An Augmented Reality System for treating psychological disorders: Application to phobia to cockroaches

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Abstract

Augmented Reality has been used in many fields, but it has not been used to treat psychological disorders. Augmented Reality presents several advantages respect to: the traditional treatment of psychological disorders and Virtual Reality treatments. In this paper we present the first Augmented Reality System for the treatment of phobia to cockroaches. Our system has been developed using ARToolkit software. It has been tested with one patient and the results have been very satisfactory. At first of the exposure session the patient was not able to approach to a real cockroach and after the exposure session using our Augmented Reality system, the patient was able to approach to a real cockroach, to interact with it and to kill it by herself. This first result is very encouraging and it demonstrates that Augmented Reality exposure is effective for the treatment of this kind of phobias.

1. Introduction

Our Augmented Reality system for the treatment of phobia to cockroaches (ARcockroach) is the first experience using Augmented Reality (AR) for treating this phobia, but it is not the first experience treating phobia to small animals. Our group has treated phobia to small animals using Virtual Reality (VR) [1]. Till now there are several experiences and groups treating psychological disorders using VR. The first experience was realised by the Human-Computer Interaction Group of the Clark Atlanta University for treating phobia to fly. After this first experience, VR has been used for treating different kind of phobias [1], apart from flying phobia: agoraphobia, acrophobia, claustrophobia or spiders phobia. We think it is possible to use AR to treat different kind of psychological disorders as well. The use of AR in the treatment of these disorders presents some advantages respect to the traditional treatment and the treatment using VR. In our point of view, the main advantage of AR respect to VR is that the environment is real and the elements that the patient uses are real as well. Only the elements that represent patient's fear are virtual.

2. Material and methods

The video stream is captured using a USB camera (Creative NX-Ultra). Mixed Reality Image is shown using 5DT HMD. The camera has been attached to the HMD. ARcockroach has been developed using ARToolkit 2.65 software with VRML support [2]. The system includes the following options:

Appearance of cockroaches (1, +3, -3, +20, -20). When only one cockroach has to appear, it appears in the centre of the marker. When more cockroaches have to appear, they appear randomly.

Movement of cockroaches. Cockroaches continue their movement from the position where they were. The movement is repetitive and different for each cockroach.

Stop movement. Cockroaches stop their movement.

Initial position. Cockroaches come back to their initial position.

Zoom in/ Zoom out. Cockroaches increase/reduce their size with these options.

Users can also kill one or several cockroaches. It can be done using: a flyswatter and a cockroach killer. We have put a marker on these two instruments. The program identifies when one of these markers are near of the cockroach's marker and then it kills one or several cockroaches depends on the number of cockroaches that have been selected. When the user kills cockroaches, the program plays a sound like when you flatten a real cockroach (using the flyswatter) or like when you use a real insecticide (using the cockroach killer). Once one or several cockroaches are died and the scraper is near the cockroach's marker, only one dead cockroach appears in the middle of the marker, so the user can throw the dead cockroach to the dustbin.

All these options are included in order to patient's treatment can be progressive. The therapist chooses in every instant how many cockroaches have to appear, if they have to move or not, their size, to kill a cockroach when the patient is prepared and throw it to a dustbin.

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3. Results

The system has been tested with a female of 26 years old. She asked for help in the Anxiety Disorders Clinic of the Jaume I University. Before the treatment an admission interview was realised. Through this interview, demographic and clinical information was obtained. During the interview, the patient was also asked about some questions to determine the presence of different anxiety disorders. Regarding the diagnosis, the patient met DSM-IV [3] criteria for Specific Phobia animal type. In order to measure the level of anxiety of the patient we have used subjective units of discomfort scale (SUDS) [4]. The participant rated her maximum level of anxiety on a ten-point scale before and after the session. We also used this measure during the exposure session. The exposure session was about one hour and the steps followed were:

1.- The patient arrived to a room where a terrarium with an alive cockroach was . She did not want to come in. She scored 10 on SUDS scale. After some therapist's comments the patient went in, but she did not approach to the terrarium.

2.- Before the exposure session, the patient scored 10 on SUDS scale. The exposure session with ARcockroach started. At first, one cockroach appeared and the patient scored 10 on SUDS scale. After some therapist's comments, the patient was gradually reducing her level of anxiety. After that, more cockroaches were progressively appearing (Figure 1). During the session, the patient was able to see sixty cockroaches at the same time. Following this, the therapist tried the patient approach her hand to therapist's hand where the cockroach/es was/were crossing.

3.- The therapist included surprise boxes (1-4). Under one or two of these 4 surprise boxes was a marker. When the user picked up the box, one or more cockroaches appeared, it depends on the selection the therapist had chosen. Again, the therapist first and the patient later picked up boxes with and without markers.

4.- Once the patient scored 0 on SUDS scale, the therapist went on killing animals. At first, the therapist killed one cockroach and threw it to a box. Later the patient did same actions.

5.- In that moment, the therapist thought the patient was prepared to see again the alive cockroach. Therapist's hope was that the patient would be able to approach to the cockroach but not to kill it. Again, the therapist tried the patient would be approaching to the terrarium where the alive cockroach was. The patient touched the terrarium with fear. After some therapist's comments the patient was prepared to see the alive cockroach running on the floor. So, the therapist let the cockroach out of the terrarium. The patient was able to approach to the real cockroach, to interact with it and to kill it by herself. It was a really good result.

Figure 1. An image of the exposure session

4. Conclusions

The conclusions of the exposure session using ARcockroach with one patient are: The system was able to activate the participant anxiety. She scored 10 on SUDS scale at the beginning of the session and she scored 0 after the session. The patient experienced high levels of anxiety during the AR exposure session. The increment in anxiety was related to the different AR levels and the anxiety provoked by the introduction of several elements. AR exposure was effective for the treatment of phobia to small animals.

Before the exposure session with ARcockroach, the patient was not able to approach to a terrarium with an alive cockroach. After this session, the patient was able to approach to a real cockroach, to interact with it and to kill it by herself. This first result is very encouraging because it demonstrates that AR exposure is effective for the treatment of phobia to small animals. So we are going to test the system with more patients.

This first experience using AR to treat phobias is very important because it demonstrates that it is possible to use AR to treat psychological disorders. This opens a new field where the application of AR is possible.

5. References

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