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Preservation of monuments with mixed Real-Virtual Technology

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ABSTRACT

It is been a long "Time" ,it is usually the most story's of fairy tales started and also the second most important word is "ago" all these words which give as implication of past are related to Time, in our teachings, we learn History a lot, we learn about Mohan-ja-dare, but never seen its site, don't we known that it is the most important part of Indus Valley civilization. In the coming years, we may not be able to see it' ,learn about it & understand the first architecture of sanitation and hygiene gifted by our own dynastic people, therefore we must protect these site's & try to teach more about them as these site are aspiration for young Indians to make economic cost technology for future. In the coming of ages the problem remained how to remember things and also how to preserve ,make available to our coming generations at last. Hence forth we require more wide ,simple approach to understand this. We propose a need for augmentation, we call it as augmented room .In this paper we have studied conceptual of Augmentation and observed that how Augmentation "a mixed real-virtual environment technology" will help us reach our goal. Our major aim is to prevent these monuments for our future generations so that next generation will learn and live with it. Making it possible through augmented room. This paper gives introduction to new kind of perseverant of heritage site and new transit to technology.

Introduction

World is endowed with rich and diverse natural ,historic, and cultural resources .The Heritage of any nation is soul of its nationalism ,therefore it is the basic right ,duty and responsibility to protect it from foreign invaders ,teach ,explore more about it ,just not only to it own citizens but also to coming future generations well. These sites are main sources as well as main contributor to one own nation growth and development .However ,it is yet to explore the full potential of such resources to its full potential of such resources to its full advantages. Past efforts of conserving historic and cultural resources in Indian cities and towns have often been carried out in isolation from the needs and aspirations of the local community and people of the belonging area, as well as the main urban development issues, such as local economy ,urban development of that area always have remained untouched.

The conservation and study is not just about development of these cities but also to keep them alive from time to time for future for future generations , to come, one of the most difficult thing is to learn in today's day. We could not learn about these sites just setting in our class room's ,in which we know study.

As per syllabus history book of each 8th or 7th grade of secondary school of any Board in India ,specially have architectural study of at least of mohan-ja-daro, Red fort etc in order to learn about Indus Civilization's but it become very difficult for student 's to understand these difficult references about there length when they could not even had ever seen them 2D pictures and video only give visual anatomy of understanding not the correct length's ,the most important thing is it structure recent advances of technology only bought the boon of understanding through videos or "Virtual Reality" which itself the immersion of understanding of one person inside the computer rather then the understanding it in real world as interactive interactions.

One of the major change comes when a person listens ,the direct interaction of human with computer, that is possible only through the Augmented Reality which provide direct interaction of human's with computer ,that's why it allow better immersion of human beings into the virtual world, so it doesn't allow human into computer instead computer based virtual closer to the human world ,something that follow the suite of mixed reality better bet called .

Augmented reality generally refers to viewing the real, physical world with superimposed computer generated graphics. Today this usually involves rendering graphics onto a live video of the physical world, most commonly on a mobile device such as a Smartphone. Graphics are updated continuously to follow the orientation of the device video camera, such that the graphics appear to be inserted into the real world. This approach has the drawback that rather than look at the real world, the user must instead look at a small video feed of it. Near-to-eye displays address this shortcoming, allowing the user to view the real world with superimposed graphics directly, but require wearing exotic gear [2, 3].

An alternative approach to achieve direct viewing is to use projectors to render graphics onto the real world directly. Spatial augmented reality [2] entails correcting the projected graphics to account for the shape of the projection surface, possibly

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assuming the user's viewpoint. Whereas the effective field of view of a Smartphone or near-to-eye display AR system is potentially unlimited as the user moves their head or their device, a projected spatial augmented reality sys-tem is limited by the field of view of the projector. This can be overcome somewhat by using multiple projectors and cameras, at the expense of the overall complexity of the system [4].

Augmented reality (AR) is an important branch of virtual reality, and it's a hot spot of study in recent years. AR is that organically, in real-time and dynamically overlaying virtual images created by computers and other information on real environment which the observer sees. And when the observer moves in real environment, virtual information changes according to the movement, just like those virtual information truly exists in real world. Azuma R.T. summed up AR with three properties: combines real and virtual objects in a real environment; runs interactively, and in real time; and registers (aligns) real and virtual objects with each other (Azuma, 1997). With the help of photoelectric display technique, interactive technique, Calculator sketch technique and visualization technique, AR created virtual objects not exist in real environment. And by sensor technique AR well overlaid virtual objects on real environment [1]

What is Augmented Reality?

Augmented Reality (AR) is a new technology that involves the overlay of computer graphics on the real world (Figure 1). One of the best overviews of the technology is [5] that defined the field, described many problems, and summarized the developments up to that Point. AR is within a more general context termed Mixed Reality (MR) [6], which refers to a multi-axis spectrum of areas that cover Virtual Reality (VR), AR, telepresence, and other related technologies. Virtual Reality is a term used for computer generated 3D environments that allow the User to enter and interact with synthetic environments [7] [8] [9]. The users are able to "immerse" themselves to varying degrees in the computers artificial world which may either be a simulation of some form of reality[10] or the simulation of a complex phenomenon[11][7].

Figure 1. AR example with virtual chairs and a virtual lamp.

In telepresence, the fundamental purpose is to extend operator's sensory-motor facilities and problem solving abilities to a remote environment. In this sense, telepresence can be defined as a human/machine system in which the human operator receives sufficient information about the teleoperator and the task environment, displayed in a sufficiently natural way, that the operator feels physically present at the remote site [13]. Very similar to virtual reality, in which we aim to achieve the illusion of presence within a computer simulation, telepresence aims to achieve the illusion of presence at a remote location.AR can be considered a technology between and telepresence. While in VR the environments completely synthetic and in telepresence it is completely real, in AR the user sees the real world augmented with virtual objects. When designing an AR system, three aspects must be in mind: (1) Combination of real and virtual worlds; (2) Interactivity in real time;(3) Registration in 3D.Wearable devices, like Head-Mounted-Displays (HMD) [9], could be used to show the augmented scene, but other technologies are also available [5].Besides the mentioned three aspects, another one could be incorporated: Portability. In almost all virtual environment systems, the user is not allowed to go around much due to devices limitations. However, some AR applications will need that the user really walkthrough a large environment. Thus, portability becomes an important issue. For such applications, the 3D registration becomes Even more complex. Wearable computing applications generally provide unregistered, Text/graphics information using monocular HMD. These systems are more of a"see-around" setup and not an Augmented Reality system by the narrow definition.

Henceforth, computing platforms and wearable display devices used in AR must be often developed for more general applications. The field of Augmented Reality has existed for just over one decade, but the growth and progress in the past few years has been remarkable [12]. Since [5], the field has grown rapidly. Several conferences specialized in this area were started, including the International Workshop and Symposium on Augmented Reality, the International Symposium on Mixed Reality, and the Designing Augmented Reality Environments workshop.

Projected AR displays

Below is the figure[15] showing the Projected Augmented Reality advantages, with that the overview of spatial augmentation. The Spatial projector base Augmented Reality play vital as well as core role about the paper work on its purpose of education and perseverance of heritage sites.

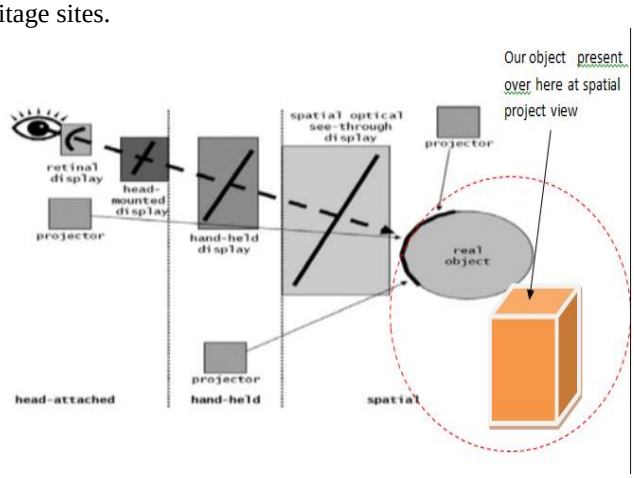

Figure 2. Image generation of different AR dis-plays.

In order to provide a classification first the term see-through display must be explained. The basic idea behind this is to have a display, which can overlay virtual information over a real environment. Therefore, if the display does not show information at a certain location, one can see through it. There are two basic approaches to realize such a display:

1) Video-mixing: Here the real environment is filmed by a camera, then combined with virtual information and finally displayed.

2) Optical: Here an optical combiner (e.g.: a half-silvered mirror or a transparent monitor) is used, such that one can observe the real environment, while it is overlaid with virtual information.

As one can see from figure 1 it is possible to make use of projectors in every domain. In addition, the following advantages become apparent:

• Projectors can directly project onto the object; there-fore, the projector and its image must not necessarily be located in the same domain.

• The eye of the observer does not need to switch focus between the image plane and the real environment, thus, projected AR allows for an easy eye accommodation.

• The image plane of projectors does not need to be a rectangular plane. It can have various shapes and might be non-planar.

• A projector can be much smaller than the image it projects.

Two disadvantages of projectors are:

• Low light-intensity. While this is normally not a problem for stationary projectors, it can be a major chal-lenge for mobile projectors. Depending on the application a trade-off between battery life, light intensity and projector size must be found.

• The image is always projected into the scene. While this is normally seen as an advantage, it might be a problem if one wants to display information in mid-air. [16]

Comparison of Projected AR Displays and Hand-held See-through Displays

By comparing mobile projected AR device with a hand-held see-through display (see table 1), it becomes apparent that both technologies complement each other[16].

Table 1. Comparison of projected AR and hand-held see-through displays (advantages highlighted in grey)

	Hand-held see-through displays	**Mobile projected AR displays**
Outdoor usage	Standard application of smart phones	Problem of low light intensity
Displaying objects in mid-air	Possible	Only by using a mobile plane
Computing ergonomics	User must be active; needs to move/hold the display	Lazy; user can let his/her hand hang on his/ her side
Display size	Limited by the device size	Theoretically un-limited
Image plane	Planar; separated from the real objects	Can be non-planar; is near the real objects, allows for an easy eye accommodation

Augmented Reality and Learning Potential

In the article Trend

Augmented Reality Check Kaplan-Leiserson (2004) explores AR and its applicability to learning and notes that much less attention has been paid to the learning potential in AR than that of VR. The reason for this, Kaplan-Leiserson suggests, is that the AR technology is more complicated and has matured at a slower pace. Due to research and hardware advances in the past years, AR has developed more rapidly and may now be making an entry in the learning arena. As researchers have developed additional technologies, the definition of augmented reality has expanded and now includes visual, auditory and touch, or haptic augmentation. Visual AR technology is the furthest along when it comes to practical application since it has been under development the longest. AR systems within online learning and collaboration are making progress, and Kaplan-Leiserson (2004) suggests that AR would much better than VR when it comes to learning and training in terms of cost and realism, as well as human factors.

Augmented Reality Rooms-Living with Technology

The paper till now was only limited its discussion to Augmented Reality as well as projected Augmentation ,but the real cause of this paper is how could we use this technology to increase the knowledge understanding level of generation as well as coming generation's at rapid rate with that able ,to use this technology for preserving the past heritage sites with it.

"Augmented Rooms are the rooms that have real-time interactions between the receiver of knowledge with its subject present in form of augmentation"

This ,means that the subject with which one is interacting would be projection's but not of hand mounted head's, but they would be generated by the steerable projectors that would be mounted in room at it's all corners, that allows it to change rapidly at dynamic rate forming different image of augmentation dynamically as per students subjects.

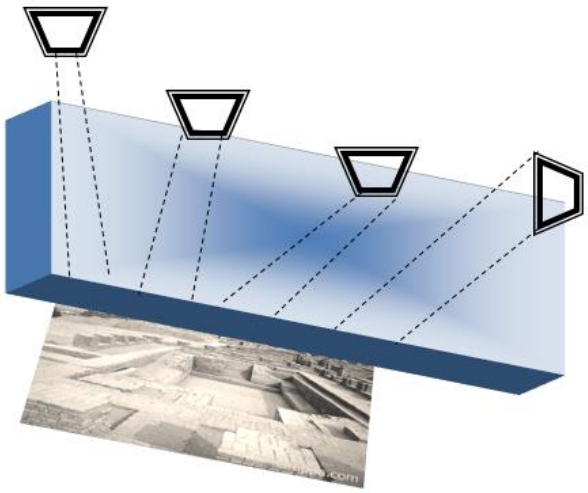

Figure 2. Vision of how might the Augmented Room May Look Like.

This might seems to out of belief at once but these rooms play vital role in coming days the as magic book[14] termed by previous researcher's of augmentation reality education technology, but it would much easier as well as economic in its nature of teaching due to its projection view ,one is able to bring large number of students to learn from projected subject model at once ,with this also allow the one to contribute toward community as well team learning, when one would be in projected room one will see the projection all around him/her, with one can interact at first hand, as well when this technology would be of projection of heritage sites, this will not only bring that site direct contact with students but also do able to protect it from the time or destruction which is currently going on with the activity of human conflicts.

This could only be possible in our view through spatial projectors of 3D view ,these projector's will not only create the projections the room itself ,dynamically as per computer interaction and input by the user will create dynamic interactive hologram into the room that ,not only will create the interactive projection but also allow the subject material to live upon that will definitely create the enthusiasm among students to learn the subject well.

Beamatron: A Steerable Displays

The most important part of this possibility would of to increase the field of view of an AR device . To successfully apply this idea to a projector, it must solve the following problems:

• The projection should stable during the movement of the device.

• It must be able to project images 'correctly' on arbitrary surface.

To solve these problems geometric-awareness is required. An example for a projector, which solves these problems, is the Be matron. It was presented in [20].

Build

To allow for a steerable display, a video projector was mounted on a light platform. Furthermore, a Kinect sensor was attached to it.

Figure 3. The Be matron

Stabilizing Projected Graphics During Movement

When a moveable projector is moved, while it projects an image, this movement must be taken into account in order to stabilize the projection. For example, if a real object is augmented, the virtual information should remain attached to this object, even when the projector is moving. To solve this problem the authors of [20] built a circuit board, which directly connects to the built-in pan and tilt sensors of the platform. They were, therefore, able to accommodate for any movement of the projector.

Understanding the Geometry of the Display Surface

Through the use of the Kinect sensor, in combination with Kinect Fusion [19], the unit is able to obtain smoothed depth images of its environment (see Fig. 4 [20]). These depth images can then be used to project images 'correctly' onto arbitrary surfaces as described in the next section.

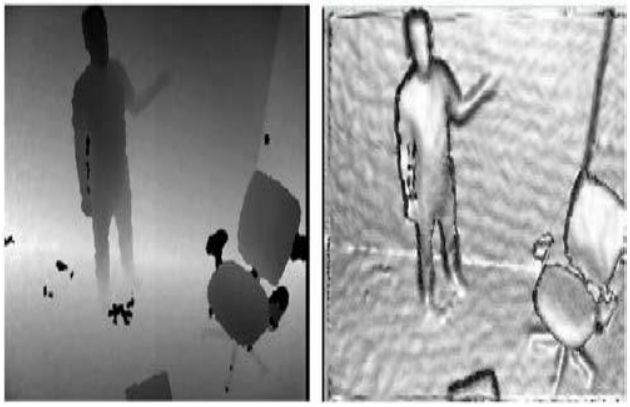

Figure 4. Multiple depth images are combined into one smooth estimate of the room geometry.

Projecting Images 'Correctly' onto Arbitrary Surfaces: It was already discussed how an image can be projected onto a real object, such that its distortion is minimized for a num-ber of observers with different viewpoints. For the Beama-tron the authors wanted that the projection creates the illusion of a real 3D object for a single observer (see Fig. 5 [20]). To achieve this two rendering passes are required

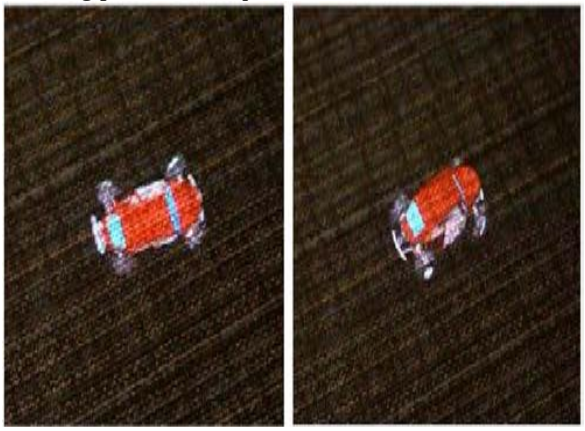

Figure 5. Rendering of a toy car. Left: Without projective texturing; Right: With projective texturing

1) Render the real objects along with the virtual objects from the point of view of the user.

2) Use the result as a texture map while rendering the real geometry.

Keeping Track of the User Position

Often the sensing ca-ability of an easily transportable projector is limited by the condition of being self-contained. For example, the Beamatron as described so far can only sense activities, which happen in the field of view of the Kinect sensor. To overcome this problem the authors decided to extend the sensing abilities of the Beamatron by adding infrastructure in the form of three Kinect sensors. These sensors were mounted – two horizontally and one vertically - in the corners of the room. By using their array microphone it was possible to localize the user while he or she speaks (see Fig. 6 [20]). Furthermore, he or she could give commands, which were recognized by the Beamatron.

Application

An application given by the authors is the Beamabuggy. A user controls a toy car with a steering wheel. Because of the geometric-awareness of the Beama-tron, the virtual car is rendered correctly from the view-point of the user, where this viewpoint was determined through the sound localization described above. Further-more, the car realistically reacts to the real environment, e.g. it is possible to jump over a ramp (see Fig. 7 [20]).

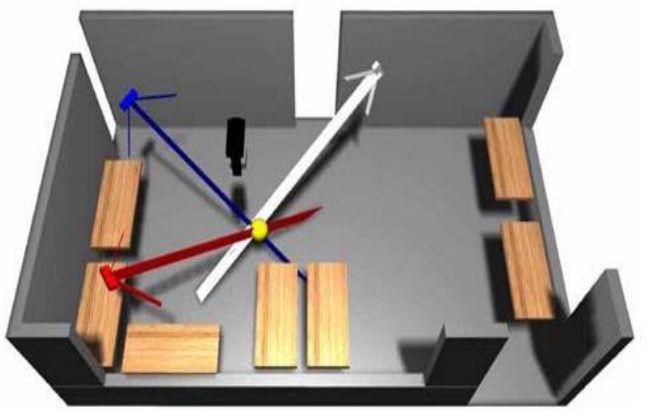

Figure 6. Illustration of how the array micro-phones are used to localize a user.

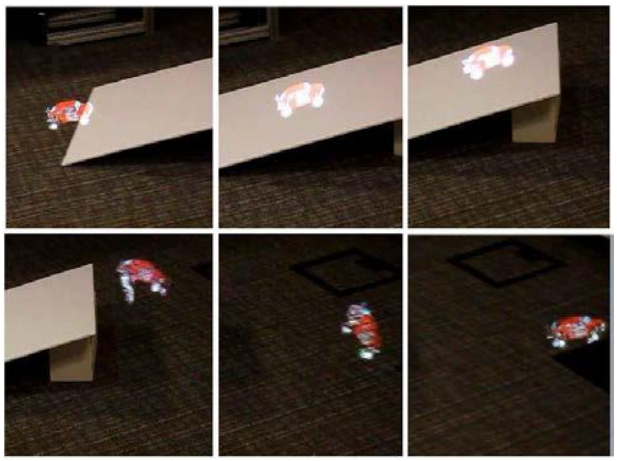

Figure 7. Because of geometric-awareness a virtual object can react realistically to the real environment.

Discussion

Because projectors can create large displays, without being large themselves, they are well-suited for creating AR de-vices, which can be transported easily and still retain some of the advantages of a fully stationary display. Three important requirements were identified in [21], which must be considered in order to create such an easy-to-transport device. From my point of view, the most important one is the geometric-awareness. Through it important problems, like:

• Projecting an image, such that it appears 'wall-papered' onto a real object or to be 3D.

• stabilizing the projection during movement could be solved.

To tackle the problems of low light-intensity and a limited field of view, two solutions were presented:

• Creating a cluster of projectors

• Making a single projector steerable.

Through the latter solution it became apparent that there exists a trade-off between how self-contained or independent a unit can be and how much it can sense.

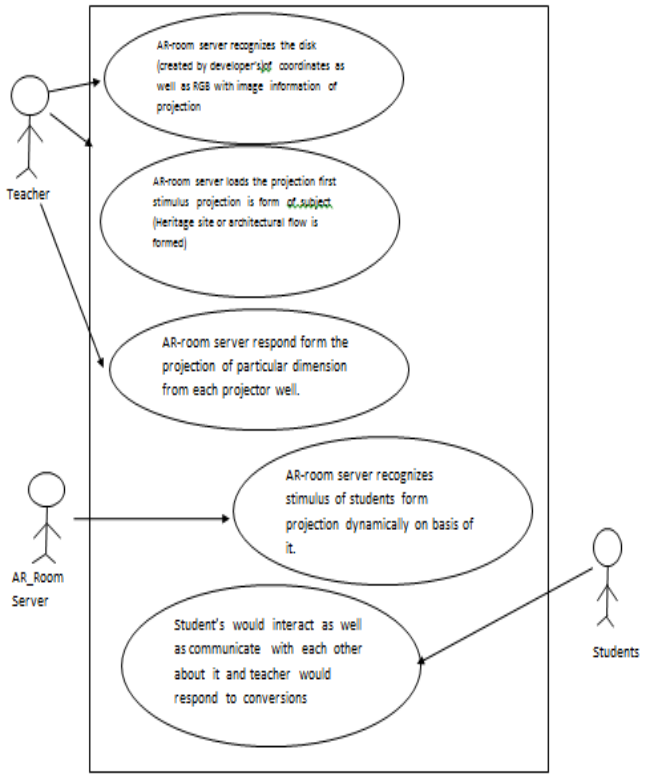

Figure 8. Case Diagram for AR-Rooms

Conclusion

The most important aspect of given application of augmented Reality room would be easy to visualize the architectural interaction between students with their education subjects this will not only a step further technological rendered education, but also will preserve our own national heritage sites.

Government scheme such HRIDAY [17] to protect our heritage site would only create tourism towards these sites but this Augmented Room Based teaching would not only increase the flow of education to be accelerated but also ,going next step further will also keep them alive in their current form ,the students of next generation after us, would definitely have no difficulty in studding the molecular weight's as well chemical structure of formula's well ,they could not only see the augmentation of these structure but also able understand them well.

The further challenge would definitely gone a come from the cost Beamomteron ,related software requirements as they are quite expensive in Indian markets ,which definitely cause a problem ,for the question of affordability ,another question might be about the maintenance as the devices itself have the complication's they would require good technical as software experts staff to maintain, definitely the most important problem would be arising from how to create the augmentation of these historical sites in clear image from existing one.

The solution could possible to use 3d tracking based augmented reality for cultural heritage Datamanagement device[18] that would definitely can be use d to make 3D Virtual or Computer based model of these projection 's, the full the proposed conceptual system to create these3D projections could not be explained here but the basic idea is given below.

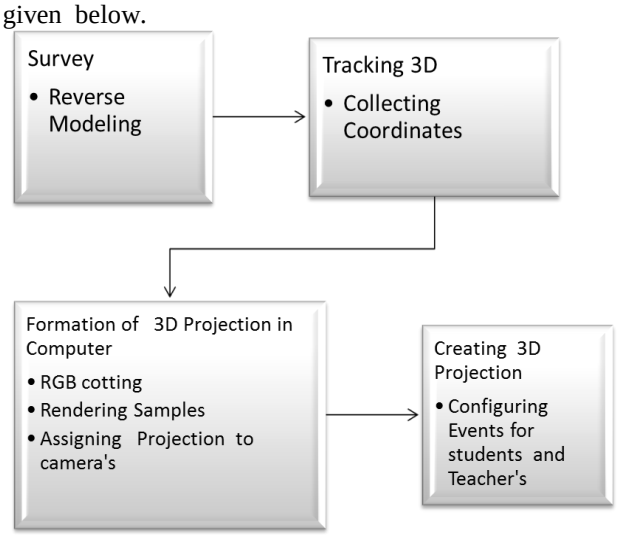

Figure 9. Proposed Method to make Augmented Reality Room's.

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