Experimenting with Non-Verbal Interaction

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1 Investigating Non-Verbal Interaction

In face-to-face interaction people use body position and orientation to create and maintain shared interaction spaces that frame interactions and provide a structured communication space for gestures and other non-verbal cues [1]. To date, analysis of the structure of these spaces has depended primarily on observational studies and the analysis of video corpora. Direct experimental investigation has been hampered by a lack of techniques that can support systematic, fine-grained interventions in non-verbal interaction. We present a system that combines an avatar engine with real-time motion capture data to provide new levels of experimental control for investigations of non-verbal interaction.

2 Detecting and Manipulating Non-Verbal Behaviours

We use the PIAVCA environment [2] to create and control the behaviour of avatars in our system. PIAVCA is a framework for controlling responsive animation based on motion capture data that is geared to non-verbal communication. It provides a range of real time motion editing filters that can be combined to achieve complex animation effects, as well as authoring of control flows that make it possible to create both scripted and reactive responses to events. We captured a corpus of motion data which used Piavca's motion editing tools to create a series of responsive behaviour patterns.

The interface between the PIAVCA environment and the motion capture system VICON allows us to create reactive mixed-reality applications. The data from the motion capture system is used to trigger responses in avatars, giving us full control over interactional behaviour. Information such as people's position or head direction can be used to trigger motions such as nodding, gaze tracking or hand gestures in the avatar. This allows us to study how user's respond to different patterns of avatar behaviour. The delay between capture and response is less than 50 ms, so there is no noticeable lag in responses.
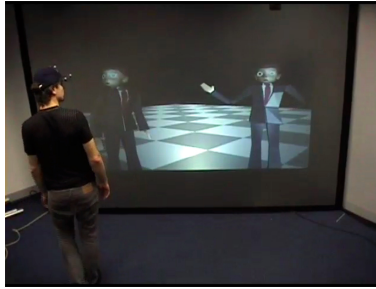
Fig. 1. Interacting with Two Avatars [3]

3 Applications

Our system demonstrates the potential for real-time experimental manipulations of mutli-party interaction by using the position and orientation of a human participant to control the behaviour of avatars (see Figure 1). As people approach the avatars turn towards them and then walk over. They then form a shared interaction space (o-space in Kendon's terms) with the participant that is maintained through continual re-adjustment of their position and orientation. The avatars also make co-ordinated adjustments of their focus of attention and posture in response to changes in participant's focus of attention. The overall effect is to create a convincing conversational 'cluster'.

This system significanty extends the range of possible experimental studies of non-verbal behaviours. It can be used to create real-time manipulations of a variety of aspects of non-verbal interaction ranging from large scale manipulations of body position to small-scale manipulations of the position, timing and form of gestures.

References

1. Kendon, A.: Conducting Interaction: Patterns of Behaviour in Focused Encounters. Cambridge University Press, Cambridge. (1996)
2. Gillies, M.: Piavca: A Framework for Heterogeneous Interactions with Virtual Characters, IEEE Virtual Reality Conference (2008).
3. The Augmented Human Interaction Laboratory, School of Electronic Engineering and Computer Science, QMUL: `http://www.dcs.qmul.ac.uk/research/ahi`