

Generation of Arm-gesture and Facial Expression for Intelligent Avatar Communications on the Internet

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Abstract

Recently the sign-language communication systems between avatars of different languages have been investigated as a means of overcoming the linguistic barrier. In the systems, an intelligent communication method has been employed, where sets of the animation parameters such as the joint angles of the gesture were transmitted instead of sending the entire-real motion pictures. However, the communication has been done based on the gesture only without considering the facial expression. In this paper we propose an approach to the communication based on the facial expression as well as the arm-gesture, and generating them on various avatar models. To extract the parameters to be transmitted, three kinds of key-frame editors are employed using techniques of inverse kinematics and partial differential equations. In generating facial expression especially, the movements of the cheeks and the jaws as well as other facial components are also utilized. The preliminary results show a possibility that the method could be used as a useful means for avatar communications between different languages on the Internet cyberspace.

1 Introduction

Internet cyberspace has become a place of connecting millions of people around the world based on multimedia such as text, sound and animation. To enter cyberspace and become a member of a new community, a virtual persona for self-representation, the so-called avatar, is needed [1]. When an avatar is navigating the space, he or she could meet others who speak (use) different languages and could feel a linguistic barrier as it is in real human communication.

As a means of overcoming the linguistic barrier, recently a couple of studies on the sign-language communication between avatars of different languages have been performed [2], [3]. In the communication, two avatars using different languages such as Japanese-Korean, Japanese-Portuguese, or Japanese-Chinese have communicated with each other us-

ing their own sign-languages. From the studies, it has been revealed that the gesture like sign-language can be used as an auxiliary communication means between different languages. However, the communication was done based on the arm-gesture only without considering the facial expression, even though it plays an important role in communicating messages [4].

In this paper, we propose an approach to the intelligent avatar communication based on the facial expression as well as the gesture animation. To produce the expression exactly on avatar mesh models, in the method, an adequate number of polygons are required. On the other hand, a smaller number of polygons allows for faster animation. In the avatar communication especially, the gesture and expression should be generated in real-time with the parameters (the joint angles and the action units). Moreover, avatars of various mesh models can participate in the communication. Considering these points, in this paper we employ three kinds of key-frame editors and develop a method of generating facial expression on various avatar models.

This paper is organized as follows: In Section 2, we briefly introduce the avatar communication between Korean and Japanese using the intelligent communication method. From Section 3, we discuss avatar models for the communication, three kinds of key-frame editors employed here, the movements of the cheeks and the jaws, physical constraints in the animation, and a method of generating emotional expression on different avatar models in succession. Experiments and discussions are provided in Section 7. Finally, the conclusions are given in Section 8.

2 Intelligent Avatar Communication between Different Languages

As mentioned previously, the sign-language communication between different languages has been considered as a means of overcoming the linguistic barrier [2], [3]. As an example, consider an avatar communication between Korean and

