

Creating Trust Between Groups of Humans and Robots Using a Novel Music Driven Robotic Emotion Generator

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https://www.nsf.gov/awardsearch/showAward?AWD_ID=1925178

Motivation

- Creating affective trust and likeable robots for human-robot interaction requires socially believable emotional agents
- Music is one of the richest means to show emotion, avoiding high degrees of freedom and uncanny valley
- Musical prosody can allow robots to communicate and demonstrate emotions and state of mind
- We present a new generative process for emotional musical prosody, and evaluate its potential across different robotic platforms

Dataset and Generative Gestures

- Similarly to prior work, we collected a set of emotionally labeled gestures from professional dancers
- We used this dataset to create new frameworks for emotional gestures and to improve animacy and fluency in robotic dances

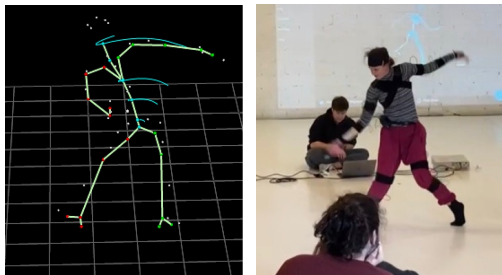


Figure 1: Motion capture analysis from a group of dancers

Scalability

- We used the generated gestures and prosody to create a set of performances with 12 robots and six dancers (Figure 3)

Entitativity

- Previous research shows that robotic groups can cause uneasiness when humans interact
- We ran a between-groups study where we used musical prosody to change the perceived entitativity
- Robots with similar musical prosody had a significant increase in entitativity
- We found that increased entitativity lead to better trust and Godspeed measures (Figure 2)

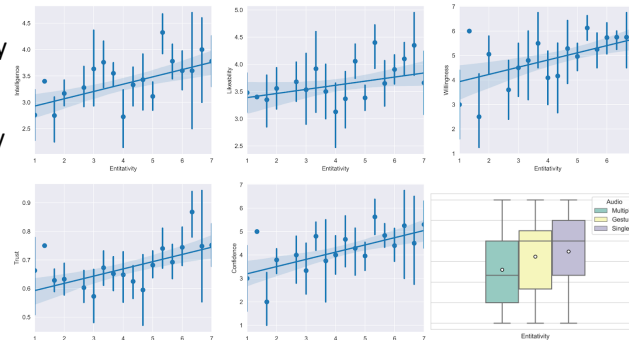


Figure 2: Comparing entitativity levels to godspeed metrics and trust



Figure 3: Performance between dancers and Robots

Personality

- From the Big-5 human personality types Neuroticism (N) and Extraversion (E) both have robust findings in psychology literature regarding common emotional responses to stimuli
- We constructed a between group study, with a robot responding using gesture and audio with either HighNLowE or LowNHighE emotion regulation strategies. We collected participants' personality types and found significant variation between the preferred robot across metrics (Figures 7 and 8). Both human personalities found the robot with LowNHigh E more Likeable, but results varied for Animacy and Anthropomorphism

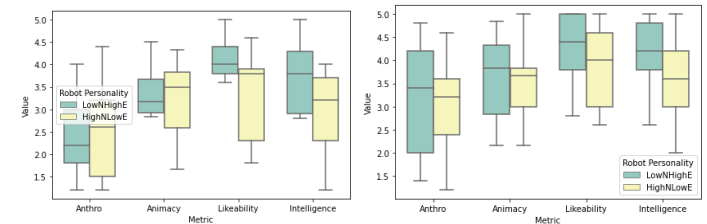


Figure 6: Comparing a Humanoid and Industrial Robot for Trust (Left) and Likeability (Right)

Summary

- Emotional musical prosody showed significant results for key metrics for social and industrial robotics
- Emotional musical prosody also increased metrics in more functional applications (passing objects)
- Shows the importance of implicit forms of communication that do not deter from robot primary tasks
- Future work looks at the use of musical prosody to increase engagement with users and perceived competency of a robot