SUMMARY OF Ph.D. DISSERTATION

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Title

The Facilitation of Communication in Virtual Space with the Aid of Non-verbal and Biological Information

Abstract

Non-verbal information plays a significant role in interpersonal communication. The information is processed and deliberated, inducing a dynamic change in the speaker's formation of the topic or the tone of words. Hence, one's enthusiasm, confidence and conviction in one's speech may vary with one's grasp of the other party's responses and non-verbal gestures.

In remote environment, the listener's response is not fully conveyed to the speaker. With the improvement of network infrastructure, video conference systems are increasingly being put to practical application. These systems were designed to create a seemingly face-to-face environment for users in virtual space. However, the systems have not been able to construct a seamless communication space as expected. It is difficult for users to be aware of who is focusing whom and to determine whether the other person is interested in his/her talk. Consequently, the environments supported by these systems greatly hinder the smooth progress of communication.

With those issues in mind, the aim of this research is to contribute to the ease of communication in virtual space by proposing the design and construction of an environment that allows the user to be aware of who is focusing whom and the other person's status of brain activity from both non-verbal and biological information.

This communication environment is constructed in a prototype system called e-MulCS. A virtual space is introduced and avatars that represent the users are created. Changes in the users' facial orientation are captured by an input interface and reflected onto the avatars. The avatars successfully showed the subtle changes in the facial orientations of users. An electroencephalograph then measures and analyses the brain waves of participants, and records the data from which a brain activity index indicating the status of a user's brain activity is obtained. By reflecting the index onto the avatars, it is possible for users to grasp the status of interest of other users.

Through evaluation experiments, it is demonstrated that non-verbal feedback greatly facilitates communication and that the brain activity index reflected in avatars indeed corresponds to the status of brain activity of the users. The experiments show that it is possible to attain smooth communication in virtual space when the speaker receives precise non-verbal and biological feedback. These positive results would substantiate the validity and usefulness of this research.