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Enabling trust between people and MR/VR users

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Abstract

The present disclosure describes a system that enables trust between a Mixed Reality (MR)/Virtual Reality (VR) user and people in the vicinity, so that the people can be assured if the user is aware of their presence or not. A light strip with LEDs is embedded in an MR/VR headset, along with a camera. The camera records a video of the user's surroundings. The video is wirelessly transferred to an Application Program Interface (API) of an MR/VR application. A pre-trained person detection model of the API detects people in vicinity of the user. The API determines a type of session that the user is engaged in, if people are detected in the vicinity. The API enables the light strip and turns on blue LEDs, if the user is immersed in an MR session. This is an indication to the people that the user can see them. In a similar manner, the API enables the light strip and turns on red LEDs, if the user is engaged in a VR session. This serves as an indication to the people that the user cannot see them. This develops a bond of trust between the user and the people in the vicinity, and this aids the people to act appropriately when they are around users, who are immersed in the MR/VR reality. However, the light strip is not enabled if people are not present around the user.

Problem

In Mixed/Virtual Reality (MR/VR), a user interacts with virtual objects overlaid on a real environment in real time. The user might be playing a mixed reality game that requires body movements of the user in the real environment. For example, a game of boxing requires the user to make arm movements as shown in Figure 1. People in the user's surroundings do not know whether the user is aware of their presence since most of the user's face is covered by an MR/VR headset. This creates a situation in which the people feel unsafe and uneasy being in the user's vicinity, when s/he is immersed in an MR/VR reality.

The present disclosure implements a system for detecting people around the user and giving an indication to them whether the user can see them or not, while being immersed in the MR/VR reality.

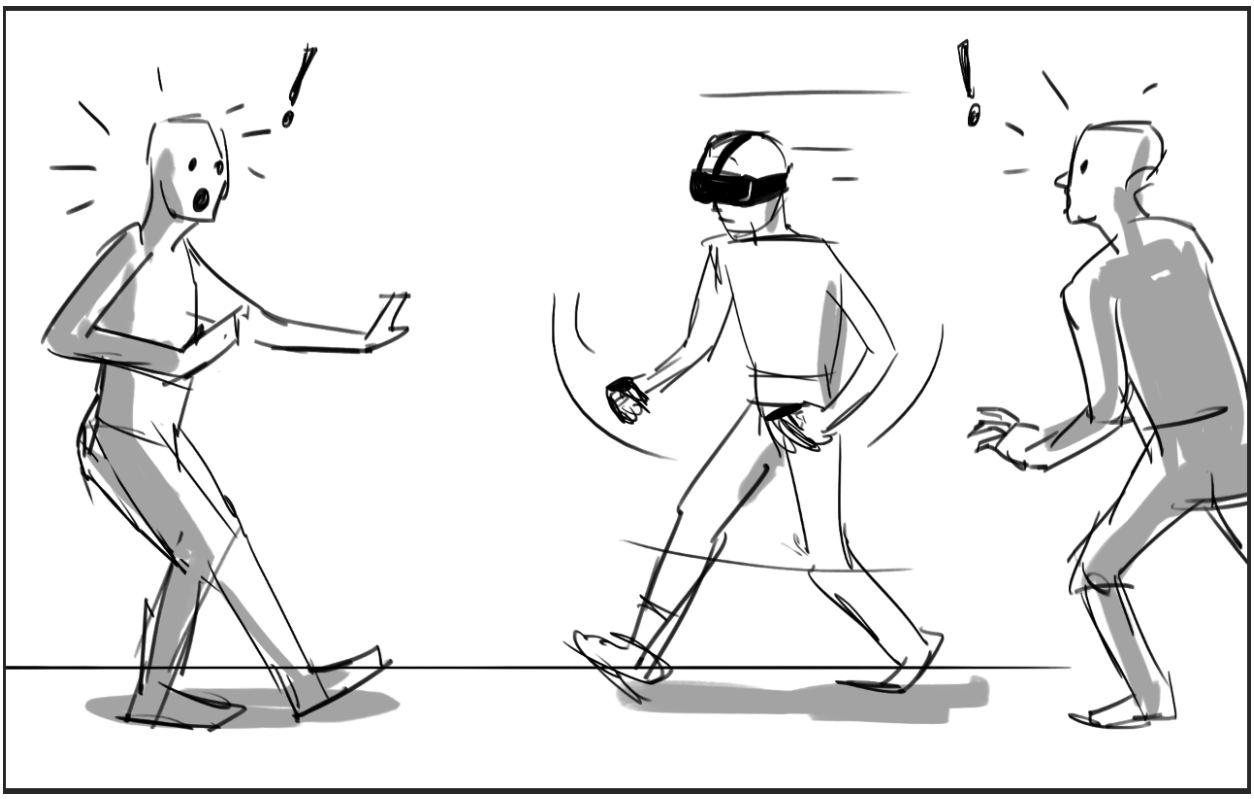

Figure 1: People in the vicinity hesitating and keeping clear of the user wearing the MR/VR headset.

System and working

The present disclosure describes an MR/VR system in which a bond of trust is developed between a user (i.e. an MR/VR user) and people in the vicinity of the user.

The system, as shown in Figure 2 comprises of:

1. An MR/VR headset
2. A mobile device

The mobile device has an MR/VR application installed in it. A light strip and a camera are embedded in the MR/VR headset. The light strip includes blue LEDs and red LEDs.

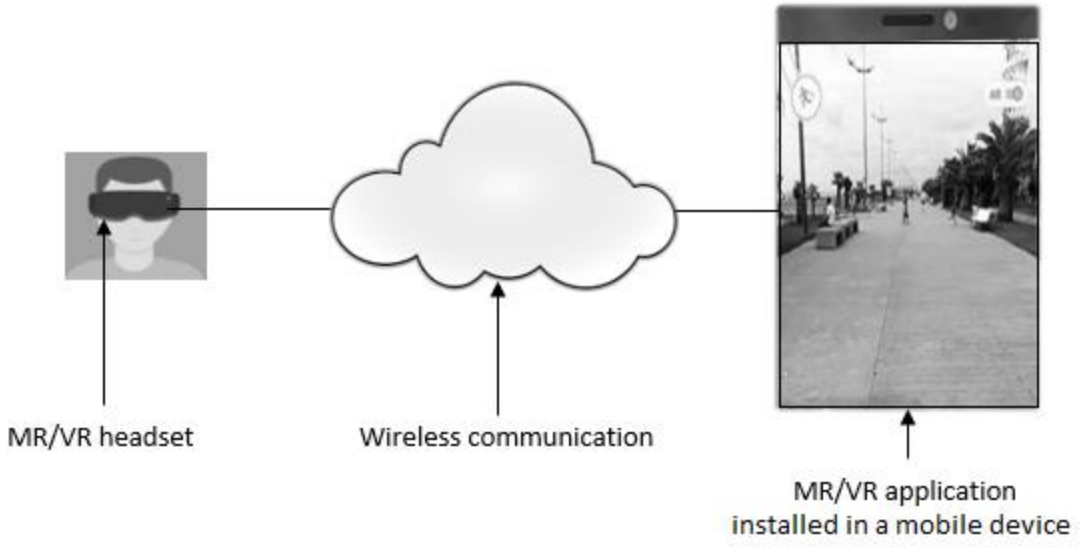

Figure 2: The MR/VR headset wirelessly interfaces with the MR/VR application

When the user is engaged in an MR/VR activity (such as playing an MR game) wearing the MR/VR headset, people in his/her surroundings are unaware if the user can see them or not. This creates hesitation amongst the people, and they stay clear because of safety concerns. The MR/VR headset is wirelessly connected to the mobile device. The mobile device runs the MR/VR application for displaying MR/VR content on the headset. The user might be viewing a VR session or a MR session. An API of the MR/VR application is aware of the type of session in which the user is engaged. The API turns on the camera of the MR/VR headset when the MR/VR activity starts. The camera starts recording a video of the user's surroundings. The video is wirelessly transferred to the API of the MR/VR application in real time. The API includes a pre-trained person detection model. The video is given as an input to the pre-trained person detection model. The pre-trained person detection model detects object(s) of interest utilizing a technique of background subtraction. High dimensional features are extracted from each object. The object(s) is/are classified into a "human" or a "non-human" category based on the extracted features. If the object(s) is/are classified into a "human" category, following cases (A or B) arise:

(A) If the user is engaged in the MR session, the user is aware of his/her surroundings. But the people do not know that the user can see them. As soon as the user enters in the MR session, the API invokes a glowlight() function for turning on the blue LEDs of the light strip as shown in Figure 3(a). Glowing of the light strip in blue color serves as an indication to the people that the user can

see them. So, the people can walk freely as the bond of trust is developed between the user and the people as shown in the Figure 4.

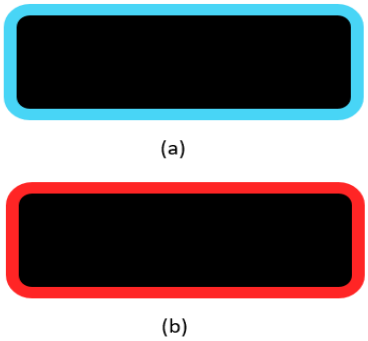

Figure 3: Front view of the MR/VR headset when (a) the user can see people (b) the user does not see people in his/her vicinity

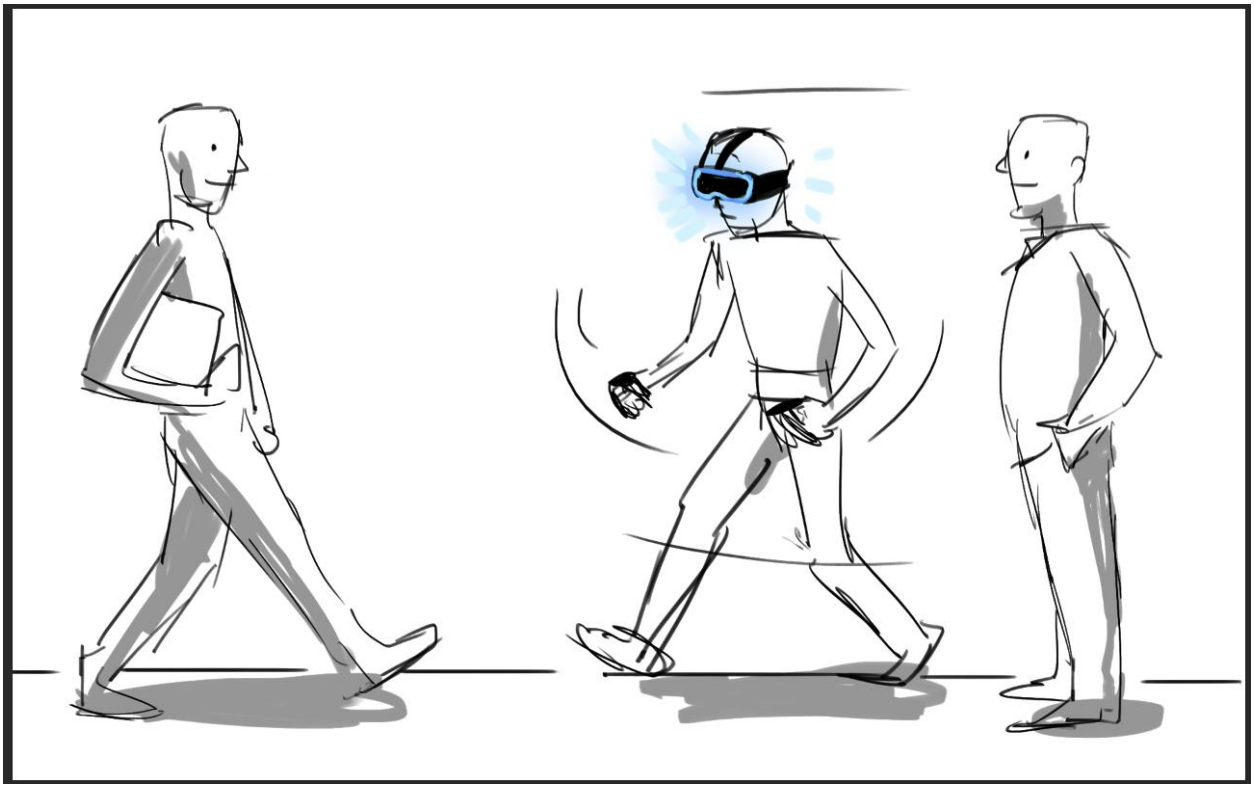

Figure 4: The glowing light strip giving the indication to the people

(B) However, if the user is engaged in the VR session, the user is completely unaware of his/her surroundings. Also, the people do not know that the user cannot see them. As the user enters the

VR session, the API invokes the glowlight() function for turning on the red LEDs of the light strip as shown in Figure 3(b). Turning on the light strip in red color serves as an indication to the people that the user does not see them. In this scenario, the people keep clear of the user. However, the user needs to rely on a feedback from a guardian to keep him/her away from dangers in his/her real environment.

However, if the object is classified into a "non-human" category, both the blue LEDs and the red LEDs are not turned on.

Additional embodiments

In an additional embodiment, the MR/VR headset embeds following components:

- An external speaker
- An internal noise-cancellation device

As the pre-trained person detection model detects people nearby, the API triggers a command to enable the external speaker to generate a voice message. If the user is immersed in the VR session, the voice message "I can't see you" is communicated to the people nearby. If the user is engaged in the MR session, the voice message "I see you" is communicated to the people nearby. The internal noise-cancellation device inbuilt within the MR/VR headset attenuates signal corresponding to the voice message for the user engaged in the MR/VR environment. Therefore, the user's MR/VR experience is not bothered by the generated voice messages.

Conclusion

Playing immersive reality games has become quite a norm in today's world. However, such activities tend to make others in the vicinity of the player/user quite uncomfortable and unsure as to how to act/behave. It is always ambiguous to such passers-by if the player/user can or cannot see them. This disrupts even normal activities like leisurely walking by. With the solution provided by this disclosure, we can mitigate this problem to quite an extent. This solution is enabled to provide an easy reference to everyone around as to when the user (immersed in the MR/VR reality) is/is not aware of his/her real environment.