RISE

Research Centre on **Interactive** Media
Smart Systems and **Emerging** Technologies

Using Virtual Reality to Train Designers to Develop Friendly Interfaces for Achromatic Vision Patients

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Abstract

An investigation in the use of Virtual Reality as a means of training designers to design interfaces accessible to achromatic vision patients is presented. Within this context virtual environments incorporating real life environments are visualised through the eyes of achromatic vision patients and designers are given the opportunity to navigate and interact with the virtual environment using different types of interaction schemes. Through the process designers assess the applicability of different interaction methods adjusted to the needs of achromatic vision patients. According to the results of an experimental investigation, the idea of using Virtual Reality-based training is deemed effective.

Virtual Reality (VR) Application

The VR application involves **three real-life scenarios**. During the **first scenario** the user needs to **cross** three busy **roads using pedestrian traffic lights** designed **using different schemes** to indicate the GO and STOP commands. In the first case, symbols (**octagon and arrow**) are used, in the second case the words **"GO" and "STOP"** were utilized and in the third case the use of a **walking or stationary human figure** were used (see figure 1).

The **second scenario** includes a **virtual clothing store** (see figure 2) where cloth colours are presented using dedicated **symbols on labels or using text labels or using audio**, activated using proximity sensors.
The **third scenario** involves the **purchase of fruits and vegetables** of specific color in a virtual supermarket (figure 3). In this case the colour/type of different fruits is indicated through dedicated **symbols and labels** that help the user to distinguish fruits.

During the experiments users were requested to **cross the roads** using the **three types of pedestrian traffic lights** in order to be transferred to the cloth store scene where the user is **requested to select a red, a blue and a yellow shirt** in the right order. Once the cloths are selected the user is transferred to the **supermarket** where the task is to select a **red apple and a green lemon**. In all cases different types of achromatic vision disorders (i.e. **protanopias, deuteranopia, tritanopia**) are **simulated** so that the tasks are performed **through the eyes of achromatopsia patients**. The visualization of the **VR environment** was done using an **Oculus Rift headset** and the interaction was carried out using **a game controller**.

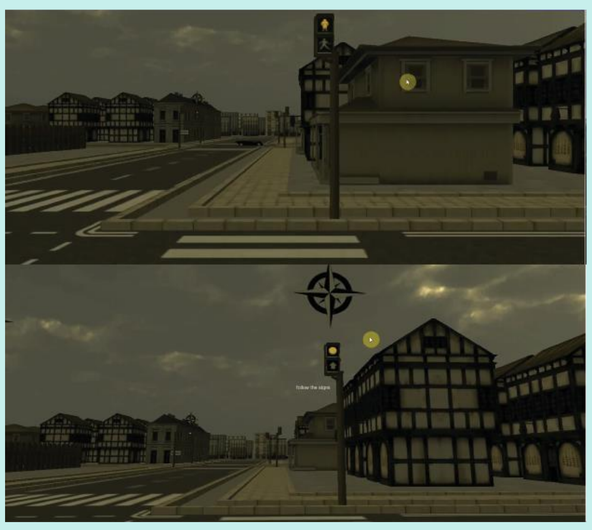

Figure 1: Traffic lights designed using schemes octagon and arrow, words "GO" and "STOP" and a human figure.

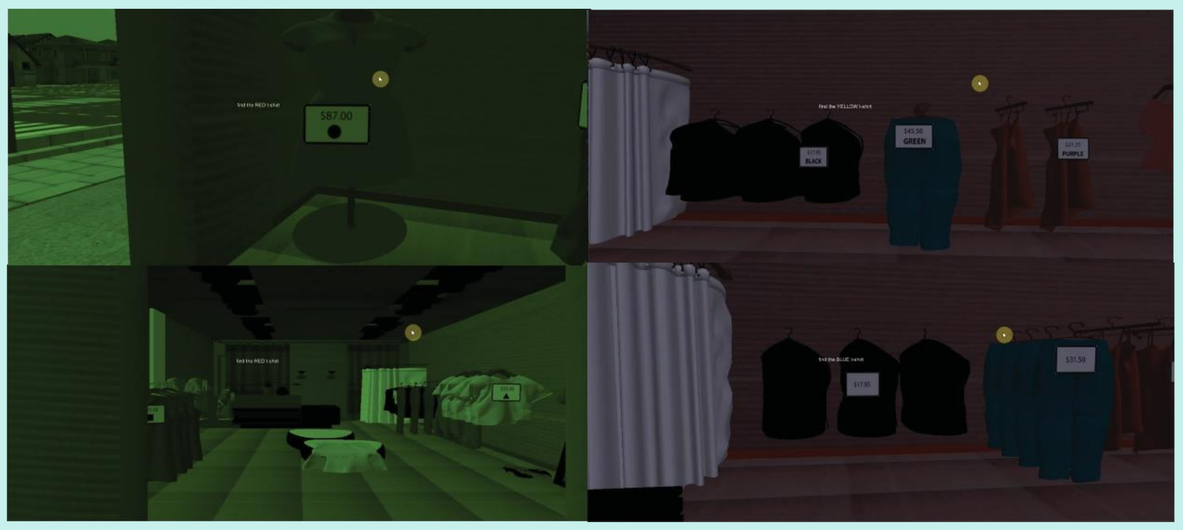

Figure 2: Clothing store where cloth colours are presented using dedicated symbols on labels or using text labels or using audio.

Figure 3: The colour/type of different fruits is indicated through symbols and text labels.

Results and Conclusions

- 14 out of the 15 participants do not take into account color-blindness in their designs.
- They **did not face significant difficulty in completing all tasks.**
- The interaction schemes adopted in the form of **text-based descriptions, dedicated symbols and sound, provided useful ways to support achromatic vision patients.**
- **All designers who participated** in the experiment **gained invaluable knowledge and expertise related to problems** faced by achromatic vision patients, along with **experience of using alternative color-blindness friendly interaction schemes.**

A preliminary study of using VR to train designers to create interaction modes friendly to achromatic vision patients, was presented. Based on the preliminary results we envisage that the knowledge gained and the overall experience in the VR environment will be instrumental in promoting to designers the design of color-blindness friendly interfaces.

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