

A Study of Intelligent Nonverbal Communications System on the Internet Cyberspace

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1. Introduction

The nonverbal communication can be used as a communication means between avatars having no common language in the Internet. Recently the sign language communication[1] system between avatars of different languages has been investigated as a means of overcoming the linguistic barrier. In this paper, we proposed an intelligent communications method, where sets of animations parameters such as the joint angles of gesture were transmitted instead of sending the entire-real motion pictures. We designed a nonverbal communication system using 3D avatar and intelligent Communication Method on the Internet as trial to through the linguistic barrier.

In this paper, we demonstrate an experimental avatar language system based on Japanese, Chinese, Korean and English sign language with which the human user can be communicate non-verbally with each other using 3D animation on the Internet cyberspace. Since the original avatar language gestures analyzed and coded intelligently, we call the communication method discussed in this paper as intelligent communication method. The method on client-server architecture could be practice a real-time communication. In this method, 3D avatar models are stored at all clients in advance and only intelligently coded data such as joint angles are transmitted instead of motion images or their compression. Experimental results show a possibility that the nonverbal communication system using intelligent method could be provides a mean overcoming the linguistic barrier in the Internet.

2. System Overview

The general process of this communication system is shown as Fig.1: The user inputs his mother tongue sentence from the keyboard, the sentence analyzed and divided as some keywords corresponds to a set of parameters representing actions, and the animations of the avatar synthesized with the received corresponding parameters will be shown on the other user's interface. In other words, in the intelligent coding and decoding processes, we used a dictionary system to store the parameters of each keyword and translate the keyword which in the different language.

The system is constructed of the client-server architecture.[3,4] At server, avatar language animations are analyzed into a sequence of parameters and transferred through the Internet. At client, the corresponding animations are regenerated with the received parameters on

their models. The scenario of the communication between the server and a client is as followings: (1) a server is waiting for a request. (2) a client connects to the server.(3) the server sends a list of connected client group to the client. (4) the server adds the client into the existing connected group and sends the modified list to all online clients. (5) a client input a mother tongue sentence. (6) the server translates it into parameters and transmits it to the group of clients. (7) the animations are implemented in the clients' interface with the received parameters.

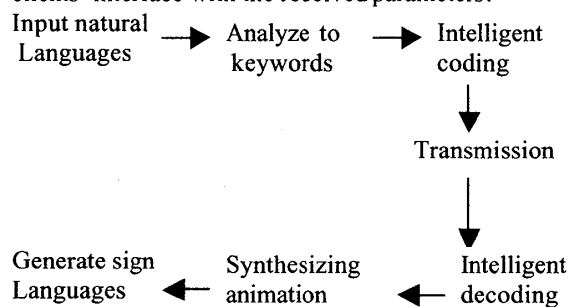


Fig.1 The overview of intelligent avatar communication

3. Common Gesture for Nonverbal Communication

When we unknown a foreign language and had to talk with a foreigner, we will inevitably start to use gestures. Since everyday situation is almost common to all counties of people, a mutual understanding can be achieved through using gestures and simple sign language [2]. As we know, there are many common gestures in the world, like "victory", "I", "you" and "being troubled" and so on.

On the other hand, it is not correct to assume that the same gestures are used in avatar language through the world, because of the gap on different from culture and nation. A representative example is the nodding gesture. Almost people recognize the nodding gesture as the significance of "OK", "yes" or "agree", but it means "NO" in India and some regions oppositely. So we must be take care to use gestures that might possibly be taboo in some countries. However, We focus on the fact that there are also lots of common gestures understood in many countries and nations. If we express information with fundamental gestures, those gestures will provide a useful means of common communication, and a nonverbal communication will be performed by those gestures.

4. Database System

In The nonverbal communication system, expression of the complete avatar communication requires a lot of parameters

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and a system, which is able to extract the necessary parameters from the database at high speed. In order to solve this problem, we proposed a tree structure keyword database.

The comparison between avatar language and natural language is that the avatar language is grammatically completed less than the natural language since postpositional particles and auxiliary verbs are mostly omitted. Furthermore, there are only declinable words, finishing shapes used to represent a number of basic shapes.

For example, when a natural language sentence "I go to school" is input in English, the unnecessary words "to" is deleted so that the keywords "I", "go", "school" are remained, then the system retrieved the corresponding parameters of each keyword from the dictionary database, and display the avatar animation on the screen with the parameters following in the a natural language order.

If the participant is a Chinese, the gesture animation would be displayed by the keyword order of "I", "go", "school", on the other hand, if the participant is a Japanese, the gesture order would be as "I", "school", "go". The index table of dictionary database has the structure is shown as following Fig.2.

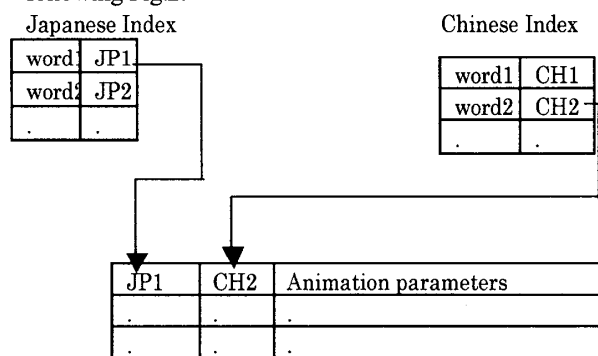


Fig.2. Index table of Parameter and keyword

5. Experiment

Since avatar language is based on the sign language, we conducted a simple experiment to translate sign languages between Japanese, Chinese and Korean. Our purpose is to build a real-time avatar chatting system in the Internet cyberspace where the avatars that represent the human beings can communicate with each other in the real time. The client-server architecture is constructed in Java to make the avatars share the same VRML[5] environment. We have built an avatar animation parameter dictionary with about 20 corresponding natural language words registered, and the recognition rate of avatar gesture reaches 70% on the average with nearly real-time synthesizing.

We designed the avatars symbolize nationalities with the dress. The following figures show an experiment of the chatting system in the Internet cyberspace, two users' avatars dressed transitional Chinese and Korean costume respectively to represent the national. When user input there native verbal language in alphabet, the avatar instead

of him will express the meaning by gesture of animation, and so another of users can communicate with each other by understanding the meaning of gesture.

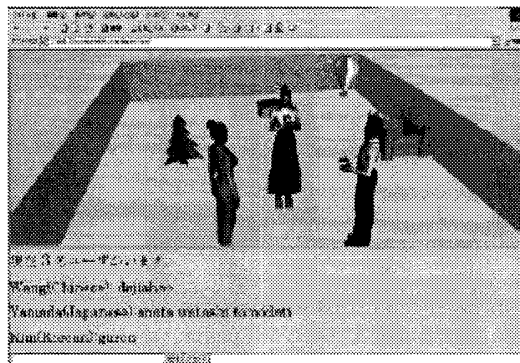


Fig.3. The experiment

6. Conclusion

We proposed an intelligent communication system using avatar gesture and so on as a means of nonverbal communication between people have no common language in the Internet cyberspace. For the intelligent communication method, avatar models are stored at all clients in advance and only intelligently coded data of parameters such as joint angles are transmitted instead of motion images or their compression. The method approach to the amount of data to be transmitted between clients is very small and it is possible to communication in real-time. From the results, we confirmed a possibility that the proposed method could be useful for nonverbal communication between different languages in order to overcome the linguistic barrier in cyberspace. However, the current system is a preliminary system, which is used to limited sample data of gesture. For the future research, we need to carry out the extended system that has a lot of expressible date and can be applied to any other national gesture.

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