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AR BASED STRUCTURE DESIGN AND MODEL DEVELOPMENT FOR CONSTRUCTION APPLICATION

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Abstract – *This is an AR based cross platform application specially designed for civil application in which we will use Augmented Reality (AR) to design and model the construction real time object. In this system first we will upload the proposed model or design as an object in our system in .png file format. Then using CoreAR library we will put the object in real time environment using camera video feature. CoreAR is a library distributed by google for free on android platform. AR is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.*

***Augmented reality** (**AR**) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, and olfactory. AR can be defined as a system that fulfills three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one. Augmented reality is related to two largely synonymous terms: mixed reality and computer-mediated reality.*

Key Words: Algorithm, civil, AI, Network, Construction, Apps, Dataset, ANN

1. INTRODUCTION

Augmented reality (AR) is one of the biggest technology trends right now, and it's only going to get bigger as AR ready smartphones and other devices become more accessible around the world. AR let us see the real-life environment right in front of us—trees swaying in the park, dogs chasing balls, kids playing soccer—with a digital augmentation overlaid on it. For example, a pterodactyl might be seen landing in the trees, the dogs could be mingling with their cartoon counterparts, and the kids could be seen kicking past an alien spacecraft on their way to score a goal. With advances in AR technology, these examples are not that different from what might already be available for your smartphone. Augmented reality is, in fact, readily available and being used in a myriad of ways including as Snapchat lenses, in apps that help you find your car in a crowded parking lot, and in variety of shopping apps that let you try on clothes without even leaving home. Perhaps the most famous example of AR technology is the mobile app Pokemon Go, which was released in 2016 and quickly became an inescapable sensation. In the game, players locate and capture Pokemon characters that pop up in the real world—on your sidewalk, in a fountain, even in your own bathroom.

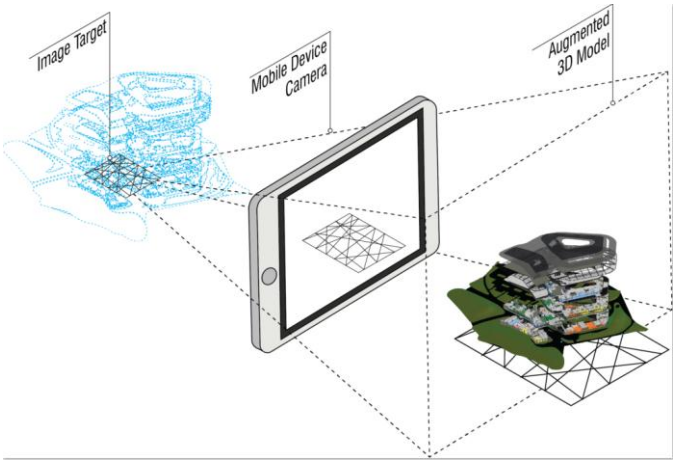

Fig -1: AR Architecture

A key measure of AR systems is how realistically they integrate augmentations with the real world. The software must derive real world coordinates, independent of camera, and camera images. That process is called image registration, and uses different methods of computer vision, mostly related to video tracking. Many computer vision methods of augmented reality are inherited from visual odometry. An augogram is a computer generated image that is used to create AR. Augography is the science and software practice of making augograms for AR.

Usually those methods consist of two parts. The first stage is to detect interest points, fiducial markers or optical flow in the camera images. This step can use feature detection

methods like corner detection, blob detection, edge detection or thresholding image processing methods. The second stage restores a real world coordinate system from the data obtained in the first stage. Some methods assume objects with known geometry (or fiducial markers) are present in the scene. In some of those cases the scene 3D structure should be calculated beforehand. If part of the scene is unknown simultaneous localization and mapping (SLAM) can map relative positions. If no information about scene geometry is available, structure from motion methods like bundle adjustment are used.

In Augmented Reality, the distinction is made between two distinct modes of tracking, known as marker and markerless. Markers are visual cues which trigger the display of the virtual information. A piece of paper with some distinct geometries can be used. The camera recognizes the geometries by identifying specific points in the drawing. Markerless tracking, also called instant tracking, does not use markers. Instead, the user positions the object in the camera view preferably in a horizontal plane. It uses sensors in mobile devices to accurately detect the real-world environment, such as the locations of walls and points of intersection.

Augmented Reality Markup Language (ARML) is a data standard developed within the Open Geospatial Consortium (OGC), which consists of Extensible Markup Language (XML) grammar to describe the location and appearance of virtual objects in the scene, as well as ECMAScript bindings to allow dynamic access to properties of virtual objects.

To enable rapid development of augmented reality applications, some software development kits (SDKs) have emerged.

2. AR IN CONSTRUCTION

The use of augmented reality gives firms the ability to understand the building more in-depth. AR can display the environmental and social impacts of the project visually. The value of augmented reality in construction begins in the planning and permitting stages. It gives firms the ability to showcase the end-product (e.g., completed building) on a very detailed level and how the structure will benefit or impact its surroundings.

In the planning phase of construction, it is crucial to make sure that your project plan aligns with the requirements of the client. By using augmented reality in conjunction with BIM, both the architects and construction firms can truly showcase functional models to their clients. Clients can make decisions based on the current plan and make changes before construction starts. Some applications can be downloaded on smartphones or tablets. Morpholio is an example of an app that can be used by architects to design the project by incorporating CAD in the planning phase. Safety is a common challenge in the construction industry. In terms of safety, wearables like the DAQRI smart glasses are used as safety equipment and for augmented reality's inspection works. SRI, an augmented vision technological research institute, uses glasses (Microsoft Hololens) to transform jobsite operations to help construction inspectors save time, cut costs, and improve safety. Usually, the inspection process is done manually and often requires more than one person. An inspector can accurately align and compare the as-built structures against the BIM model. An inspector can capture photos on demand, or retrieve notes from location sites. On-site, complicated areas, and serious concerns become easier to recognize, identify, and can be shared instantly.

3. PROPOSED SYSTEM

AR based cross platform application specially designed for civil application in which we will use Augmented Reality (AR) to design and model the construction real time object. In this system first we will upload the proposed model or design as an object in our system in .png file format. Then using CoreAR library we will put the object in real time environment using camera video feature. CoreAR is a library distributed by google for free on android platform. AR is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

4. AR ARCHITECTURE

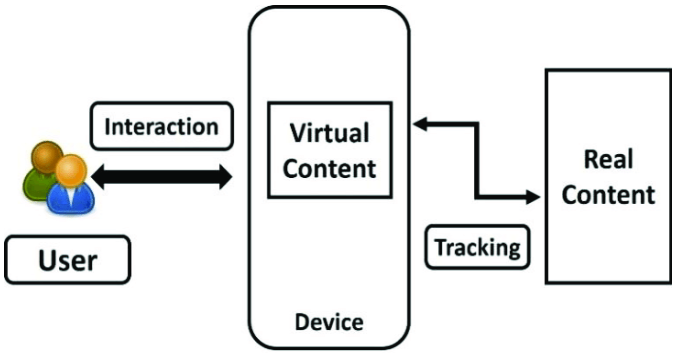

Fig -2: AR Block Diagram

AR can aid in visualizing building projects. Computer-generated images of a structure can be superimposed onto a real-life local view of a property before the physical building is constructed there; this was demonstrated publicly by Trimble Navigation in 2004. AR can also be employed within an architect's workspace, rendering animated 3D visualizations of their 2D drawings. Architecture sight-seeing can be enhanced with AR applications, allowing users viewing a building's exterior to virtually see through its walls, viewing its interior objects and layout.

With continual improvements to GPS accuracy, businesses are able to use augmented reality to visualize georeferenced models of construction sites, underground structures, cables

and pipes using mobile devices. Augmented reality is applied to present new projects, to solve on-site construction challenges, and to enhance promotional materials. Examples include the Daqri Smart Helmet, an Android-powered hard hat used to create augmented reality for the industrial worker, including visual instructions, real-time alerts, and 3D mapping.

Following the Christchurch earthquake, the University of Canterbury released CityViewAR, which enabled city planners and engineers to visualize buildings that had been destroyed. This not only provided planners with tools to reference the previous cityscape, but it also served as a reminder of the magnitude of the resulting devastation, as entire buildings had been demolished.

5. REQUIREMENTS

- OS : Android
- Hardware : Camera (>8MP for best result)
- Library : Smart Reality, CoreAR
- RAM : 1 GB
- Platform : WEB, Mobile

6. CONCLUSIONS

This system is very useful application for real time object modeling one of the best example of real time object modeling is construction project in which you cannot test or review until object is ready but it's too costly for reviews and revisions so AR is best solution for this type of problems in which visual object shown on real time background using camera feature and make revisions and reviews before object creation. It's a handheld device compatible and cheap to use as a free application.

With the rise of technology in our digital world, augmented reality is important to keep up with because it is becoming more common in the construction industry. In the planning stages of construction, AR can showcase to the client what is going to be built to ensure their requirements will be fulfilled. AR ensures accurate measurements because they can measure a space's dimensions, including depth, height, and width. Another benefit of using AR in construction is the ability to have on job-site revisions by discovering problems and fixing them proactively to mitigate rework. Also, AR allows inspectors to retrieve notes, pull up checklists, and capture photos on demand. Finally, using AR in construction is on the rise, not only is it crucial for project management, but it also is a safe and labor efficient utility.

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