

# In therapy with avatars

Combating phobias and psychotic disorders using virtual technology: that is what the work of Dr Willem-Paul Brinkman of the Faculty of Electrical Engineering, Mathematics and Computer Science involves. Of course one does not have any of these disorders oneself – or at least that’s what our reporter also thought.

As a white European, I glance from under my mask at the monitor on which my heartbeat and sweat production are creating fluctuating patterns. I have just entered a virtual pub, packed full of people of North African appearance.

And it gets worse: Dr Willem-Paul Brinkman has just pressed a button causing the few remaining white people to suddenly get up and leave. The empty chairs gradually fill with North African avatars who wander into the pub.

Luckily, the sensors on my fingers do not send out any strange signals, even when I use a joystick to approach the new arrivals in the pub up close and make eye contact. Being with people of different skin colour does not make me feel any less comfortable. This is something I already knew about myself, but now I have proof. The pattern on the monitor remains the same.

“Ah, that’s what you think,” laughs Brinkman, who is supervising the experiment in a completely darkened room in the Electrical Engineering, Mathematics and Computer Science (EEMCS) building. “The patterns of your heartbeat and sweat production have shown some real changes. They have become more irregular. You cannot see it with the naked eye, but we have computer programs that analyse it.”

Brinkman can tick boxes on the screen with words such as ‘crying’, ‘angry’, ‘tense’, which are used to mark the behaviour of the test subject on a timeline. This can prove helpful in reconstructing the most awkward situations retrospectively. I am spared this ordeal, as there is nothing to tick on this occasion.



Willem-Paul Brinkman

The TU Delft researcher is developing what are known as VRET (Virtual Reality Exposure Therapy) systems, which can be used to help people deal with their anxieties, such as fear of flying, fear of heights or claustrophobia, or psychotic disorders such as paranoia. He took over the research project, which has been running for almost ten years, from Dr Charles van der Mast in 2007.

One of the first products to emerge from the laboratory of fear was a vibrating aircraft seat. Two economy class seats in the corner of the laboratory serve as a reminder of the time when Brinkman and his colleagues were experimenting with them.

In collaboration with the University of Amsterdam, Leiden University and KLM’s Valk Foundation (established to help combat fear of flying), the Delft researchers developed a system to enable people with a fear of flying to don a virtual reality helmet, hear characteristic aircraft sounds and experience the vibrating seat as if they were really in the air. This helps people become accustomed to the sensations and overcome their fear.

The system is used intensively by the Valk Foundation, explains Brinkman.

## Even scarier

Dr Brinkman’s recent work has focused on programmes like the virtual pub, which are designed to help people with social problems. He is working in alliance with researchers from Parnassia, a Dutch psychiatric institute. “They have many patients of North African origin with psychosis,” explains Brinkman. “These patients suffer from delusions that other people want to harm them and they are especially suspicious of people from outside their own ethnic group.”

The idea is that reconstructing the social environment in a virtual world and exposing people to it will enable psychiatrists to improve the research they conduct on the psychotic symptoms and ultimately provide better help to patients.

The virtual pub is still in the pilot phase, however, and needs to be made even scarier. Patients find it extremely frightening when people look at them for long period of time, and hence this feature needs to be added. It

should also be possible to conduct a simple conversation.

“Developing a real treatment method will take quite a few years,” says psychiatrist Dr Wim Veling. “We have now conducted research on what happens when we expose people to a crowded environment and to people of a different ethnicity - two factors which are known to cause psychosis. The results are highly encouraging: people with paranoia show a similar response to situations in the virtual world as to those in the real world.”

The researchers conducted the experiment with 15 patients and 24 white, European students and staff from TU Delft. They were all asked to walk through the pub and - as a kind of distraction - search for numbers that had been put on the chests of five random people in the pub.

“In the test with healthy test subjects, I reversed the roles,” Brinkman explains. “This makes the stress factor the number of North Africans - rather than white - people present, given the fact that the test subjects available to me were mainly white. But the principle remains the same.”

The small increase in fluctuations of heartbeat and sweat production observed by Brinkman after collecting and analysing all the data from all the Delft test subjects serves as a baseline, which subsequently can be compared to the outliers among the patients.

“It’s like an echo,” says Dr Veling, describing the measurements. His colleague, Professor Mark van der Gaag, explains: “For millions of years we lived in clans with only a few hundred people. This means that our brain is probably constructed in such a way that we are quickly able to determine who belongs to the group and who doesn’t.”

The ultimate aim of the research is to develop a method for use in cognitive behavioural therapy that “brings the world into the consulting room”, in the words of the psychiatrists. “Now patients tell us afterwards that they were afraid when they were sitting in the tram, for example, because they felt that they were being stared at,” explains Prof. Van der Gaag. “Or that they heard fragments of conversations and thought people were talking about them. In cases like these, their response is to flee.



Patients are exposed to a social environment in a virtual world.

*‘People with paranoia show a similar response to situations in the virtual world as to those in the real world’*

“In the virtual world, we encourage them to respond differently. The threshold for staying in the tram for one more stop - we intend to also create a virtual world set in a tram - is lower because you know that there is no actual danger. The patient then realises that people eventually look away and there is actually nothing going on.”

The virtual worlds still look quite artificial. Is that an area that still needs further work? “Photo-realism is not important at all,” says Prof. Van der Gaag. “All you need are the right fear cues. Take the system to combat fear of flying for example: it uses a helmet in which you see images of old-style VGA quality. If you look past the airport towers, all you can see is pixels. It bears no resemblance to anything. And yet, people still throw up in a bucket.”

Another interesting feature of the experiment is that the avatars look particularly attractive. Have the Delft researchers simply programmed their dream women and men, like a bunch of nerds? And could that not also be the reason why my heartbeat became slightly more irregular, I ask optimistically? That slight paranoia, however natural it appears to be, was still a bit embarrassing. “No, it’s not down to that,” laughs Brinkman. “Of course, in order to make the virtual world appear more natural we would have preferred to use avatars that are more average in appearance, but we had no choice. We bought these avatars from an American company and these were the only figures they had. It would cost us a great deal of time and money to create them ourselves.” (TvD)