Interactivity of an Affective Puppet

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figure 1. View of the test of the application in the science museum in Naples, Italy.

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Abstract
This paper describes a computer-animated puppet responding to multimodal and affective inputs from a group of spectators in order to engage them in the visit to a science museum. In order to compute the emotional state of the audience, our system allows fusion of information acquired from microphone and camera input. The objective of our demonstration is to put forth a mechanism for using emotions for group interaction and to provide an example of real world application of this technology.

Keywords
Interaction, Emotion, Multimodality

ACM Classification Keywords
H.5.2 User Interfaces

Introduction
In previous work, digitally augmented puppeteering has been presented [2]. Also the use of emotions as an input or output in interaction has been investigated, e.g. in [3], which shows how to decode and alter the affective states of users. Now, we present the first virtual puppet that is computer animated, providing interactive loops with the spectators through multimodal and affective interfaces. Its aim is engaging users in their visit of the museum, whether they be kids (figure 1), parents or other spectators.

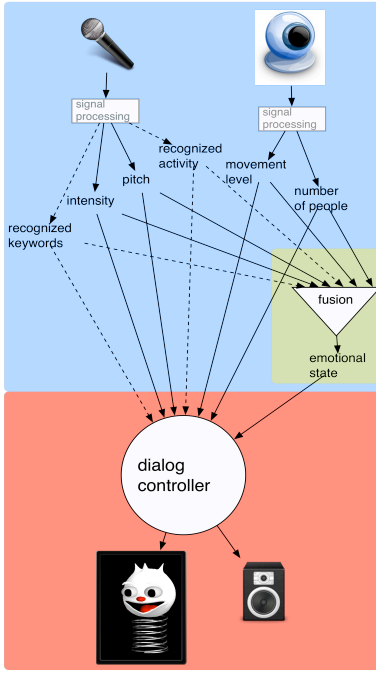

figure 2. System overview.

System overview

As shown in figure 2, in order to engage the visitors as a group, their numbers, movements, noise, voices and speech are analyzed to compute overall emotional states and other semantic aspects. These then trigger the animations of the puppet.

The input components of the system (blue in figure 2) provide us with several kinds of data, like low and high-level information from the raw video and audio signal (figure 2): audio intensity, pitch, audio activity (music, speech, silence, clapping, whistling, applause, etc.), recognized key spoken words, number of people and the amount of their movement [1]. Also, the timescale between value updates varies greatly from continuous signals (plain line in figure 2) to rare events (dash line in figure 2). Our fusion component (green in figure 2) allows transforming complementary and redundant input values into a comparable scale and provides usable data for the dialog controller (figure 2), e.g. arousal value of the interacting group.

According to the input and the computed emotional state of the audience, the system controls the puppet on the screen and through the speakers (red in figure 2), e.g. its position, facial expression or clothes. For instance, the arousal of the group is used to amplify the reactions of the puppet (e.g. bigger smile) in order to improve the engagement of the audience.

In the context of the science museum (figure 1), the affective puppet allows the visitors to be engaged in their visit to the museum. This system allows the museum curator to propose and install several interactive puppet areas scattered throughout the museum, which all respond uniquely to visitors, whereas a sole human puppeteer could only interact with one area at a time.

Discussion

Our demonstration shows a real-world ubiquitous application using emotions and multimodality with the interaction of an audience. In order to better assess its limits, the accuracy of the emotional model will be evaluated (e.g. through system logs and video analysis) along with the user experience (e.g. through questionnaires) during successive lab and field evaluations.

References

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