ABSTRACT

The paper presents a work in the field of ‘mixed reality boundaries’ applied to the visualization of museum collections in order to display the collections ‘live’ as a way to extend virtually the preservation areas of museum collections. To achieve this goal, it was set out to integrate several virtual-studio techniques with multicasting IP in the web and the ‘tectonics’ of museums architecture were also redesigned to turn this sort of new infrastructure into what will be a new typology of mixed architectures for museum preservation areas. Dynamic lighting for Chroma-keying techniques were adapted to the real time applications and a MR J3D collision tool was added to the remote motion control of the video camera’s 3d scene live navigation.

Keywords: Collaborative Environments, Extensible 3D (X3D) Multicasting, Haptic Interaction, Mixed Reality Boundaries, Museum Collections, On Line Virtual Studio

1. INTRODUCTION

The work we present employs multidisciplinary research in the field of mixed-reality boundaries, which can be defined as a mixture of the architectural ‘borders’ of physical space and the spatial ‘icons’ of virtual-reality techniques (William Mitchell 1996) [1]. This kind of work fits into the field of augmented reality, otherwise known as mixed reality. Nowadays, augmented reality applications try to relate a digitized three-dimensional space supported by programmable or interactive platforms with the three-dimensional space of complex areas of urban landscapes or inner space within buildings (physical-mechanical; static and non-programmable).

The most widely used applications today complement views with synchronized geographical information systems (GPS) or social
networking which supplements the digital landscape (i.e. the Google MR glasses). They have instructions for users that allow for an interaction with the constructed space and the facilities within it (workshops, classrooms, etc.). The most widely used types of interface are portable devices with geographical positioning systems which employ different kinds of body-motion sensors.

In the mixed or augmented reality interfaces described, the architectural space is a very important part of the applications. This is the space of the building, regarded by architects and designers as a topological ‘place’, and its material characteristics as defined by the concept of tectonics, i.e. layers of building materials organized in a three-dimensional, topological arrangement. The ‘tectonics’ of the building involve different design disciplines. Some of them were employed in this work on ‘mixed-reality boundaries’ or mixed architectures here presented.

The work focuses on an exploration of the virtual reality which manipulates the borders of architectural or tectonic spaces: “mixed-reality boundaries in the words of Professor Benford (1998; Darlagiannis et al., 2010): a kind of composite electronic/ tectonic space. Benford designed a new kind of audience hall in which some of the ‘tectonic’ borders (walls) were actually 3d avatar-displays guided by users located outside of the hall itself. Thus, parts of the building were transformed through virtual reality projections and both real and virtual spaces were merged into an audience hall. Unlike most MR or AR applications, which employ body-type interfaces or ‘tectonics’, those of the mixed reality boundaries’ interfaces explore an integrated approach to architecture space.

To achieve ‘mixed reality boundaries’, the usual hardware and software applications must be extended to include the architectural design --the actual built space -- then modified by the impact of electronics, as explained in Table 1.

Such ‘mixed reality boundaries’ or mixed architectures thus also actually mean the design of new types of buildings or architectural typologies.

The latter would mean significant changes in the tectonics and design due the introduction of the infrastructure needed for virtual studio techniques and collaborative environments in the areas which house collections in the museums preservation areas, as it is proposed in the work. This proposal is aimed to allow for the live capture and dynamic visualization of these collections and thus open the way for collaborative work, in real time, in the web. It is important to note that in the museum portals seen on the web today, access to collections by the public or scholars is mainly gained by navigating an established menu of collections made up of 2D or 3D images or clips, but not ‘live’ material.

Digital objects, CAD tools, other means of visualization or augmented reality techniques only occur as an appendix to the displays of actual ‘live’ collections of selected or curatorial objects in the museum galleries. In many cases the physical space of the gallery is previously photographed, as in Google’s ‘view art’, whereas the collections stored for preservation are displayed through 2d or 3d data bases and search engine charts. On the other side current museum buildings offer a continuity of space, with tectonic division between areas which house objects viewed by the public and those which preserve objects not on display. Their

Table 1. ‘Extended architecture’ diagram proposed

<table>
<thead>
<tr>
<th>Software</th>
<th>Interactive and programmable iconic spatial border defined by human body interfaces.</th>
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<tbody>
<tr>
<td>Hardware</td>
<td>Static spatial borders defined by a formal topology and construction materials</td>
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<tr>
<td>Tectonics</td>
<td></td>
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