

# Demo Title: A Customisable Real-time Video and Audio Streaming Approach to Creating an Immersive Collaborative Distant Learning Environment.

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**Overview.** The intention of this demonstration is to present a novel immersive telepresence system that enables remote students to participate in seminars and lectures using online streaming video and audio connections. In this system, a virtualized video view is created using a 360° panoramic video projected onto a 180° curved projected screen (immersive shell). This recreates a more natural human-like perception of real environments and thereby stimulating the learning process. 3D audio is also collected and reproduced at the remote location adding to the realism. To accomplish this we use a 360° mirror situated in the classroom which we use with a camera to transmit a panoramic image to the remote users where they reconstruct the original image from spherical to Cartesian. To process the audio we use a small array of microphones at the classroom end. In addition, we provide various tools to allow the participants to control their position within the virtualized views, thereby creating an innovative technology and user experience. We will be demonstrating this system at the conference.

**Keywords.** Immersive Reality, Immersive Shell, Immersive Panoramic Audio and Video.

## Introduction

Our aim is to present an immersive system within a learning environment which allows remote students to participate, either in synchronous (real-time) or asynchronous (video-on-demand) sessions. We will show that such a fully immersive video and audio experience is no longer a dream for the future, but is currently possible. This is a demonstration compliments a technical paper submitted to the same conference (iED Europe Summit London 2013) [2].

We are using an immersive shell manufactured by Immersive Displays Ltd which utilizes a semi-spherical 180° projection screen where the image presented is a partial view of a 360° panoramic video that is controlled by the end user. The image is transmitted through the internet by a Media Server with RMTP and reconstructed by the end user's browser where the view can be controlled either by a variety of HCI

schemes such as ‘drag or drop’ (mouse/keyboard) or by a ‘head tracker’ or ‘mouse camera’ scheme.

## **1. Demonstration set up**

Our demo will present 2 concurrent scenarios:

### *1.1. Seminar room at a host location*

Scenario 1 depicts a local scene where a seminar event is taking place with local students.

A spherical mirror is mounted on a tripod, with a webcam above the mirror which streams real-time video into a Media Server, which broadcasts it to the multiple connected clients.

The spherical mirror is located somewhere in the middle of the room between the attendees in order to simulate a seated student. The mirror can be adjusted to differing heights representing someone standing or seated. In this way, remote individuals can emulate being local subjects.

### *1.2. Student at a remote location*

Scenario 2 illustrates the remote location where the distant student is located. The remote location consists of an immersive Displays Ltd shell together with an integrated projection and audio facility.

In this scenario the distant seminar room video (from scenario 1) is projected onto the semi-spherical 180° screen which the student stands or sits in front of. A wireless keyboard/mouse is used to control the system (or if we have one, we may use a head tracker to control the panoramic video view). Audio is presented using a hypersonic audio system to provide a directional binaural experience. A headphone will also be available.

Users of the system will be able to ‘drag and drop’ the panoramic video in order to simulate moving freely around the 360° video scene streamed from the distant seminar room. As the user rotates through 360°, the binaural audio will follow the video to intensify the feeling of “being there”, not only visually but in an auditory sense as well. This will provide a selective directional audio approach which we have presented at another conference earlier this year [1].

### *1.3. Live event streaming and VOD future work*

The demonstration will show the system being used in a real time streaming mode but it could easily be adapted to a VOD system as the entire session could be recorded for a later access without losing any of the information either visually, with the panoramic facility or auditory, with the binaural experience.

## 2. Framework elements

This novel system I makes use of the following third-part components:

- Media Server with RMTP, such as *Flash Media Server*® or *Red5*®, as a method of streaming from the lecturer to the student
- Immersive shell *ImmersaVue*® manufactured by Immersive Displays UK where the 180° image is projected
- Spherical mirror with an arm mounted HD Webcam for collecting the polar image
- *HHS Hypersonic*® loudspeaker system to provide the directional audio.

## References

- [1] A. Torrejon, V. Callaghan, H. Hagra. “*Selectable Directional Audio for Multiple Telepresence in Immersive Intelligent Environments*”, Intelligent Environment 2013, , 18-19 July 2013, Athens, Greece.
- [2] A. Torrejon, V. Callaghan, H. Hagra. “*Immersive Audio and Video towards the Immersive Learning experience*”, Immersive Education 2013, 28-29th November 2013, London, UK.