

Human-Robot Dynamic Social Interaction

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Project Overview

NTT researchers are interested in the question of whether a physical robot produces a more direct emotional coupling with human beings than does a computer generated graphical image of a similar robot. At MIT we are building a robot that has human-like facial expressions and shoulder and neck gestures, and that perceives human motion and facial expressions. This is coupled to an emotional system so that the person and the robot naturally follow normal human communication social dynamics. This robot will be installed at the NTT Communications Science Laboratories in Kyoto where the response of human subjects will be measured and compared to their response a graphical face interface.

Progress Through December 1999

During the first six months of these project we have had three accomplishments

We completed a design for a new, more robust, robot head that we call Kismet 2. The new design was based on human anatomical models so that the gestures that it makes are much more human-like. The system includes seven degrees of freedom for gross anatomical movement. There are 4 degrees of freedom in the neck, including one non-human freedom which is neck extension. Humans achieve this motion through their shoulder structure but Kismet 2 has no shoulders. There are three degrees of freedom in the eyes. One tilt degree which couples both eyes together, and two independent pan degrees of freedom. The eyes each consist of one miniature color camera. The facial expression degrees of freedom are not included in this part of the design.

We completed the design of a new control system for Kismet. This is a rack mounted set of electronics which provides interfaces from computers to the electromechanical hardware of Kismet 2. This is a well documented design which will be easily reproducible, and also very maintainable at NTT.

We built the first prototype of the Kismet head system. This includes the mechanical components, motors, and encoders. We have verified the correct operation of this prototype, made a series of minor modifications, and are now ready to be able to reproduce it for the version that we will provide to NTT.

Research Plan for the Next Six Months

During the period from January 2000 to June 2000 we will make the prototype fully operational with all necessary software. This includes the following steps:

- ¥We will fabricate the control system for Kismet 2.
- ¥We will develop a software library to run the new Kismet 2 head system.
- ¥We will design the facial expression system for Kismet 2.
- ¥We will fabricate the first prototype of the Kismet 2 facial system.