) are associated with intimate self-disclosure (see Figure 1 & 2). We found that head tilts and pauses are strong nonverbal cues that convey high intimacy. There was no statistically significant difference for the gaze feature, but, in general, interviewees looked at an interviewer more when they gave less intimate answers. We, however, found that interviewees showed more eye gaze accompanying head nods while interviewees were giving less intimate information about themselves. These outcomes imply that head nods may be a strong cue representing low intimacy in communication. Finally, head shakes and smiles were not affected significantly by intimacy levels of interviewees’ self-disclosure.

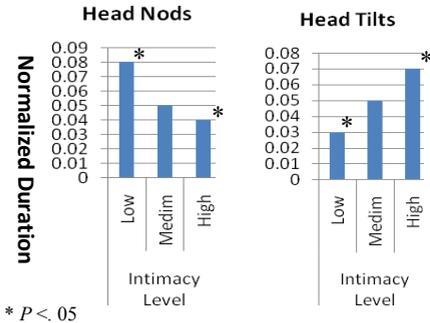


Fig. 1. Mean difference of normalized duration for head nods and head tilts

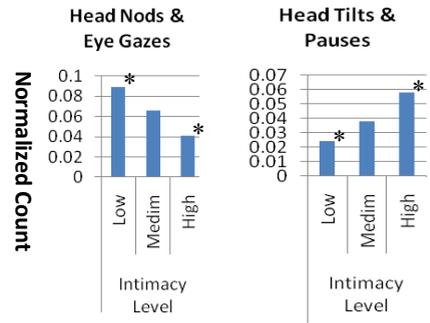


Fig. 2. Mean difference of normalized count for two co-occurrence patterns

Our study of nonverbal behavior in association with intimate self-disclosure provides future directions for designing virtual agents who talk about themselves in counseling interactions. Based on the outcomes of our current study, we argue that virtual counselors should show head nods and eye gazes for less intimate self-disclosure and head tilts and pauses for highly intimate self-disclosure. We believe that virtual counselors’ intimate self-disclosure accompanying with appropriate nonverbal behavior will enable human clients to like their counselors more and create better rapport with them.

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