Conect - An application for hybrid conferences

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ABSTRACT

For the IEEE ISMAR 2021 contest, we propose Conect, an application allowing natural social interactions to build next generation hybrid conferences. Our application works on a smartphone and a classical computer. A video projector is used at the real-world conference site and displays the names of remote attendees on the floor. On-site attendees can scan the projected names with the mobile app and communicate with remote attendees. This application allows natural interactions between on-site and remote attendees through video calls, a feature absent from current virtual world apps. Since it requires using everyday-life devices only, Conect is an non-intrusive application, easy to use and to deploy, focusing on improving awareness and preserving the experience of real-world conferences.

Index Terms: Human-centered computing—Human computer interaction (HCI)—Interaction paradigms—Mixed / augmented reality; Human-centered computing—Human computer interaction (HCI)—Interaction paradigms—Collaborative interaction

1 INTRODUCTION

This year's IEEE ISMAR contest deals with "Natural Social Interactions at the Hybrid Conference of the Future". To meet the objectives of this contest, we propose "Conect", an application for next generation hybrid conferences. Since the focus has been set on social interactions, defined as reciprocal interactions with at least two persons [6], Conect has been imagined to be non-intrusive, and easy to use and to deploy. To fulfill natural social interactions, some key elements must be taken into consideration, such as verbal and non-verbal communication [3]. Nowadays, video communication has become standard in everyday life [2], as it can transmit verbal and non-verbal gestures. However, there has been evidence that it remains less natural than face-to-face communication [1].

With the Covid-19 pandemic, dozens of virtual world applications and platforms for events, such as Virbela, Virtway Events or Attendify, have been released. However, they often raise awareness issues, as, for on-site attendees, it is complicated to know who is connected without signing in the virtual world, which diminishes the real-world experience. Since our application shall be used at hybrid conferences, we propose to mix distant and real worlds, so that remote attendees can easily perceive on-site attendees, and vice-versa.

We developed Conect to connect remote attendees between each other, but also remote and on-site attendees, without diminishing the conference experience for on-site attendees, while requiring using everyday-life devices only.

2 CONCEPT

Conect is composed of three parts: a smartphone app, a computer app and a video projector app. They are all connected through PhotonEngine, an independent network engine and multiplayer platform. Fig. 1 shows the overall concept of Conect.

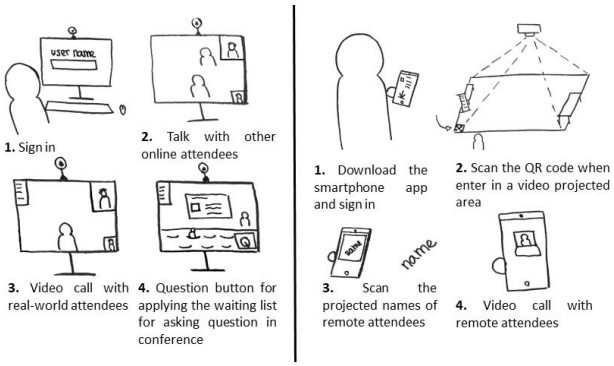

Figure 1: Concept of Conect, on the left for remote attendees and on the right for on-site attendees.

Figure 2: Computer application of Conect.

2.1 Computer application

Designed for remote attendees, this application is a digital twin of the real-word conference site (Fig. 2). Through an avatar, users can explore the virtual world and communicate with other remote attendees by messages or video calls. They can also exchange with on-site attendees when they connect on the phone app and scan a QR code.

2.2 Video projector application

Video projectors are fixed to the ceiling of conference rooms, towards the ground. They are connected to the computer application and project the corresponding zone in the virtual world seen from above, without any detail of the virtual environment to avoid overloading the image. Remote users' avatars are replaced by their names on the ground, at the same place as in the virtual world (Fig. 3).

2.3 Phone application

The phone application is designed for on-site attendees. After downloading the application, the attendees are invited to sign in with a name and join the room corresponding to the conference. QR codes are placed at the entrance of the areas delimited by the images

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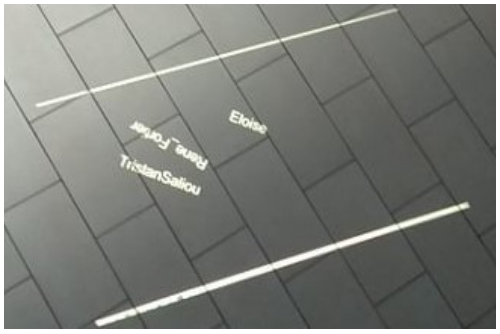

Figure 3: Projected names of remote attendees on the ground.

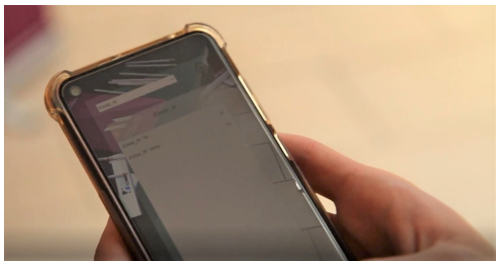

Figure 4: Pop-up window on the phone application displaying the names detected by scanning the floor.

displayed by the video projectors. When the attendees scan a QR code, their location is uploaded to the virtual world and displayed on boards on the virtual walls of the corresponding room, allowing remote attendees to get informed about the presence of on-site attendees nearby. The names projected on the floor of the conference site can be scanned, which pops up a window on on-site attendees' phone and allows them to communicate with remote attendees via text messages or video calls (Fig. 4).

3 How it works

The three applications were developed under Unity3D in C#. We integrated four additional plugins: PhotonEngine, Agora, Vivox and Vuforia.

PhotonEngine is used for the multiplayer part and synchronizes the names, positions and animations of the avatars between the three apps. Since it synchronizes also the movements of the remote users, their names projected by the video projectors on the real-site ground move according to the avatars' positions.

Agora enables videos calls, while Vivox is used for audio calls and messages.

Vuforia handles the detection by the phone's camera of the names projected on the ground. Vuforia's "Instant Image Target" function was used for this purpose. We placed a white text in the Unity scene corresponding to the name of the remote user, with a camera filming this text from above, with a black background. Then, an automatic screenshot of what the camera sees is taken and saved as an image file. This image is then used for detection by Vuforia in the phone's camera video stream, then, specific actions are performed when the corresponding image is identified. For example, pop up a window to communicate by message or video call with the corresponding user. All these steps are done for each remote user already logged in when an on-site user logs into the app, and also each time a new user logs into the computer app.

Each application is connected to the same "room", hosted by PhotonEngine; they all have access to the different users, regardless of whether they are on the computer application or on the phone application. The room is created by the first user who connects to any application, e.g., the one who will install the video projectors in the conference site, before it opens. Each attendee, remote and on-site, signs in with a name on the apps that is then used by the four plugins to identify users and allow them to communicate with each other.

4 Discussion

The major innovation that we have added, which is not present in other virtual world applications and improves social interactions, lies in the possibility of video calls. In addition, we have not identified similar applications integrating video ground projection. Most applications using video projectors deal with interactions with virtual objects, and are not aimed at social interactions [4, 5].

The development of Conect is not fully complete. Among the missing features but in progress, the addition of a button on both the computer and phone apps, to create a waiting list for asking questions during the conference, and the enrichment of the computer app that is still limited in the possible actions. Other improvements can be proposed, such as integrating multiple video projectors, upgrading the user interface, making it more friendly and working on multiple user video calls, or improving the augmented reality experience for on-site attendees.

5 Conclusion

For the IEEE ISMAR 2021 contest, we developed Conect, an application to achieve natural social interactions at hybrid conferences. Our project is composed of three applications to be installed on three devices: a smartphone, a computer and a video projector. With the smartphone app, on-site attendees can notify their presence to remote attendees and communicate with them. The computer app is a virtual world where remote attendees can exchange between each other, but also with on-site attendees. As it is a digital twin of the real conference site, the position of the remote attendees is synchronized and displayed on the conference site's ground through their names. To achieve the most natural social interactions, we have added video calls in addition to audio calls and messages, which is not featured in existing virtual world applications. The use of video projectors as a communication mean is also a novelty.

We have developed a proof of concept, featuring a virtual world, the choice of two avatars, video and audio calls, and messages between users. The specificity of Conect is to require using non-intrusive, easy-to-use and familiar devices, such as smartphones and video projectors, making hybrid conferences available to anyone without needing to invest on high-end mixed-reality devices.

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