

Interacting with Humanoids

Human Computer Interfaces 1

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Summary

Telepresence is the future of multimedia systems and will allow participants to share professional and private experiences, meetings, games, parties. Humanoids or Virtual Humans have a key role to play in these shared Virtual Environments and true interaction with them is a great challenge.

Introduction

The sense of "presence" in the virtual environment is an important requirement for collaborative activities involving multiple remote users working with social interactions. Using autonomous virtual humans within the shared environment is an essential supporting tool for presence. Their role is very important in virtual environments with many people, like virtual airports or even virtual cities. In the next few years, we will see a lot of Humanoids or Virtual Humans in many applications. These virtual humans will be more and more autonomous. They will also tend to become intelligent.

We may identify several areas where autonomous virtual humans are essential:

Virtual people for Inhabited Virtual Environments. Two types of real-time virtual humans may coexist in the same shared virtual environment: the guided ones and autonomous ones. Guided humans or avatars are useful to represent ourselves, the users or participants. Autonomous humans are able to act on their own. Based on the perceived information, the virtual human's behavioral mechanism will determine the actions it will perform.

Virtual substitutes. A virtual substitute is an intelligent computer-generated agent able to act instead of the real person and on behalf of this person on the network. The virtual substitute has the voice of the real person and his or her appearance. He/she will appear on the screen of the workstation/TV, communicate with people, and have predefined behaviors planned by the owner to answer to the requests of the people.

Virtual medical assistance. Nowadays, it seems very difficult to imagine an effective solution for chronic care without including the remote care of patients at home by a kind of Virtual Medical Doctor. The modelling of virtual patient with correspondence to medical images is also a key issue and a basis for telesurgery.

Contribution to the theme: challenges and solutions

Behavior and perception

Autonomous Virtual Humans should be able to have a behavior, which means they must have a manner of conducting themselves. Typically, the Virtual Human should perceive the objects and the other Virtual Humans in the environment through virtual sensors: visual, tactile and auditory sensors. Based on the perceived information, the actor's behavioral mechanism will determine the actions he will perform. An actor may simply evolve in his environment or he may interact with this environment or even communicate with other actors. In this latter case, we will consider the actor as a interactive perceptive actor.

Virtual vision is a main information channel between the environment and the virtual actor. The Virtual Human perceives his environment from a small window in which the environment is rendered from his point of view. As he can access depth values of the pixels, the color of the pixels and his own position, he can locate visible objects in his 3D environment. To recreate the a virtual audition, in a first step, we have to model a sound environment where the Virtual Human can directly access to positional and semantic sound source information of a audible sound event. For virtual tactile sensors, it may be based on spherical multi-sensors attached to the articulated figure. A sensor is activated for any collision with other objects. These sensors could be integrated in a general methodology for automatic grasping.

Intercommunication between Virtual Humans

Behaviors may be also dependent on the emotional state of the actor. A nonverbal communication is concerned with postures and their indications on what people are feeling. Postures are the means to communicate and are defined by a specific position of the arms and legs and angles of the body. These nonverbal communication is essential to drive the interaction between people without contact or with contact.



Sensing the Real World for a Virtual Human

The real people are of course easily aware of the actions of the Virtual Humans through VR tools like Head-mounted displays, but one major problem to solve is to make the virtual actors conscious of the behavior of the real people. Virtual actors should sense the

participants through their virtual sensors. Such a perceptive actor would be independent of each VR representation and he could in the same manner communicate with participants and other perceptive actors. Perceptive actors and participants may easily be. For virtual audition, we encounter the same problem as in virtual vision. The real time constraints in VR demand fast reaction to sound signals and fast recognition of the semantic it carries. For the interaction between virtual humans and real ones, gesture recognition will be a key issue. As an example, we have produced a fighting between a real person and an autonomous actor. The motion of the real person is captured using a Flock of Birds. The gestures are recognized by the system and the information is transmitted to the virtual actor who is able to react to the gestures and decide which attitude to do.

Conclusions and recommendations

Telepresence is the future of multimedia systems and will allow participants to share professional and private experiences, meetings, games, parties. The concepts of Distributed Virtual Environments is a key technology to implement this telepresence. Using humanoids within the shared environment is an essential supporting tool for presence. Real-time realistic 3D avatars will be essential in the future, but we will need interactive perceptive actors to populate the Virtual Worlds. The ultimate objective in creating realistic and believable virtual actors is to build intelligent autonomous virtual humans with adaptation, perception and memory. These actors should be able to act freely and emotionally. Ideally, they should be conscious and unpredictable. But, how far are we from such an ideal situation? Our interactive perceptive actors are able to perceive the virtual world, the people living in this world and in the real world. They may act based on their perception in an autonomous manner. Their intelligence is constrained and limited to the results obtained in the development of new methods of Artificial Intelligence. However, the representation under the form of virtual actors is a way of visually evaluating the progress. In the future, we may expect to meet intelligent actors able to learn or understand a few situations.

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