

# Augmented Reality in Environment

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**Abstract** - This article presents an application of Augment Reality technology in a Real-time environment. In an augmented reality (AR) system, real and virtual objects are used together to create a real environment, presented in the field of view of a user. There are increasing numbers of application that use virtual reality (VR) technologies have appeared in the recent industry. Augmented reality (AR) users to allow learn from a total immersion experience. The market of Traditional tools is gradually being replaced by real-time interactive and sensory technology. AR Environment is exploited as the new working environment for architectural, educational, offices, etc design work. They can do their work snugly as such collaborative discussion through an AR environment. The study develops an AR system and tries to determine its advantage and drawbacks.

**Key Words:** Augmented reality (AR), Virtual reality (VR), ARToolKit, Mixed Reality (MR).

## 1. INTRODUCTION

Now a day, with the development of high performance and low cost hardware, Computer is already considered as a part of our daily life. High-performance Electronics is new ubiquitous and offer and continuously improving resources ready to support us in the execution of ordinary tasks.

A way to exploit (use) these resources are given by augmented reality (AR). Augmented reality (AR) is an enhanced version of the real physical world that is achieved through the use of the digital visual element, sound, or other sensory stimuli delivered via technology. AR allows the user to see the real world, augmenting it with superimposed virtual objects. amid the rise of data collection and analysis, one of augmented reality's primary goals is to highlight specific features, of the physical world increase understanding of those features, and device smart and accessible insight that can be applied to real-world applications.

For example: - some early adopters in the retail sector have developed technologies that are designed to enhance the consumer shopping experience. By incorporating augmented reality into catalogue apps, statues let customers visualize how different products would look in different environments. Elsewhere, augmented reality benefits could extend to the healthcare sector where it could play a much bigger role. One way would be through apps that enable ways to see highly detailed, 3D images of different devices over target images.

For example: - the augmented reality could be a powerful learning tool for medical professionals throughout their training. Even if several kinds of the AR system are available in the market, or research field covering all the range include between a high-end and a low-end system, all AR solutions have some specific common needs and therefore, some specific hardware: one or more cameras and tracking hardware to perceive the real world, a procuring unit to collect data and a display to show information to the user.

AR system must be aware of the environment it has to augment, so cameras are used to provide images to the real world. Then to match the virtual and real-world, object movement in both words must be tracked. The goal of tracking is to provide high accuracy, low latency, low jitter, and robustness. At this point, the AR system can correctly superimpose virtual objects in real world images.

## 2. AUGMENTED REALITY- NEW RESEARCH APPROACH FOR ARCHITECTURE:-

### 2.1 Augmented Reality Technology

Augmented Reality (AR) may be a new technology that involves the overlay of special effects on the important world. As a result, the user can see the important world augmented with virtual objects and may interact with them. Within a more general context, AR is additionally termed Mixed Reality (MR), about a multi-axis spectrum of areas that cover computer game (VR), Augmented Reality (AR), telepresence, and other related technology [1] (Figure 1).

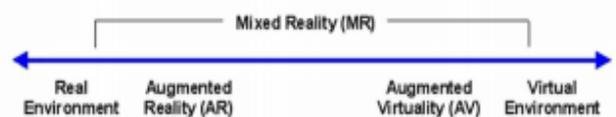


Fig -1: Paul Milgram's Reality - Virtual continuum

Augmented Reality systems combine digital information and therefore the world in a way that the user experiences them together. A very important property of AR is locating virtual objects within the right place and position, which makes the Tracking System one among the foremost important components of an AR system. Essentially, an AR system must be ready to follow the user's point of view dynamically and keep virtual objects aligned with world objects. The essential components of an AR system are a display, camera for graphic captures, and computer installed application

software, plus various different sorts of hardware can be used, for example, camera phones, PDAs, laptops, HMDs, and wearable computer systems.

Typically, an ARToolkit library is employed to work out the relation between the important and virtual world. The ARToolkit uses a computer vision technique to define the position and orientation of the important camera viewpoint relative to a true world marker. The ARToolkit defines and calculates the position of the virtual coordinates. Supported a concurrence of virtual and real camera coordinates, the pc graphics are then drawn as an overlay on a fiducially Markers card.

Thus, the client encounters a video transparent increased reality on the PC screen or all the more vivacious impression by HMDs (Kato, H.2001 and HIT Lab Washington University). The virtual images are added to the important image before its projected which solves the OST problem of surrounding light also gives control over where the virtual objects are placed. This method, however, has other problems like the lag, determined by the camera image update frequency, which may affect the user experience of the system, like simulator sickness. As such, AR technology has many possible applications across a good range of fields, including entertainment, education, medicine, training, engineering, and manufacturing.

## 2.2 Augmented Reality in the Architecture Field

Augmented reality (AR) is an alive, replicated perspective on a physical, genuine climate whose components are increased (or enhanced) by PC created tangible info. Computer-generated reality replaces this present reality with a mimicked one while increased reality takes this present reality and adds to it inside the instance of engineering—a 3D model of your plan. With the assistance of cutting-edge enlarged reality innovation like PC vision and item acknowledgment, the data about the encompassing genuine universe of the client gets intuitive and ready to be carefully controlled. In increased reality, PC programming should infer certifiable directions, free from the camera or camera pictures. , AR innovation is additionally being considered as another plan approach for design. Accordingly, a great deal of AR examinations and exploration has been coordinated toward the engineering configuration measure.

## 3. OCCLUSION BASED INTERACTION

Two-dimensional interactions usually have a pointer on an interaction surface, and the users are provided with an interface tool, such as a mouse or a tablet pen, to move this pointer. When a user moves the pointer on the interaction surface, the object or place over which the pointer lies is determined as the interaction point.

There are two approaches to 2D interactions: a pointer-centered view and an interaction object-centered view. In the pointer-centered view, the system tracks the movement

of a single pointer and checks whether there is an interaction object beneath the pointer. This approach works well in a traditional desktop graphical user interface. , it is not easy to apply the same method to Tangible AR environments where natural interaction methods are vital. In the real world, humans can use a variety of objects or even their bare fingers as a pointer. Also, for some situations such as having multiple participants, or using bi-manual interactions, interaction can even involve multiple pointers.

## 4. INTERIOR DESIGN IN DIGITAL ENVIRONMENT

### 4.1 Properties of Interior Design

In the instance of an inside plan, the creator applies the three fundamental standards of an inside plan: shading, scale, and extent inside a foreordained space. The proposed AR framework is centered on giving the client the adaptability to configuration utilizing these three fundamental standards. In the proposed AR climate, the client can change the properties of virtual furnishings and establish various game plans in a genuine climate.

### 4.2 System Design

For execution, two separate modules were created: one for making and dealing with the 3D data set, and the other for showing. First, CAD applications remove data from an attraction and connection it to an information base. Mathematical data is then extricated from a three-dimensional data set of furniture. After stacking the calculations, the position and bearing of the perspectives for the client are determined dependent on the information marker following. The area and heading-based math information are changed utilizing change networks to create pictures that adjust next to different items in the genuine view. In intuitive AR applications that require reactions from the client, there should be an effective and non-interruptive approach to convey the reactions to the AR framework. The fundamental objective of carrying outlook control into an AR framework is to make the cooperation between the framework and the client simpler and more effective.

The properties of the furniture illustrations are saved in a data set produced by a CAD application, for example, 3DSMax programming, while OpenGL renders the last illustrations. Additionally, an ARToolkit programming library is utilized to figure the 3D positions and directions of the virtual furnishings.

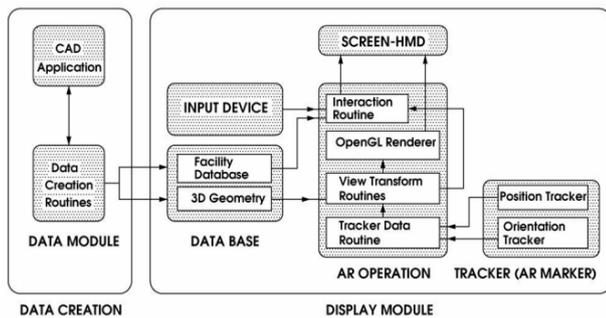


Fig -2: System Design

The position tracker and direction tracker are significant components of AR frameworks and the advancement of AR innovation.

### 4.3 Software

Computer-aided design applications handle the administration of the structure calculation information and connection it to a data set. Then, the AR programming recovers and shows the position and direction information in the characterized climate. An ARToolKit library at that point expects the job of building the AR application. ARToolKit programming utilizes PC vision calculations to take care of this issue. An ARToolKit video following library characterizes the virtual camera position and direction comparative with actual markers continuously. The ARToolKit library-the result of HIT Lab NZ-is then used to show the virtual items. CAD (Computer-aided design)

Numerous MR frameworks in research today use marker-based following procedures where the MR framework identifies markers set in the encompassing. These markers educate the framework regarding where to put the virtual items which can be text, 3D models, sound, pictures, recordings, movements, and volumetric models. The MR framework portrayed here utilizes a crossbreed following innovation, fundamentally a marker location framework (given ARToolKit (HITLAB site page) ARToolKit Plus (Schmalstieg 2005), and ARTag (Fiala 2005) however with the expansion of a 3DOF inertial tracker (InterSense (isense.com) and Xsens (xsens.com)).

Unique programming has been created with the means to allow an application engineer to characterize a situation document in XML sentence structure. The cooperation zone can likewise be non-straightforward, if helpful for the application. Straightforwardness, shading, picture, and arrangement of the collaboration territories are set in XML grammar in the situation document.

### 4.4 Hardware

The AR system depends on a customary PC with a Windows XP working framework running on an Intel (R) Core(TM) Quad CPU Q6600 with 2GB of RAM. Also, a webcam, Logitech Quick cam Vision Pro, is utilized to catch

the sense pictures. The client's camera is fit for distinguishing known examples from a solitary picture and computing the 3D position and direction for world space. The virtual items (furniture, parts, dividers, entryways, and so on) are then superimposed dependent on marker following.

In the created framework, eye stare connection can be limited both transiently and spatially - certain pieces of the showcase will have the capacity, and just when there is a requirement for look collaboration. The association regions are characterized in the application situation XML document, just as eye stare abide times and order activities. The look exchange zone positions can either be fixed or dynamic, comparative with identified marker position which permits an adaptable plan of the application. The connection zone can likewise be non-straightforward, if valuable for the application. Straightforwardness, shading, picture, and position of the connection regions are set in XML punctuation in the situation document.

A portion of the following markers utilized by an ARToolKit library is extremely exact and hearty. The Head-Mounted Display (HMD) likewise is prepared for a client in the down-to-earth execution. By utilizing HMD for AR show, the client can move openly around virtual furniture when they are seeing it.

## 5. METHOD ON OCCLUSION MARKERS FOR AR SYSTEM.

This paper applies an interaction object-centered view to 2D interactions, which is easy to apply to Tangible AR environments where natural interaction methods are vital. In the real world, humans can use a variety of objects or bare fingers as a pointer. Predefined formal markers are widely used for tracking real objects in Tangible AR environments. Although current vision technologies can provide robust marker tracking, they can occasionally fail due to bad lighting conditions, motion blurs, marker deformations, or occlusions. To avoid this problem, vision-based tracking systems usually use multiple markers for tracking one object. Some markers are attached to a single object in a pre-configured spatial relationship. In this way, the object can be tracked successfully even if some of the markers in the marker set are not visible.

A simple way to guarantee that a marker is within the view volume is to check the visibility of its neighboring markers, referred to as boundary markers, while a marker being checked for occlusion is referred to as an interaction marker.

### 5.1 The Boundary Marker Method

This paper applies an interaction object-centered view to 2D interactions, which is easy to apply to Tangible AR environments where natural interaction methods are vital. In the real world, humans can use a variety of objects or bare fingers as a pointer. A simple way to guarantee that a marker is within the view volume is to check the visibility of its neighboring markers. We refer to these neighbor markers as

boundary markers, and a marker being checked for occlusion as an interaction marker. For instance, for a single interaction marker, we need at least 2 boundary markers surrounding the interaction marker. By checking if these boundary markers are visible, the interaction marker can be guaranteed to be within the view volume; hence, it is occluded if it is not detected.

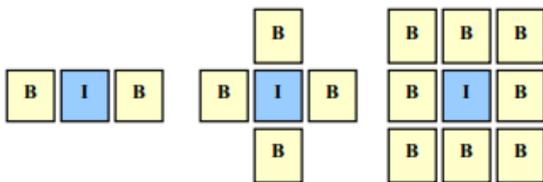


Fig -3: Boundary markers around interaction markers

When multiple interaction markers are placed in a line, the neighbors of the interaction marker being tested can also be treated as boundary markers. The tested marker within the view volume whenever there is at least one visible boundary (or hybrid) marker on each side. Thus, hybrid markers act as both boundaries and an interaction point. Hybrid markers act as both boundaries and an interaction point themselves. In this way, occlusion of multiple consecutive markers can also be detected, as well as allowing the boundary markers to be out of the view.

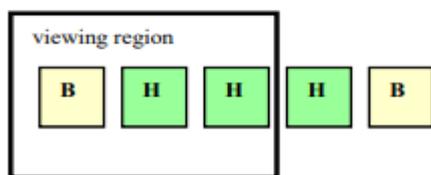


Fig -4: Hybrid markers: the center hybrid marker plays the role of Boundary markers for the left hybrid marker.

Although the boundary marker method is simple to implement and works reliably, marker wastage is unavoidable, since additional non-intractable boundary markers are required.

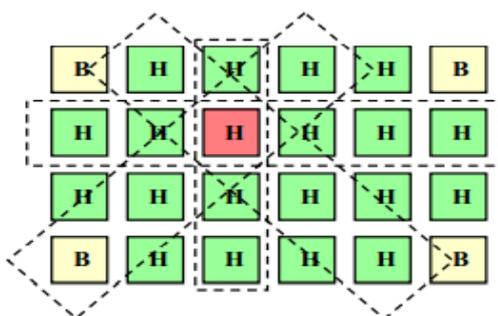


Fig -5: A 2D set of markers

## 6. THE ESTIMATED MARKER PROJECTION METHOD

The spatial relationships of markers within a marker set are known, so as the marker set is being tracked, the 3D position and orientation of invisible markers relative to the camera can be estimated. Once the 3D pose of an invisible marker is estimated, its 2D projection on the screen can also be predicted. Compared to the boundary marker method, the estimated marker projection method needs just one visible marker from the marker set, to check the visibility and occlusion of undetected markers. As a result, the users have to keep only one more marker within view in addition to the marker she is interacting with, so interaction is easier. Besides since all the markers in the marker set can act as an interaction point, no markers are wasted.

## 7. IMPLEMENTATION

Augment the truth is characterized as «the continuous utilization of data as text, designs, sound, or other virtual improvements coordinated with genuine-world objects». This for the most part implies that advanced symbolism, or information, is delivered onto genuine articles like actual things or, on occasion, coordinated into more conventional media like live video transfers or heads-up presentations, or uncommon increased reality glasses. Augmented Reality is the forcing of carefully produced pictures into a watcher's genuine environmental factors. In contrast to Virtual Reality, which establishes a fake climate, AR utilizes the current climate and overlays it with new data.

Augmented reality applications are generally composed utilizing uncommon 3D projects which permit engineers to superimpose movement in the PC program, to an AR «marker» in reality. The term 'Increased Reality' was begotten by Boeing scientist Thomas Caudell in 1990, to clarify how head-mounted showcases of circuit testers worked during the gathering of muddled wiring.

## 8. CONCLUSION

This paper zeroed in on the plan and utilization of innovation of an AR game-based learning framework. The framework is almost wrapped up. The consequences of the pilot framework assessment uncovered that understudies are significantly intrigued by the framework. , AR innovation opens up numerous new exploration fields in designing and engineering. AR, the virtual results of realistic innovation are for recreation as well as get genuine higher qualities. AR innovation can turn into another enlivened reproduction device for inside plan, permitting the client to see.

## ACKNOWLEDGEMENT

This article presents an application of Augment Reality technology in a Real-time environment. In an augmented reality system, real and virtual objects are used together to create a real environment, presented in the field of view of a user. AR Environment is exploited as the new working

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## REFERENCES

[1] ARTOOLKIT.<http://www.hitl.washington.edu/artoolkit>  
BILLINGHURST, M., POUPYREV, I., KATO, H. and MAY, R. 2000. Mixing Realities in Shared Space: An Augmented Reality Interface for Collaborative Computing. In Proceedings of ICME 2000, IEEE, 1641- 1644.

[2] Azuma, R, Bailot, Y., Behringer, R. Feiner, S., Simon, J. & MacIntyre, B. (2001) Recent Advances in Augmented Reality, IEEE Computer Graphics and Applications. November/December, p 34-47

[3] Billinghurst, M., Kato, H. and Poupyrev, I. (2001) The MagicBook: Moving Seamlessly between Reality and Virtuality. IEEE Computer Graphics and applications Volume 21, Issue 3.

[4] Gandy, M. MacIntyre, P. Presti, P. Dpw, J. Bolter, B. Yarbrough, and O'Rear, N. (2005) AR Karaoke: Acting in your favourite scenes. Proceedings of the forth IEEE and ACM International conference on Mixed and Augmented Reality (ISMAR), October 5-8, Vienna Austria

[5] Gustafsson, T., Carleberg, P., Nilsson, S., Svensson, P., Sivertun, Å. and LeDuc, M. (2004) Mixed Reality for technical support. Technical report ISSN 1650-1942, Swedish Defence Research Agency.

[6] Henrysson, A. Ollila, M. and Billinghurst, M. (2007) Mobile Phone Based Augmented Reality. in Haller, M. Billinghurst, M. and Thomas, B. Emerging technologies of Augmented Reality. Interfaces and design. London: Idea Group Publishing

[7] Woodward, C., Lahti, J., Rökkö, J., Honkamaa, P., Jäppinen, J., Rainio, K., and et al. 2007. Virtual and augmented reality in the digital building project. International Journal of Design Science and Technology, Vol.14, No.1, 23-40.

[8] Billinghurst, M., Kate, H., and Proupyrev, I. 2001. The MagicBook-Moving Seamlessly between Reality and Virtual IEEE Computer Graphics and Applications, Vol.21, No.3, 2- 4.

[9] Kensek, K., Noble, D., Schiler, M. and Triparthi, A. 2000. Augmented Reality: An application for architecture. In Proceedings 8th International Conference on Computing in Civil and Building Engineering, ASCE, Stanford, CA, 294- 301.

[10] KATO, H., BILLINGHURST, M., POUPYREV, I., IMAMOTO, K. and TACHIBANA, K. 2000. Virtual Object Manipulation on a Table-Top AR Environment. In Proceedings of the International Symposium on Augmented Reality (ISAR 2000), Munich, Germany, 111-119.

[11] Dias, J. M. S., Santos, P., Nande, P. 2003. In Your Hand Computing: Tangible Interfaces for Mixed Reality. In Proceedings of 2nd IEEE International Augmented Reality ToolKit Workshop, Waseda University, Tokyo, Japan.