Integrating Rocketbox Avatars with the Ubiq Social VR platform

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ABSTRACT

Having a truly ethical, unbiased technology, requires people developing and using this technology to have an equal opportunity to participate in its creation. In this sense, open-access tools are a way to share best practices and enhance collaboration. In this paper, we will present the integration of the Microsoft Rocketbox avatar library into the Unity networking library Ubiq. We will see how they may contribute to the research in the field of populated virtual environments.

Keywords: social virtual reality, open source, networking, avatars, communication tools

1 INTRODUCTION

Putting multiple participants together in a virtual reality scenario creates a collaborative situation that, is in some ways is similar to a real-life situation. People can react to virtual events and virtual characters as if they were real and this may be facilitated by avatar embodiment. Thus, avatars take an important role to social VR and AR interactions [12] as they can be used to recreate and evaluate humans responses to realistic scenarios. A self-avatar, or embodied avatar, is a 3D representation of a human that is co-located with the user's body. Self-avatars have shown to help users to better perform cognitive tasks [13] or even modify implicit racial bias [10]. To this day, comparison of current commercial and research SVR experiences shows the lack of support of some key social features around group coordination and user representations. There should be more support of emotion and gesture display as non-verbal communication plays an important part in the quality of group interactions [8, 9]. Recent taxonomies [6–8, 14] of SVR systems highlight the lack of support for common conventions in avatars' creation, representation and controls. Ultimately, avatars take an important part in the users' experience of SVR systems, in their interactions with others, and in the construction of digital identities [2]. Therefore, having open-access to social virtual platforms using multiple types of representation of users will help researchers implement their own experimental systems so that they can studying self-representation in multi-user systems and thus, enhance communications and interactions between users.

2 OPEN-SOURCE TOOLS USED

Microsoft Rocketbox Avatar library Microsoft has released an open-source avatar library [5] that offers a collection of 115 virtual avatars representing humans of different gender, age, race and occupations. The avatars are fully rigged and equipped with an internal skeleton allowing their animation, including body and facial animation. The library has been used for applications in the virtual reality research field but also crowd simulation and real-time avatar embodiment. Using this library allows researchers to investigate the relationship between people and their virtual representations, as it affects their own behavior interactions with others in virtual worlds, sometimes leading to having an impact in the real world as well.

Microsoft Movebox Avatar library On top of Rocketbox, Microsoft has released an open-source toolbox [4] for the animation of its avatars, using motion capture in three different ways. First, with a simple capture studio using depth sensor. Second, with a IK Hand Tracking tool for realtime use with HMD, thus, recreating avatar embodiment in VR. Last, with an offline video tracking tool by extraction of skeleton of video footages to convert them into animations compatible with the avatars. The tools from the capture studio can be imported to the IK Hand tracking project to record the motions of the participants or users.

Ubiq, a Social VR system to build experiences Ubiq [3] is a Unity-based framework for building SVR systems for research, teaching and development. It includes message passing, room management, rendezvous and matchmaking, object spawning, lightweight XR interaction examples, customisable avatars and voice chat. It supports multiple XR platforms as well as desktop and web clients. To allow multi-user social interactions in Ubiq, SVR features have been implemented that allow users to embody avatars and communicate with body language and voice chat. Ubiq enables the creation of different multi-user applications and is designed to facilitate setting-up, running and evaluating experiments for the purpose of teaching and research.

3 FEATURES

Initially Ubiq provides cartoony floating avatars but we extended this to support Microsoft Rocketbox avatars. These have been rigged using the open source Microsoft library Movebox for the support of IK Hand Tracking. To make use of full body avatars in VR, we also use commercial inverse kinematics libraries such as Final IK (for Unity) [11] to procedurally animate the body parts that are not tracked in real-time with Movebox. Specifically, we used the VRIK sample from Final IK. To implement Rocketbox avatars into Ubiq, and to support fully rigged animation, some steps must be followed, included the creation of a Unity prefab containing :

- A rocketbox avatar gameobject.
- An animator component.
- A script setting up the gameobject as a Ubiq networked object with a unique id.
- A script tracking the head and hands positions and rotations of the avatar and sending this data on the network.
- A Rocketbox ArmIK **OR** a VRIK script assigning avatars' bones upper or full body rigged animation.

Ubiq supports both desktop and VR controls, and camera and hand controllers are calibrated to fit the avatar head and hands. The Movebox open source plugin allows hand tracking using Inverse Kinematics solver reconstructing possible elbow position, but does not yet provide a solution for the animation of the rest of the body. Meanwhile the Final IK commercial plugin allows full body animation with its solver VRIK. The plugin uses a procedural locomotion technique to animate the feet, moving the avatar to catch up to the

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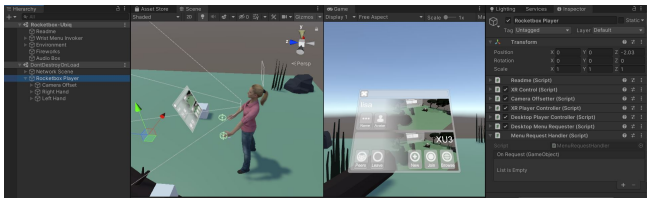

Figure 1: Example of connection of one user using Rocketbox avatar in Ubiq sample scene in Unity window..

HMD. When applying animated locomotion to remote instances of networked avatars, only the head target, hands target position and rotations need to be synchronized and to be shared over the networked.

4 Basic examples

We have been using Rocketbox avatars for our own lab experiments for both single and multi-users studies. Using both supported avatars in Ubiq (floating cartoony avatars and Microsoft rocketbox avatars). We have been exploring the use of avatars in both synchronous and asynchronous experiments and worked on tools to control participants and to automate running and evaluating experiments in virtual reality. Using different types of avatars allow us to explore the impact of users representations on media-based communications and interactions. Also, Ubiq supporting both VR, MR and desktop systems, we can explore the impact of users' level of immersion in social virtual reality systems.

Figure 2: Example of social gathering between multiple floating avatars and Microsoft Rocketbox avatars in Ubiq.

Figure 3: Example of multiple floating avatars and Microsoft RocketBox avatars completing a collaborative task in Ubiq.

5 What we may expect in the future

While Ubiq already offers a large variety of functionalities to support distributed and remote XR experiments, we would like to develop more tools for avatars customisation and non-verbal communications support. For instance, we are looking at solutions to support lip synchronisation using Movebox open source plugin and SALSA LipSync Suite v2 [1] to create advanced emote expressions for realistic avatars. Finally, we would like to replace Movebox IK Hand Tracking and Final IK plugins by our own open source full-body animation system, including feet animation as well. Our goal is to offer teachers and researchers access to fully open source social virtual reality studies. Enabling experimenters to reproduce, set, create and run svr experiments. Thus, in order to invest more in the research on avatars and virtually media-based social interactions.

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