Architectural Models in Urban Landscapes

Synthesis of Markers and Virtual Structures

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ABSTRACT

In marker based AR systems an overloading of tasks for markers can be beneficial. The proposed technology uses tracked markers, which simultaneously can serve additional functions besides its primary task as fiduciary feature to align an augmented scene. It can supply data required for the creation of the scene and even be a be part of the scene.

The patented [6] technology has been developed to create robust mixed-reality scenes in realtime. This poster presents AR for large scale modeling within the thematic scope of architectural and urban planning. A previous prototype (AmbiViewer [1]) already demonstrated the unique technique to calibrate a camera in augmented scenes.

KEYWORDS: urban, architecture, augmentation, POI.

INDEX TERMS: (primary keyword); Installations; Software and Tools; Architecture; Urban Design; Cultural Heritage; Aesthetics

1 INTRODUCTION

Augmentation is not a technical term on its own. In the tradition of *Le Saut dans le Vide* (Leap into the Void) by Yves Klein the artist's body acted as a marker in his 60's happening between both realities of the ultimate freedom as presence and the prospect of pain after the unavoidable impact. His conceptual scene would not be understood without him as marker. The marker constitutes binding and boundary at the same time. Hence, we are thinking about Augmented Reality (AR) as being autonomous from a particular electronic manifestation.

Today, planners, game designers and animation scene creators want to record their spatial ideas in true urban settings rather than in virtual spaces. AR technology as tool means a significant step ahead for the creation of ambient worlds. It is comparable perhaps to the idea of using a camera obscura device and then adding the concept of distance and time to it, when serial photography and motion picture recordings came around.

2 POIS AND MARKERS

The foundation of every AR-system is an anchorage of the virtual in the real. The experience of immersion into augmented virtual constructs can be disturbed from witnessing marker as artifacts or milestones moving between the one territory and the other.

On the other hand distortions of the geometrical simulacrum are often a result of insufficient marking techniques or when camouflaging markers. In many cases, markers are not thought to become a part of a scene, being undesired. Virtual models are expected to cover the marker's area.

Also tracking techniques and the usage of existing real feature are often favored in realtime AR-systems instead of designated markers. That approach demands the use of even more technologies and also site-specific knowledge often not applicable in a timely manner.

Fig.1. First prototype with marker   Fig.2.Large scale marker indoor

Being a part of both the virtual world, there as virtual invisible objects, and the real world, where they can not be hidden, the hybrid nature of markers is ignored. As consequence the dual character of markers demands closer examination.

3 MODELS

The anticipation of a future design as vision is an essential part of the creative process, and hence models always have been an integrated part of it.

Traditionally the use of physical three-dimensional representations of architecture or similar objects is limited to downscaled models. With the exception of very few but prominent projects – such as the 1993/94 Berlin Palace simulation with painted canvasses on scaffolds – on-site models are not an option.

The introduction of computation shifted the physical appearance of models to digital images of virtual models. They have been established since then. The capabilities of computers to render perspective viewings of three-dimensional objects from all directions have veiled the lack of materialization of both the model and its represented environment. Digital representations of virtual objects are always bound to computational device, usually a screen. If a physical representation is needed, snapshots as prints of the virtual models are made for distribution and archiving.

By comparison hybrid models resemble all the characteristics of AR. In part virtual, in part real the introduction of hybrid models established a new level of complexity. If the physical part is a model, they are handled like physical models. Otherwise they are always marker based, which constraints their overall usability to that of marker-based AR-systems.

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4   LAND ART

Land art is a category of plastic art, which signifies outdoor installations on a large scale placed on specific sites to alter the perception of said location.

Out of the countless numerous physical installations only one example should demonstrate the characteristics of such an outdoor installation: "Schachtzeichen", a temporary installations as part of the "Ruhr2010". It has a striking similarity with our AR-project, and in fact we bought some of their balloons at a bargain after the show. But during the installations they were pure art. The balloons did not serve a purpose other than showing itself as means to alter the place.

In outdoor places virtual installations are rare. Before the introduction of capable mobile phones they were almost only ideas and projections.

We have developed a concept of our own (HotPOI [5]), an application for locative exhibitions on mobile devices. The contents can be adjusted to a condition of a concrete location or the intended character of an exhibition.
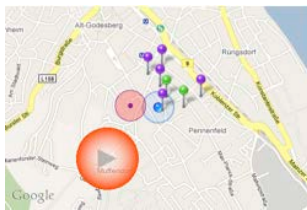

Fig.3. Land art in Dortmund;   Fig.4. POI-based application

A POI-based application provides locations defined by coordinates and related timeframes. If a user enters the proximity of such a location, or a POI, it becomes virtually active and an event can be triggered and informations and media only available at that location are prepared to be presented on demand.

By now this project consciously does not introduce virtual models. It has become very evident, that physical locations are taken as just given. Therefor the focus here is on the examination of defined locations.

5   AR-SYSTEMS

Common AR-system are either based solely on markers, then the markers are complex and usually of a small scale, or they are based on tracking devices, which provides more flexible but also sketchy results.

Only very few systems are capable of visualizing large scale models in outdoor scenes. This reflects the situation of one-to-one physical modes. Their expense is substantial, and their effectiveness in examining alternative is slim at best. In fact, the project in Berlin is likely to have been more a fundraising and lobbying project than an architectural effort.

During the development of our system the focus was on affordability and usability, namely deployability. As key feature a tracked marker was introduced. This is a technically a sphere with a known diameter at a known position. Physically we use inflatable balloons placed on the desired building sites. Then the virtual and the real-world frame of an uncalibrated camera are aligned and a composite image is rendered.

5.1   Discussion

Actual 2D AR-systems on mobile platforms are tagging their images with added informations before they put them on screen. They are self-sufficient. Neither does the environment reflect the presence of an AR-system, nor does the surrounding of a user or the scene inflict the usability of the system.

Prior to its physical fabrication, or construction, a building and its site are only linked during the design process. Their synthesis is merely an abstract union limited to impressions on some presentations both physical and digital. The introduction of computed realities with CAD led to assumptions that such unity could be achieved in cyberspace.
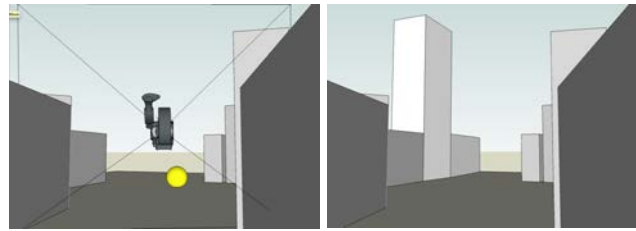

Fig.5. Real world;   Fig.6. Composite world

In reality such an aesthetic integration is impaired by distracting technical interfaces. Virtual digital models depend on technology. It is vital for their perception that this technology should be as unencumbered and transparent as possible.

Later in the design process the models may become physical again as 3D-prints or similar. Large scale models, also very much desired, remain an illusion due to technical constraints. AR-systems at this scale, especially if they are outdoor-systems. are either unaffordable or useless. By now our system makes no exception.

Fig.7. Composed scene in backyard; Fig.8. Column behind garage

6   CONCLUSION

Our system automatically establishes a dual representation, a real world attractor and the base for unfolding an augmented scene via capable electronic devices. The clear visible marker constitutes and synthesizes the virtual scene on the spot and connects it to the real, thus integrating users with and without virtual access. The question is if augmentation is always a plural phenomena, whereby deployed layers can amplify each other, rather than contradict a virtual model?

One layer as the pure presence of reality, augmented by the visible markers and the layers of virtuality on mobile devices present scenes to spectators, observers and users perceivable to their level of experience and technology without encapsulating one world or the other.

References

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