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User System Interaction: a challenge for the present and the future

The embodiment of computers in the work place has had a tremendous impact on the field of user-system interaction. Mice and graphic displays are everywhere, the desktop workstations define the frontier between the computer world and the real world. We spend a lot of time and energy to transfer information between those two worlds. This could be reduced by better integrating the virtual world of the computer with the real world of the user. The most promising approach to this integration is *Augmented Reality* (AR) [1]. The expected success of this approach lies in its ability to build on fundamental human skills: namely, to interact with real world subjects and objects!

We present a new interaction style, called Natural User Interface (NUI). Several prototypical applications already implement NUIs and demonstrate its technical feasibility.

In all the traditional interaction styles the user can not mix real world objects with virtual objects in the *same* interface space. They also do not take into considerations the enormous potential of human hands to interact with real and virtual world objects. This aspect was one of the basic ideas to develop data gloves and data suits for interactions in a virtual reality system (VR). The other basic idea, to realize a VR system, was the 3D output capabilities in the usage of head mounted displays. However, in VR systems several serious problems are inherently present; they are:

- The lack of tactile and touch information and consequently the mismatch with the proprioceptive feedback.
- The lack of information for depth perception, since visual displays generate 2D data. Many informational concepts are generating possibilities to reconstruct 3D pictures from these 2D data.
- There is always a time delay in the user-computer control loop, which may yield severe problems with reference to the perceptual stability of the vestibular apparatus in the ear.

- The strong influence of continuous communication--based on a shared social space--on social interaction is of paramount importance. Not only the shared sound space, but also the shared social nearness--in the real world--influences the human to human interaction [2].

The general advantage and disadvantage of immersive VR are the necessity to put the user into a complete modeled virtual world. This concept of immersing the user in the computer's world ignores the on-going process of interacting with the real world. In the same interface space the mixing of real and virtual objects is not possible. But, humans are--most of their time--part of a real world and interact with real objects and other real humans.

- [1] Wellner P, Mackay W, Gold R (1993). Computer-Augmented Environments: Back to the Real World. *Communications of the ACM*, 36(7), pp. 24-26.
- [2] Rauterberg M, Dätwyler M, Sperisen M: From Competition to Collaboration through a Shared Social Space. In: *Proc. of East-West Intern. Conf. on Human-Computer Interaction (EWHCI '95)*, 1995, pp. 94-101.