

Virtual partners in cyberspace - a proposal

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ABSTRACT

People with Aphasia have great use for computer support in their rehabilitation, aided by different types of software. Most of the software consists of sets of exercises with a clear language content. However, in this paper there is a presentation of ideas around a more general communication situation where a computer-simulated environment could offer people with Aphasia a broader experience of interaction and communication. Examples are given from work with videotelephony and different types of simulation software.

Keywords: simulation, videotelephony, therapy, aphasia, telematics

1. INTRODUCTION

Simulated environments have appeared in computer programs since the first commercial computer systems were introduced on the market. In the early days, text-based adventure-games like the legendary ZORK gave users the illusion of being in a fantasy-world inside the computer, where experiences were manifold although limited to text. Another famous non-game application was the misunderstood advisory system Eliza which gave the user the illusion of having a dialogue with the machine.

Today, the computer industry offers us simulated environments, where it is possible to control a computer program with movements of the body, speech and even the electrical currents in your muscles, myoelectrical impulses. It is also possible to experience the contents of the program through all your sensory organs. In other words, you interact with the computer and the program in much the same way as you interact with your physical environment or even with other people. Oral, visual and even tactile experiences can be simulated through computer applications.

However, we have a long way to go before the market can offer programs of a more total-immersive type which might be expected from my over-simplistic lines above. It is possible to use datagloves, headsets and even data-suits and interact with the computer which has been shown by pioneers like Jaron Lanier and others. It is also possible to interact as an artist with your own or anyone else's piece of art - music or painting or whatever - through the interface of a camera and a microphone which has been shown by Myron Krueger and others (Krueger, 1991; Newby, 1993). However, interacting through taste, smell and the proprioceptive systems still are lacking outside the highly specialized gas sensor systems of the laboratories (Sundgren, 1992; Teil, 1992). Tactile interaction is also very limited. However, tactile screens are in common use.

It is indeed interesting to see that the world(s) on the other side of the screen are so tempting to artists and people in general working in the cultural field. Cultural innovators like Brenda Laurel, Jaron Lanier, David Rokeby, Rafael Lozano-Hemmer, John Vincent and others have enriched the concept of art by opening similar doors of not only perception but also of active interaction with art itself through experiments with VR. The goal seems to be the enlarging of what is humanly possible to perceive and do. The end result becomes a simulation, either of reality itself or of the artist's perception of reality or even of the alternative realities of the spectator(s).

The general tendency in the computer industry today seems to be the fact that computers become more and more invisible or transparent. More and more functions are included into the computers or the (system) program. The latest piece of information about this tendency which reached my ears was the piece of news telling me that voice control will be a standard part of the new version of the WARP operating system.

2. VR AND SPECIAL NEEDS - GENERAL REMARKS

In a similar way, developers and researchers have found the field of VR rewarding and tempting when trying to develop new ways for people with special needs to interact in a better way with other people and the world in general. This conference is the fifth one in the world which concentrates exclusively on VR and disability and if we would count the total number of presentations and papers dealing with VR and special needs or disability we would probably find at least five hundred papers or presentations from the last five years. This is quite a number of papers and of ideas and it is a good measure of the amount of human creativity which has been spent in this area. I also have to add that most of these presentations have been made at some of the conferences created by the real pioneer in this field, Dr Harry Murphy Director and founder of the Centre on Disabilities, CSUN, California.

Very briefly I have looked over this impressive list of presentations and most of them seem to concentrate on the needs of people with hearing problems, motor dysfunctions, visual disabilities and in a few cases people with cognitive problems and I just want to give a few examples. In the last case, the problem of learning and understanding has been a main focus (Brown & al, 1995; Standen & al, 1995). In the field of visual disability some very exciting ideas have been presented for instance regarding the ability to construct spatial correlates, just using auditive stimuli (Cohen, 1995). In the case of motor disabilities, the main work seems to concentrate on developing more or less body-independent control-mechanisms or interfaces(Henry & al, 1992; Knapp & al, 1992; Knapp, 1995; Riedel, 1993). A good review of the VR-field, mainly from a medical perspective has been compiled by Dr Walter Greenleaf, another pioneer (Greenleaf, 1995). An interesting example of VR as a diagnostical and analytical tool can be found in the concept of holography (Szymanski, 1995).

3.VR AND COMMUNICATION DISABILITIES

However, very few applications have concentrated on the needs of speech or language impaired people. Apart from my own tentative work in the field of visual remote communication and simulation software for people with Aphasia (Magnusson & al, 1995) I think that most of the work in the language disability field and VR comes from UK, notably Dundee (Brophy-Arnott & al, 1992; Waller, 1993; Cairns & al, 1992), Edinburgh and London (Roy & al, 1993). Reviews of the general situation regarding computer application for people with Aphasia have been published in the journal *Aphasiology* several times (Loverso, 1992 and several others). However, it is important to remember when we talk about speech and language impairment that the field of AAC includes the needs of severely motor disabled persons with communication disabilities and there you will find many ideas regarding VR-based communication. The examples are many and well known.

An interesting detail is the fact that although there has existed a semi-annual American journal for about ten years called CUSH/Computer Users in Speech and Hearing, not too many of the otherwise interesting articles in that journal concentrate on applications for people with Aphasia.

4. APHASIA AND COMPUTER APPLICATIONS

This presentation, however, will concentrate on the needs of the language disabled people with Aphasia. The concept of Aphasia is very complex and, depending on your theoretical standpoint regarding the definition of the syndrome, there are several ways of defining Aphasia. A basic definition would say that Aphasia is a problem where the Aphasic person might have trouble in producing or understanding/ decoding language. Treatment for Aphasia often consists of training strategies to retrieve or recreate language structures of different types. This means that training or therapy is very important to the Aphasic person. If we want to create good training instruments for Aphasics we have to consider many different aspects of communication.

Since a language deficit like Aphasia means that you probably have difficulties in your ability to handle any type of symbol you will have difficulties in handling any computer interface since all computer interfaces are heavily abstract and symbol oriented, either using letters or icons. Another difficulty in the general handling of computers is that a common program consists of series of commands which could be difficult to remember correctly. In the old DOS-days it was difficult for someone with Aphasia (or Dyslexia) to spell the complicated commands correctly. Today, the icon-based interface might be spatially confusing since too many open windows or desktops tend to confuse a user so that in the end you really don't know where you are at the moment, since information seems to be hidden in many different graphical codes all over the screen. Few researchers have done any real serious research into the results of having to use complex interfaces and what complexity really consists of. Some work has been done regarding the use of multimedia (Cairns & al, 1992). This field is certainly open to some basic research.

Many computer based programs for Aphasia training have been developed over the years. So far, most of the programs consist of basic exercises where the user of the program encounters a set of questions or trials, mostly based on text and pictures. The training situation, however, is far from the real and basic communication situation and I

believe that if we are to create optimal training software for people with language disabilities, then we have to recreate the general communication situation itself. And to do this we have to define that situation and all its different parts so that in the end we will have a simulated reality. In this simulation we will have to consider pragmatics and body-language and also social behaviour and also the biological aspect of communication.

5. VR AND APHASIA

The optimal situation would be the (dyadic) situation which would offer most input and output channels to the participants, probably the basic situation where two persons are close to each other in the same room and within touching distance of each other. When I talk about the basic communication situation I simply mean such a situation which is as much a product of your body as of your personality. A basic morpheme in the language of life - to put it a little bit high-sounding. In other words, if it would be possible to create a computer-based situation of that sort, then it would be possible to give a computer-based experience not only of parts of the communication process but also of the totality of the communication process with speech, eye-contact, movements, touches etc as natural parts of the computer use.

At this point, some listener or reader might make the remark “why bother with simulated reality when we have the real thing?” Unfortunately, as many therapists, relatives and Aphasics themselves know to well, the “real thing” meaning other people to talk to and interact with are not always available so the simulation might become the support, helping you to find your way into the so called real world, at your own convenience.

So far, the world of Aphasia therapy has seen very little of this advanced type of program. I will give a short history of the development of computer-based Aphasia therapy leading up to more and more reality-like software and then give a few suggestions as to the next steps of development.

The very first computer programs were used in Aphasia therapy and consisted of text-based practices in word-finding, filling in sentences, finding opposites etc. In the mid fifties the mainframe based Plato system was used in a few trials in the USA but the first real programs were developed for personal computers in the middle of the seventies, in several countries including Sweden and UK and others. During the eighties real program packages containing sets of exercises were developed and several programs became commercially available. There also were developed programs not specifically for therapist-supported training but also for self-training and for use as personal communication aids. Still the programs were concentrated on linguistic training and the pragmatics of communication was not so evident in the software.

In the early nineties, software development had reached a level where it was possible to offer advanced multimedia solutions and program developers in the Aphasia field started to build scenarios for the programs where the communication situation was more interesting than just the isolated language test or practice itself. In an average program package it was possible to find exercises for memory training, word-order, syntax, semantics, basic mathematics, spatial orientation, phonological training etc. This type of program is available in most European countries as well as in the US, Australia, Japan etc.

There has also been a controversy of dialectic proportions regarding the use of computers for people with Aphasia. Many people have agreed that the computer has all the potentialities to give people with Aphasia many new possibilities and we all have seen the flexibility of training software. On the other hand, the language based structure of most computer interfaces seems to make independent computer handling very difficult for people with Aphasia and since computers are an integrated part of modern society, it seems as if computers would make society much more difficult to cope with for people with Aphasia. Besides, it has been difficult to create any really new computer ideas for Aphasics since the therapeutic software mostly is translated directly from the paper-version. In other words, developing new and creative computer solutions for people with Aphasia has been considered a very difficult task (Ahlsen, 1995; Waller, 1995).

However, the first time anyone officially expressed the new idea of a whole communication situation in the form of a computer program was the time when the Scottish speech therapist Alison Crerar coined the term “microworld” (Crerar, 1991), thereby meaning that the training situation with the computer should be likened to the sensation of experiencing a special environment or “world” where the Aphasic person would be able to experience communication as a form of interaction with the software. Several programs during the nineties have tried to offer this possibility by creating rooms, landscapes, buildings, countries etc in the computer where it is possible to “wander” around and discover different things and where the training content lies in the fact that you have to identify verbally the things you encounter.

I will show a few examples of software of this type from Sweden and the other Nordic countries. This type of program gives the user the feeling that he/she is moving around in an environment where it is possible to use and learn

from the things that you encounter in this environment, shortly that it is a question of interacting in a broader sense of the word than in the older types of programs.

This type of program is in reality a simulation and simulations of processes, stories, adventures, journeys etc. They have become very common during the last five years. We only need to think about the family of most popular games - the Sim-family games where Sim-earth might be the most wellknown example.

The simulations for people with Aphasia have so far only covered manipulation of objects and language tools and experiencing a special environment. No software has yet offered the interaction with a simulated person other than in very primitive form. And all the programs are limited to mouse- or keyboard control. What would be the next step would be to offer the Aphasic person the possibility to interact with the program in a more direct form.

6. SUGGESTIONS AND IDEAS

A simple example would be to make programs were it would be possible to use a touch screen. thereby creating the feeling that it is possible to manipulate the objects and tools on the screen directly without any intermediate medium or change of perspective. Few trials have been made yet, making use of this technology. In the same way it would be natural to offer control solutions where it is possible to talk to the computer or to make gestures to the computer which would take in the gestures through a camera connected to the computer.

We have a few examples where the computer has helped a person with Aphasia and traumatic brain injury to express the feelings related to the communication difficulties through computer-based art (Addison, 1995). We also have examples where computer software has been created to guide and support someone with Aphasia constantly through situations and environments, once familiar and taken for granted.

To sum it up, we have good programs, good experiences of the use of computers by people with Aphasia, good knowledge of what Aphasia therapy is about. However, we have insufficient control tools to make it possible to interact in a broader sense with the computer and the software. We also do not have a lot of software where it is possible to train the interaction with another person, either a real person or a simulated person.

Therefore I would like to suggest two main ways to spend research and developmental money for people with Aphasia:

1. The development of easier ways to access and use networks like the InterNet or direct contact between two individuals, in other words, meeting real partners electronically from a distance. If you call the InterNet using WWW today and make a search using the word Aphasia you will probably find about 100 hits including the presentation of a few American researches, some bibliographies from scientific journals and the homepage of the heavy metal rock group Aphasia (!). Accessing the InterNet is still a little bit cumbersome and to move around in the network you have to be good at reading and writing as well as endowed with quite a lot of patience - not to speak about all the knowledge about hardware and software which is necessary.

Another way of using standard technology to access people and sites of information over a network would be to use video-telephony, either over InterNet (Cu-See-me) or over ISDN or narrowband telephone network. My own research is concentrating on the use of ISDN-based videotelephony as a tool to give therapy to people with Aphasia over a distance. How transparent is the videotelephone technology for users with Aphasia? Will the participants experience a videotelephone-meeting in the same way as a "real" physical meeting?

Very valuable views on general design problems regarding the accessibility of remote information systems have been presented in the work at British Telecom (Smythe, 1993). Within our small community of researchers into the accessibility problems of different networks there seems to be consensus on the need to make sites on InterNet as accessible as possible (Serfleik & al, 1995). To paraphrase Krueger's words, a good program has to be like a place where you experience things and discover new aspects of the physical world. When you become accustomed to your computer and the program you have to trust the technology and feel that you sort of belong together (Treviranus, 1995).

2. The development of a totally new type of software where it would be possible to meet a simulated communication partner within the computer. This type of software would have to be controlled through, camera, microphone, touch-screen beside the usual mouse/keyboard platform. The software would also have to contain some sort of voice recognition and pen-writing function. In other words, a platform containing such a type of software will be so power demanding that the personal computer of today will probably be too limited. The large computers from film-making would probably be a more promising platform. And so far, no concrete development has been made with such an idea for people with language disabilities, at least not to my knowledge.

This type of software would certainly offer a totally new possibility of language training for people with Aphasia as well as for therapists. Apart from being slightly controversial as an idea where we really have to be careful about the

definition of “human communication” it is fascinating. Imagining meeting a virtual discussion partner on the screen where the software would adapt to your reactions and you might be able to choose from different personalities to interact with. In Sweden and Denmark we have started discussions to see what such a joint effort would demand and lead to. We would be happy to welcome other interested discussion partners.

7. CONCLUSION

To sum it up, the software with the working name “The Virtual Partner” would have to offer the user the possibilities to

- train a dysfunction
- test an ability
- get information
- get a role model
- get a way to express the inexpressable

My final and basic hypothesis would then be:

If you create a computer simulation that would function as close as possible to the situation where two people sit in the same room communicating with each other using all output and input channels available, then you have created the optimal software for the Aphasic person.

If you agree - let's do it!

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