

Description

[0001] In general, the present invention relates to an information processing apparatus, an information processing method and a computer program. More particularly, the present invention relates to an information processing apparatus, an information processing method and a computer program for presenting a 3-dimensional virtual space wherein the user is capable of operating its avatar to communicate with other avatars.

[0002] A related art cyberspace service called Habitat (a trademark) is known in the field of the so-called PC (personal computer) communication service, such as NIFTY-Serve (a trademark) and CompuServe (a trademark), in which a plurality of users connect their PCs to a central host computer through modems and a public telephone-line network to make accesses to the host computer in accordance with a predetermined communication protocol.

[0003] Lucas Film started development of Habitat in the year of 1985. And after about three years' operation of Habitat by Quantum Link, a commercial network company, NIFTY-Serve started providing a Habitat service as Fujitsu Habitat (a trademark) in February 1990. In Habitat, an incarnation of the user which is an object representing the user itself appears in a virtual city called a Populopolis which is rendered by 2-dimensional graphics, allowing the user to have, among others, a chat with another user. The parturition of the user is referred to as an "avatar" which originally means the incarnation of a Hindu deity appearing in an Indian myth. In this context, a "chat" is a real-time conversation exchanged in text being displayed on a screen as a result of operations by a user to enter characters via a keyboard. A more detailed description of Habitat is found in Michael Benedikt, ed., *Cyberspace: First Steps* 282-307 (1991).

[0004] In a related art cyberspace system operated in a PC communication service of this type, states of a row of houses on a street and rooms in each of the houses in the virtual city are rendered by 2-dimensional graphics, so that in order to move an avatar inward or outward with respect to the background of a 2-dimensional graphic, the avatar is merely moved up and down over the background. That is to say, the power of expression for display is poor to feel a pseudo experience of a walk or a movement in the virtual space. In addition, since the user sees the virtual space, in which the avatar representing the user itself and another avatar for other are displayed, from a station point of a third person, the sense of a pseudo experience is also lost in this respect.

[0005] In order to eliminate the shortcomings described above, a function to display the virtual space by 3-dimensional graphics and to allow the user to walk about in the space with a high degree of freedom as seen from a station point of the avatar is implemented by utilizing a descriptive language of 3-dimensional graphic data called a VRML (Virtual Reality Modeling

Language) as is disclosed in U.S. Patent Application No. 08/678,340. Details of the VRML are described in references such as Mark Pesce, *VRML: Browsing & Building Cyberspace* (1995), and "Recent Trends in VRML and CyberPassage" authored by Kohichi Matsuda and Yasuaki Honda, *bit* (Kyoritsu publication)/1996, Vol. 28, No. 7, pages 29 to 36; No. 8, pages 57 to 65; No. 9, pages 29 to 36 and No. 10, pages 49 to 58.

[0006] In addition, official and complete specifications of the "Virtual Reality Modeling Language Version 2.0 (ISO/IEC CD 14772)" are disclosed on a homepage at <<http://www.vrml.org/Specifications/VRML2.0/FINAL/spec/index.html>>. A Japanese version of the specifications is disclosed on a homepage at <<http://www.vebc-ity.co.jp/info/andoh/VRML/vrml2.0/spec-jp/index.html>>.

[0007] VRML2.0 which is the most recent version of the VRML can be used to describe and express an autonomous behavior of an object in a 3-dimensional virtual space. Thus, in a behavior to walk about in a virtual space displayed by 3-dimensional graphics in a browser for VRML2.0, that is, a 3-dimensional virtual space, as seen from the station point of the avatar, the user is allowed to have a feeling as if the user itself were actually walking about the 3-dimensional space.

[0008] A typical browser for VRML2.0 and software for a shared server are a "Community Place (a trademark) Browser/Bureau" developed as a product by Sony Corporation which is the applicant of a patent for the present invention. Its β -version (a prototype) can be downloaded from a homepage at <<http://vs.sony.co.jp>>.

[0009] In an observation study, for example, a number of clients each want to see and walk about the 3-dimensional virtual space by operating its avatar. For each operation, the amount of system processing increases, causing the amount of communication on a transmission line to rise as well since every avatar shares information with other avatars. For this reason, it is necessary to impose an upper limit on the number of clients allowed to participate in the 3-dimensional virtual space each as a guest who wants to have experience of the 3-dimensional virtual space before becoming a regular client.

[0010] According to one aspect of the present invention, there is provided an information processing apparatus for presenting a 3-dimensional virtual space allowing an avatar of a plurality of avatars in the 3-dimensional virtual space being operated to communicate with one or more other avatars of the plurality of avatars. The information processing apparatus includes a storage means, a judgment means, and a processing means. The storage means stores an indicator set to show whether information owned by the avatar can be communicated with the other avatars. The judgment means determines whether the information owned by the avatar can be communicated with the other avatars, based on the indicator stored in the storage means. The processing means processes the information to be com-