

"Holistic Virtual Environments"

by

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Virtual Environments (VEs) are expected to facilitate real-time interaction with human participants by using five major senses (Ref 1,2,8). These major channels provide means of interaction as well as tools for communication. However, the existence of several other senses, such as sense of fear, sense of well being, are also aspects of human interaction. Sadly, present technological focus of Virtual Reality (VR) is only the five primary channels. In the past such a reductionist approach has met with only partial success, and can be considered fatally flawed (Ref 7,9) especially when we must deal with multiple human participants in virtual environments. Thus there is a need to systematically study and create "Holistic" Virtual Environments which are sensitive to the emotional, psychological needs of the participants connected through a virtual environment.

The Holistic Virtual Environments (or simply Holistic Environments) will not focus on subdividing the human senses into primary five (seeing, taste, smell, feel, hear) senses. Instead, human participants would be modeled as dynamic, complex multi-dimensional systems, capable of chaotic behavior. As an example, even in such modern times, it is easy to communicate completely wrong message due to language barriers, social, and cultural differences. Gestures and styles in interaction also varies with where you are (Ref 3-7). These interaction-styles have been developed through ages geared towards optimizing and efficiency of interaction, and surrounding circumstances or nature. So Holistic Environments must work with these differences, and are to address verbal, non-verbal, and other multi-modal communication channels.

Some theoretical questions arise and must be addressed: (a) How can man-made (Virtual) Environment pose, or at least pretend to be warm and fuzzy humans, and have emotions. (b) Can a Virtual Environment (VE) really simulate a human being? (c) Is it necessary for a Virtual Environments to behave like a human being. What do we want to achieve in a VE, and what are our motivations and goals? (d) When would we consider a Virtual Environment a human-being? (e) Would a Virtual Environment ever be able to replace another human's touch, presence, words, or body?

Although these questions can not be fully answered at this time, and "may be" seems to be the best answer to these above questions (Ref S6-S9). We believe that systematic study and seeking answers to the above questions would be an important application of our efforts.

Presenting of information is also critical in communicating ideas, for example, some important factors are (a) when to present the information, (b) what to present, (c) How to present it, and, (d) where to present the information. In addition, we seek alternative models of human-interaction not necessary based upon today's silicon-technology, instead we want to create new active-devices which are better suited to interface with humans.

It is generally accepted that the sense of smell is useful in providing mood changes, e.g. Skunk smells can temporarily immobilize us. In addition sense of smell also can change the texture of what we are eating. As the sense of smell and taste are related, we are also interested in pursuing both psychological and functional effects of smell on the participants in the Virtual Environment.

I think that Holistic Virtual Environments will have a major impact on the computer-human interaction in near future, and would define new technology and products.

Possible Applications of Holistic Virtual Environments:

Holistic virtual environments would create a new dimension to existing research by addressing human-sensitivity issues, especially the emotional and non-verbal aspects of human-communication. For the first time, sub-conscious cues and indirect message are also to be handled in virtual environments. This will provide new richness to experiences of the participants. "Emotional" evaluation, generation, synthesis, and control of information contents are new dimensions and options available to participants in holistic virtual environments.

In Movies and Arts, camera movement and presentation has created powerful experiences providing varied emotional and psychological experiences. However, we do not know of any virtual environment where immersive experience has created a truly emotional experience yet. Holistic communication research will concentrate on facilitating experiences which are similarly powerful as it generates new dimensions in human participants. Since emotions deal with subconscious mind, this creates another avenue for future virtual environment research. What is interesting to us is the possibility of creating new long term social and personal implications which holistic environments are to provide.

Although 2D-images and 3D-graphical models, representing avatars of the participants, have provided interesting applications, we raise our expectations of avatars (Ref 8) used for/in holistic communications to another level. Avatars in holistic communication are to go beyond mimicing the actions of the participants. In holistic virtual environment we expect to address several new possibilities: (i) can avatars be autonomous enough to complete an interaction and form an agreement acceptable to "their" human participants. They can also set up introductions before the "real", busy participants show up. The idea of reducing the time and space constraints will create an ultimate choice and independence for the user in holistic virtual environments. Let us explore it a bit further.

Due to psychological reasons, we would like to create an avatar which would be almost exactly-similar to us. Realistic avatars (complete with biomechanical muscle and bone modeling, as well as realistic skin deformations) will make it challenging and interesting. So it leads to new possibilities and expansion of human-expression and communication, that of "autonomous" avatar and "mimicing" avatars, both existing at the same time. "Autonomous" avatars may represent some specific set of motions, emotions, and capabilities for/in a particular domain. Multiple "autonomous" avatars and their interactions with "mimicing" avatars would create new paradigms of human interaction in

virtual environments. This raises an interesting open question: How much we want the avatar to represent us?; How much are they capable of representing us?; How much should "it" look like us?; and, What is the difference between multiple avatars and the participant? This indeed then would bridge the gap between space and time as full body avatars can create a feasibility that "virtual" and "physical" presence are indeed identical. This creates "new" possibilities. For example, new social interactions are possible. New type of medium would be created to deal with holistic (or intrinsic nature of) participants instead of dealing only with their senses (Ref 7).

One important issue which holistic virtual environments must address is to assimilate a variety of social, psychological, cultural, and complexity of environments. Large complex virtual environments provide both "clutter" and "useful" information, the issue then would be "what" information to provide "when" to the participants. The context based presentation is important. Change of domain could change the "avatar's" knowledge model. For example, multiple "domain" avatars can assist the participant to deal with other avatars and participants including with some limited capability (disability). These "domain" specific avatars will fine-tune their communication channels based upon the "audience" the intended message is targeted for.

In holistic virtual environments, we are interested in providing with new tools for human-communication and modalities. So holistic virtual environments are expected to grow as the computation, knowledge, and time spent by the participants in these environments grows. Thus future virtual environments might be able to sense more than just five channels of communications. See seventeen senses (Ref 9). New possibilities of both "active" (by active we mean genetical/and biomedical devices) input and output devices. This will provide more humane-interaction in these environments. This opens possibilities of a variety of holistic communications: private, personal, professional, and a variety of group activities.

One of the most important application of holistic virtual environments would be to explore alternative (and hence the name "holistic") models based upon non-reductionist approach. Thus for the first time, study of both reductionist and non-reductionist (Ref 7) approaches would be facilitated. A systematic study of these approaches is indeed necessary as the role of nervous-system as well as brain needs to be emphasized when modeling humans in virtual environment (Ref 9).

There is also a need to systematically study long-standing questions: (i) Since human participants and different forms of their avatars, are present in holistic virtual environments, how can we measure the "intelligence" in these environments. (ii) Is there an intelligence in these environments which could be compared to "human" intelligence (iii) Can a virtual environment ever understand human participants so that virtual environments are able to predict their next action, (iv) what is the relationship between the knowledge of human participants and their "avatar" forms.

Finally, we feel that the holistic virtual environments would facilitate a forum for new type of interaction, and provide a better medium of expression to pursue and expand human-activity.

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