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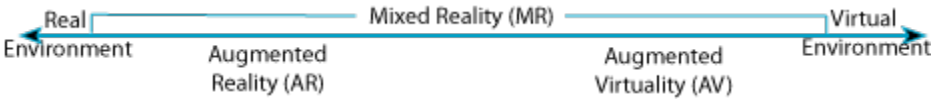
Mixed Reality Browsers

Introduction

This paper focuses on Mixed Reality Browsers (MRB) that merge real and virtual worlds somewhere along the virtuality continuum which connects completely real environments to completely virtual ones. We will give a demo of the audio-visual MRB developed by the WAM project-team of INRIA at Grenoble which use an RDF data format for POIs whose URIs refer to content expressed in HTML5 and in a declarative data format for interactive audio.



Concept

The concept of Mixed Reality comes from the fact that the real-virtual dichotomy is not sharp, but interpolatively smooth over a virtuality continuum [1]. Idealised notions of reality and virtuality can be thought of as endpoints on a continuum, an instance of the former approach corresponding for example to a see-through display with natural sounds, an instance of the latter to texture-mapped image-based rendering (panoramas) with synthetic sound objects.

Augmented Reality (AR) mode refers to all cases in which the auditory or visual display of an otherwise real environment is augmented by means of virtual sound or graphic objects. The converse case on the virtuality continuum is Augmented Virtuality (AV), where a virtual world, one that is generated primarily by computer, like with synthetic 3D graphic or synthetic panoramic, is being augmented with the audio-visual content of Point of Interests (POI).

The introduction of mobile augmented reality browsers has forced a rethink on what kind of reality should be offered. Mobility induces a need for telepresence and simulation to free the user or the developer of the necessity to go each time in the real world. Mobility is the main reason behind the concept of Mixed Reality Browsers. By its intrinsic characteristics, MRB supports advance MR applications like mobile to mobile remote maintenance and assisted navigation.

Mixed Reality Displays

There are many different displays, if we consider that we can mixed the modality type, audio or visual, with the mixed reality type, AR or AV. In the following, we will focus on two of them that we have implemented in our MRB [2].

Auditory AR Display

3D Interactive audio is a very important modality in a situation of mobility, the creative and technological potentials of location-sensitive, mobile spatial audio being very high. The effect of lateralized sound in headphone listening can be produced using amplitude and delay differences in two headphone channels corresponding to each source. In order to make a sound source externalized, more sophisticated binaural techniques are needed. This techniques work by filtering sound sources (monoaural signals) with left-right pairs of directional transfer functions using non-individual models or measurements of the external ears. For most applications, models or measurements specific to each individual user are an impossibility, so a generalised measurement is used. Sound sources cannot be spatialized in real-time on the actual generation of mobiles. They have to be precomputed in advance, but then the rendering even with earphones can be quite impressive. Sounds source can be mixed on top of' a natural ambient soundscape by using headphones with airtube, an important feature for visually impaired people.

Visual AV Display

Current image-based panoramic visualization browsers provide a way to experience virtual- and real-world environments using cubical, cylindrical, or spherical panoramas. A viewpoint is positioned at the center of a panorama and a user can pan to the left and right, tilt up and down, and zoom in and out. On mobiles, compass, gyroscopes and accelerometers are use to detect the movement of the mobile in the hand of the user, allowing to browse panoramas with gestures. Panoramas are useful not only for telepresence but also in cultural heritage visits where the place is overcrowded or encumbered with constructions. In this case, a geospot i.e. a point with known geographic coordinates can be used.

Mixed Reality Navigation

Pedestrian navigation enables user interaction with content by choosing where to walk and how to move through the augmented space. Navigation an important feature of MRB either embedded in an application or as the application itself, for example for guidance of visually

impaired people.

AR audio-visual Navigation

In AR audio-visual navigation, the user navigates with virtual arrows that overlay on the real paths and with the help of sound objects whose behaviour depends on user movements and positions of real objects. One can switch from this mode to the more classical AV navigation by a gesture in moving the mobile from a vertical position to an horizontal one for example.

AV audio-visual Navigation

In AV visual navigation, OpenstreetMap data (tiles or geographical data) or Google Maps tiles can be used, the itinerary being shown in overlay with dynamic information in the form of directional signs about the guidance POIs along the route. Audio consists of turn-by-turn instructions. Passing from one mode (AV navigation) to the other (AR navigation) is useful.

Mixed Reality Content

Push Content

Push content from the browser is coming from the POIs whose content is pushed when the user enters a new zone. At the level of a data format, this is supported by a triggering specification.

Pull Content

Pull content allows users to search detailed information of the artifacts that are located in the content preview of the POI. An example of pull HTML5 content in a webView in our MRB is shown here.

Mixed Reality Social Experience

Mixed Reality allows telepresence and sharing with others when not on the spot. it's on the list of potential rich features of MRBs.

Acknowledgements

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WAM Projet-team members developing the MRB Browser.