Using virtual public transport for treating phobias

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ABSTRACT

Nowadays using and talking about virtual reality (VR) is a very popular subject. VR is an artificial world, a computer mediated environment. The user tries to enter fully into the spirit of her or his role in this unreal-world. Virtual Environment (VE) technology has undergone a transition in the past few years that has taken it out of the realm of expensive toy and into that of functional technology. During the past decade, in the field of Mental Healthcare, the considerable potential of VEs has been recognised for the scientific study. This paper shows the application of VR and presents the VR research in the University of Veszprem. The virtual worlds, introduced below, are developed for treating specific phobias (fear of travelling).

1. INTRODUCTION

The medical application and research of VR has more than one and a half decades of history. For all this the cooperation of more scientific fields are needed. Beside computer science and software engineering - that provides technology - also sociology, psychology are needed especially to reveal the psychological background of the effectiveness of VR and either to improve it.

VR is a computer mediated environment where one can step in, move and also create an interactive connection with. The psychological background of its effectiveness as mentioned above is not yet clear in details. What we surely know by now that one of the keywords of its effectiveness is "presence". Presence is feeling "real" in the mediated world. It is a product of the mind, created by a complex psychological procedure. This psychological procedure is closely related to self-perception and attention preferences also play very important role.

The number of fields for using VR are constantly expanding. From the first applications in games, entertainment through army applications nowadays healthcare and education turned to be in the middle of interest. They use VR for the training of the aircraft, pilots, firemen, divers, soldiers etc. In medicine, VR starts to play role in the training of surgeons, medical students and in the field of psychiatry, psychotherapy, neuropsychiatry. The latest applications are pain reduction and physiotherapy, rehabilitation and scientific researches.

In neuropsychiatry learning memory dysfunctions, learning and improving cognitive dysfunctions, helping Parkinson-patients with movement-induction, the rehabilitation of post-stroke patients are the most improving fields. In children's psychiatry researches have been shown in the field of improving children with autism, ADHD and other attention disorders. In psychotherapy VR is already proved to be effective in the therapy of anxiety and body-perception problems, PTSD and phobias.

Next to clinical experiences many controlled clinical researches have already proved the equal effect of desensitisation with VR and regular psychotherapy. Wiederhold and colleagues have published the analysis of a long term, prospective research with the biggest sample yet. It e.g. shows the already mentioned equality between the two kinds of therapies but also shows that those therapies where next VR bio-feedback was also used were even more effective and what is really interesting and important that only 4 % was the dropout during the 4 Years of data collecting.

Advantages of treating phobias with VR are:

- it is easier to complete the tasks in the office instead of organising complicated outside programs
- it is safer and more controllable by the therapist who can monitor the effects and react to them more precisely.
- It is repeatable
- Easier to engage the patients for the therapy and the dropout is less during research or therapy

Disadvantages of the therapy with VR include

- simulator sickness may occur
- still expensive

2. THE PROJECT

Phobia is an anxiety disorder in which the person has an extreme, unrealistic fear of a particular situation, activity or object. The fear over which has no control occurs whenever the object appears or the situation arises and the phobic man experiences strong, unbearable anxiety and distressing symptoms such as heart palpitations, sweating or feeling of panic when presented with the feared object or situation. (Beck, 1976; Laky, 2003; Szendi, 2000)

The person with phobia makes real efforts in order to avoid the feared situation or object. Based on the feared object or situation and the strength of the avoidance phobia can make one's life unbearable, others can live with their phobia without serious everyday-problems. For example in Hungary if somebody has snake-phobia is not a real problem since unless you go to the zoo it is hard to meet snakes. (Of course anytime a neighbour can move in with his beloved pet..) What is important that in this case avoiding the feared animal doesn't need extra energy and suffering. In another case for example with travel phobia somebody in Budapest can reach a point when he is not even able to leave his flat.

Fear of public transport is a part of the agoraphobia and its object could be travelling by train, bus, tram, aeroplane, car and the most frequented (at least in Hungary) is fear of travelling by underground.

The method of treating travel phobia with VR is practically the same as the regular psychotherapy, called desensitisation. Before the exposition with the feared situation patients learn relaxation and other methods for eliminating anxiety and they also have to create a hierarchy of the stimuli in order to show which causes the less and the strongest anxiety. After this the exposition starts and with VR the therapist can control, based on the hierarchy, the number and the quality of stimuli that the patient has to cope with.

This paper shows a pilot VE intended for people who fear of travelling by underground.

3. DEVELOPING THE VIRTUAL ENVIRONMENT

The model of the developed virtual environment is one of the Hungarian underground located in Budapest. First we prepared videos about this underground and after according to these videos we created the virtual underground by the help of Maya software. The following pictures show the real and the modelled escalator of the underground (Figures 1 and 2) and the wire frame model of the station (Figure 3).

After modelling the underground by Maya we exported the virtual objects to Shockwave 3D file format (the extension of this file is W3D). We had to do it for getting the VE interactive. For the exporting we use Shockwave Exporter that could be found free on the Web. This program is able to export Maya made object to the format (W3D) could be easily used by Multimedia Director.

Multimedia Director helps us to make our underground interactive. For this aim we wrote a small program which can modify the viewpoint of the camera by rotating 3 dimensional vectors. It permits the user to look around without limitation. The walk about is not allowed, because for it we should have had to do impact monitoring that demands a lot of computing result slowing down the computer(s). So the user while "walking" along a given route, by the help of predefined camera moving, is able to make a stop whenever he likes and he can look around. (The limitation of free walking is not a hard restriction since the escalator is limits the moving in itself.)

Figure 1. *The real escalator.*   **Figure 2.** *The virtual escalator.*
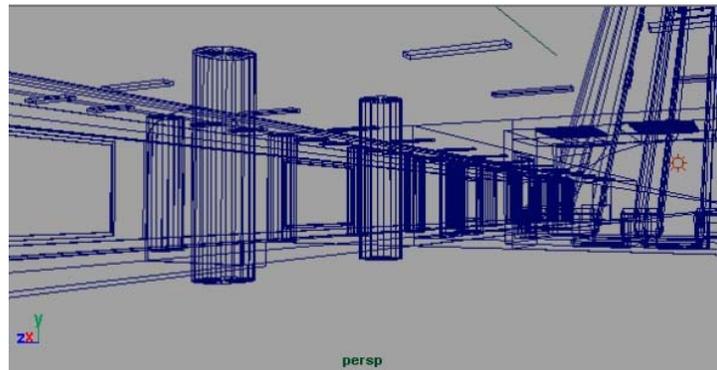

Figure 3. *The wire frame model of the station.*

For the VE we clipped the sounds from the real video for elevating the feel of reality. These sounds were applied for the prepared virtual world. The voices bulk large that the patients feel like being on the escalator or getting on a block. Some special sound effect, for example the voice indicates the departure of the underground, have particular part in that sufferer feels the same anxiety as he feels during travelling on real ones. The importance of sounds is so considerable that it could decrease the magnitude of photo-realistic graphics.

4. THE PROGRAM

The following pictures show some picture about the result, the escalator (Figure 4), the station (Figure 5) and the underground carriage outside (Figure 6) and inside (Figure 7).

The usage of the program is not so hard. The mouse controls the viewpoint of the user and there are some function key and/or button for exiting, stopping, etc. It takes only few minutes that the user makes himself at home in the program. The user has to choose between window and full screen mode and the therapy starts. We put a lot of stress on the program being easy to use. It is important that both the patient and the therapist can use the program easily so that they can turn their full attention to the task and the therapeutic situation. During planning the software we concentrated especially on making it possible to be easy to follow the most important rule of the desensitisation process of behavioural therapy, the rule of "step by step". The flexibility of the program gives wide possibilities of the length, strength and time of the exercise during the therapy. It is even possible to step one level back if the actual task causes too high level of anxiety – even during relaxation- to the patient. Practically the exercise can be repeated on a certain level without restrictions. The patient or the therapist can stop the program whenever they feel like it. After stopping the program it can be restarted or continue.

During preparing the software we didn't put stress on its image being full of with details since without the details VE is a proper surface for the patients to project their former experiences and anxiety memories.

Requirements: Pentium class or equivalent CPU (2 GHz), SVGA display with 800*600 resolution, quick video card (minimum Ati Radeon 9000) Windows XP operating system Mouse, Sound card.
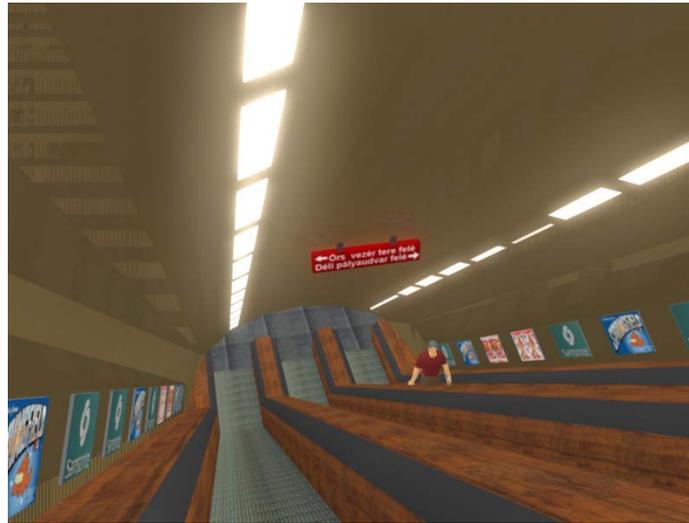

Figure 4. *The escalator*

Figure 5. *The station*

Figure 6. *The underground carriage outside*

Figure 7. *The underground carriage inside*

5. TESTING

The tests of the applicability of this program in the therapy of patients with phobia will be placed at the Department of Psychiatry and Psychotherapy in Semmelweis Medical University. Our first experiences with patients and healthy people shown the software is that they use the program without any difficulty and report about very reality-like feeling, though they miss the possibility to move freely in the environment. These tests were not clinically controlled examinations only helping us to have the first package of information about practical features and usability of the software. We plan a clinically controlled study with two steps. During the first step we are going to measure the feeling of presence and state anxiety when using the VE among phobic patients and matched control subjects. Our goal is to show that entering the VE the patients experience the same anxiety level as when they are exposed to the feared stimuli in vivo so it creates a proper basis for psychotherapy with desensitisation. During the second step we would like to start therapy with VR on a small group of pilot cases in order to show the – at least – equal effects of desensitisation with VR and regular psychotherapy and also to show the upper mentioned practical advantages of psychotherapy in VE.

6. CONCLUSIONS & FUTURE PLANS

1. Our paper introduced a new VE created for treating travel phobia

2. VR has not only useful entertaining and educational applications but proved to be important in the field of medicine especially in psychiatry. It can be a good tool to strengthen the effect of cognitive and behavioural psychotherapies

3. It is important to improve this application of VR both from the aspect of computer science and psychiatry

Our aims to the future is modelling and creating new VEs for treating other public transport phobias, such as fear of travelling by tram or bus.

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