

An Interaction Model for Non-verbal Communications among Avatars

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1 INTRODUCTION

3D multi-user virtual environments (3D-MUVEs) are communication media where users connected by network can share the same virtual reality experiences. Users can communicate with one another by controlling avatars, 3D objects which represent users in 3D-MUVEs.

One of the most attractive experiences for users in 3D-MUVEs is to let their avatars communicate with one another without using texts and voices. Avatars can express users' messages by using their faces, gestures, touches with other avatars and so on. Such kinds of communications are called non-verbal communications.

Non-verbal communications using avatars provide communications which are proper to the context of the virtual environments. In general, messages used in non-verbal communications mention the sender of the messages [1]. Thus, users are restricted to send messages based not on themselves but on their avatars. On the contrast, verbal communications in 3D-MUVEs allow users to talk daily topics which have no relations with the context of the virtual environments.

We especially focus on touch among avatars. The touch can be considered a fundamental communication mode because many other modes of non-verbal communication are used as the substitution of the touch [2]. By using the touch among avatars, users can visually perceive various feelings such as love, friendness, and offensiveness to other avatars.

We use the phrase, the touch among avatars, in a broad sense which means not only a direct contact between skins of avatars but an indirect connection between avatars through something. A hand-shake is an example of a direct contact among avatars using their hands. Playing see-saw as shown in Fig.1 is an example of an indirect connection among avatars through the see-saw bar.

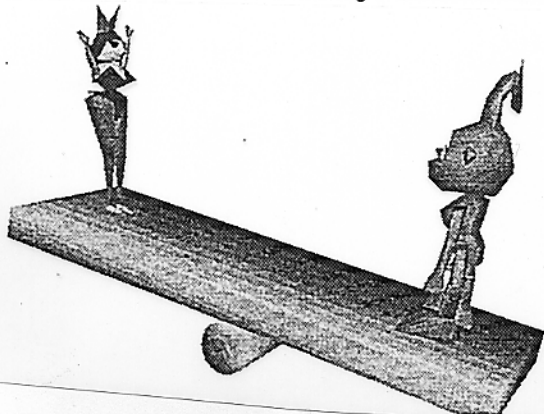


Fig.1 Playing with the see-saw: an example of a

touch among avatars

2 BACKGROUND

Although many MUVEs which support the touch among avatars had been developed, they have many troubles. Simulating the touch using collision techniques [4] is costly for calculations although they provide generality and accuracy. Describing the touch using traditional static descriptions such as key-frame animations is time-consuming for dealing with extensive combinations of avatars which can appear in 3D-MUVEs.

3 OUR INTERACTION MODEL

In this paper, we introduce touch among avatars as a means of an interaction among 3D-objects. We introduce a model [3] for describing interactions among 3D-objects in 3D-MUVEs.

Our interaction model consists of three concepts, body, jack and plug. Bodies are 3D-objects which can interact with one another. Jacks and plugs are interfaces of bodies to communicate with other bodies. Jacks and plugs play the following two roles. One role is to examine the adaptability of bodies to interact with other bodies. The other is to pass messages that control the behavior of the opponent bodies. By using the proper combinations of jacks and plugs, bodies can be dynamically interact with opponent bodies.

Our model requires users to establish and end the interactions between 3D-objects. To establish the interaction, users intentionally specify the combinations of two bodies at a time. Bodies should have at least one jack or plug to interact with other bodies. To specify the first body, users send an input to the jack attached to the body. To specify the last body, users send an input to the plug attached to the body. To end the combination, users send an input to the jack which is firstly specified when establishing the combination.

4 DESCRIPTION

We implement examples of the touch among avatars according to our interaction model. To describe the touch, we use bodies for representing not only avatars but the fields. We use the term, a field [5], to represent a space which defines a boundary with the following two conditions. One is to provide certain rules to restrict interactions among avatars inside the boundary. The other is to provide no relationship between the avatars inside the boundary and the avatars outside the boundary.

Although we should explain concrete examples with detailed syntax and codes, we do not include

them due to space constraints. In the full paper, we will describe two examples of the touch among avatars, such as playing with the see-saw and the hand shake. In Fig.1 we show the scene where a bunny girl and a guy playing with the see-saw. The see-saw bar is placed as a body which represent the field in the virtual environments. The bunny and the guy are controlled as avatars by users.

Describing the touch among two avatars requires three or more bodies. Two bodies are used for representing avatars and at least one body is used for representing the field. In Fig. 2 we show the combination of three bodies connected by jacks and plugs. In some situations, there are two or more bodies which represent the fields. In Fig.3 we show the combination of four bodies. In any cases, no direct combinations are required among bodies for avatars.

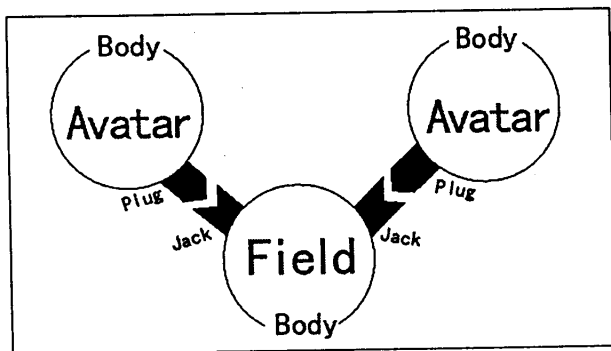


Fig.2 A combination of bodies to represent the touch among avatars

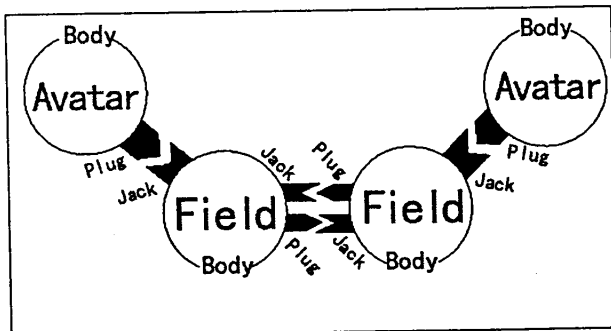


Fig.3 Another combination of bodies to represent the touch among avatars

5 CONCLUDING REMARKS

In this paper, we introduced the touch among avatars as a means of an interaction among 3D-objects. We introduced a model for describing interactions among 3D-objects in 3D-MUVEs and described examples of the touch among avatars according to our interaction model. We found these examples were properly described in the same way.

We have a further plan to describe other modes of non-verbal communications, such as facial expressions, gestures and etc according to our

interaction model. These modes can be described as the extension of the touch among avatars because these modes are used as the substitutions of the touch [2].

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