# Random GPS Position Locking Algorithm For Implementation Of Augmented Reality To Ease Visualization For Real Estate Firms

[1]Karan Sethi, [1]Vrushali Pagare, [1]Shivani Dongre, [1]Akshay Deore, [2]Prof S.V. Shinde
[1]BE Computer, [2]Assistant Professor
[1]Department of Computer Engineering,
[1]AISSMS College of Engineering, Pune, India

*Abstract:* World over the markets has opened up to immense possibilities that augmented reality devices holds, their applications span across the industries and already there is a lot of buzz happening around the world. And within few years the way we interact with the technology is about to change forever. In this project we are trying to solve the problems faced by the architects due to visualization right from the idea stage to implementation since what an architect thinks, a builder builds and a customer imagines are completely different views of the same project, for this we are using our own Random GPS Position Locking Algorithm using augmented reality to developing an application through which they would be able to see their projects at actual site in real world.

*Index Terms –* **Augmented Reality(AR), Global Positioning system (GPS), eXtensible Markup Language(XML), Unified Modeling Language(UML).**

## I. INTRODUCTION

The year 1992 is believed to be the birth of the term augmented reality. This term first appeared in the work of Caudell and Mizell [1992] at Boeing, which sought to assist workers in an airplane factory by displaying wire bundle assembly schematics in a see-through HMD. AR became a lot more popular in more recent times, and especially after 2013. Google started working on the Glass and just a few months after Google opened their Glass to developers, car manufacturers Audi and Volkswagen showcased their own AR mobile applications relating to instruction manuals and remote assistance services. And even though the Glass was not a successful project, it was a very important step into the future. Wearable AR technology is surely a part of our future.

In the next decade AR technology got a lot more popular and was used in various fields. Louis Rosenberg developed the Virtual Fixtures on 1992 which became one of the earliest functioning AR systems followed by team of people from Columbia University who built an HMD called KARMA.

## II. OBJECTIVES

To increase the transparency and understanding of the project, to increase the Productivity and to obtain more efficient result on less given resources.

## III. RESEARCH METHODOLOGY

Previously before AR (Augmented Reality) many methods were used to conquer the problem of visualization such as :- Displaying of a small 3D model of the whole project but through this the customer was only able to visualize the whole project and not the flat he/she was going to buy to overcome this they started to show the 3D model of their flats through 3D softwares through this the users were able to visualize their flats up to some extent but not about the whole project so they started building demo/ sample flats but the same problem emerged due to which they started showing video walkthroughs of the project due to which visualization of the flat and the project in real world became an issue which still prevails in VR walk-through since the VR walk-through takes you completely into a virtual world.

In the below table we have rated the level of understanding of the users flat, the whole project and visualizing both in real world out of 5 in the Table 3.1.

| | Level Of Understanding Through | | | | |
|---|---|---|---|---|---|
| | Small 3D Model | Showing The Project In 3D Software | Sample Flats | Video Walk-through | VR Walk-through |
| The user Flats | - | 3 | 3 | 2 | 3 |
| The Whole Project | 2 | 1 | 1 | 2 | 1 |

| Visualizing both in Real World | 1 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|

Table 3.1 – Survey on the level of understanding through previous methods.

## 3.1 Data and Sources of Data

### 3.1.1 Literature Survey

| Sr. no. | Paper Title | Techniques used | Merits | Demerits |
|---|---|---|---|---|
| 1. | Augmented Reality vs Virtual Reality for 3D Object Manipulation[1] | 3D input devices, head mounted device | Increase in productivity | No implementation |
| 2. | The Implementation of Augmented Reality in a Robotic Teleoperation System.[3] | Robotic Arm | Increase in productivity | Not user friendly |
| 3. | A Stereo-Vision Approach for a Natural 3D Hand Interaction with an AR Object.[7] | Stereo vision | User Friendly GUI | No Implementation |
| 4. | Hand Gesture Interaction with a 3D Virtual Environment[5] | HMD, Virtual Hand | Gesture Recognition | No Implementation |
| 5. | POLAR: a Portable Library for Augmented Reality[6] | Camera flow,3D manipulator,2D marker, application tracker | User Friendly GUI | No user satisfaction |
| 6. | Synchronous location-aware Media and Augmented visualization for Real world Tourist (SMART)[8] | Ios, android application platform | provide deeper knowledge about location's past | No gesture controls |

Table 3.2 – Literature Survey

## 3.2 Theoretical framework

The overall system design consists of following:
(a) Image selection.
(b) Scan the QR code/ Lock GPS co-ordinates.
(d) Generate AR view using mobile application.

We propose a system to automatically generate AR view that have good structure and content quality than traditional methods. The architecture of our system is shown in Figure 3.1. We are using android application to assign an important view for each co-ordinates in the given QR code or locked GPS co-ordinates, where the model is stored on the cloud. Then, we generate AR view from the given co-ordinates by using QR code or locked GPS co-ordinates. In Figure 3.1 Current method generally extract view from the points to construct the model. In contrast the co-ordinates can be divided into an ordered sequence of parts. Each part addresses a specific co-ordinate and these co-ordinates are also relevant to each other. AR view usually not only have 2D view but also 3D view such as figures and tables. But our work focuses on the 3D AR view only.

In this paper, we propose a Augmented Reality example to generate well-structured AR view for architects. Augmented reality is no longer science fiction. As we move forward, this has now become possible through CAD software, 3D data from software, a smartphone or tablet having a camera and the right amount of computing power. With this technology, while you point your device (which includes a camera) on an object in the real world while computers adds(augment), align and scale the 3D models with your view. The computer models appear in the real world, where they would be if completed. A target, I.e a printed QR code or locked GPS co-ordinates, is used to sync the location of the digital 3D data with the real world. You can walk around the object and look up or down, just as you would if it was there in real life.

**Abbreviations and Acronyms**

QRR - QR Code Reader,
OpenGL - Open Graphics Library,
SRS - Software Requirement Specification,
GUI - Graphical User Interface.
GPGGA - Global Positioning System Fix Data



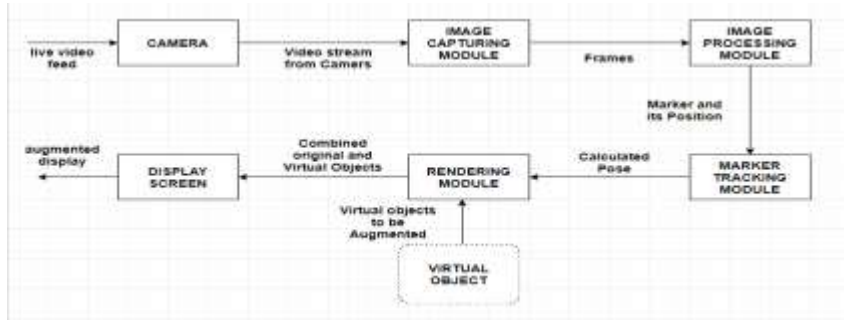Figure 3.1. System Architecture

**3.3 Random GPS Position Locking Algorithm**

A GPS co-ordinate given by a device is described below by using this we can lock the desired GPS location to a 3D image which could be then displayed into the device:-.

$GPRMC,124205.000,A,3002.8030,N,00401.4681,W,0.08,033.64,030001,,*08
$GPGGA,124206.000,3002.8028,N,00401.4682,W,0,07,0.5,0466.8,M,-10.6,M,,0000*4F
$GPGSA,A,2,11,07,10,05,04,08,13,04,,,,,1.4,0.3,0.8*2E

The GPGGA sentence that is shown above contains the following:

- Time: 124206.000 is 12:42 and 06.000 seconds in Greenwich mean time
- Longitude: 3002.8030,N is latitude in degrees. decimal minutes, north
- Latitude: 00401.4681,W is longitude in degrees.decimal minutes, west
- Number of satellites seen: 07
- Altitude: 0466 meters

Steps for locking Random GPS location from the application ;-
   1. Click on Lock GPS Location.
   2. Send the GPS co-ordinates i.e. altitude, latitude, longitude to the server.
   3. Store the locked GPS co-ordinates and position the 3D image.
   4. Send the 3D image to the device over the locked GPS co-ordinates.
   5. Display the 3D image over the locked GPS co-ordinates.



**Figure 3.3.1 Random GPS Position locking algorithm**

**3.4 Mathematical Model**

S= {Q; I; P;C; S; PP; FC; F;DD;NDD}
where, S=System
Q= States, Q={q0, q1, q2, q3, q4}

Where,

q0= Initial state
q1= Object selection and Create Tracker
q2= Direct Mode
q3= VR Mode
q4= Display and Gesture Control.(Final state)

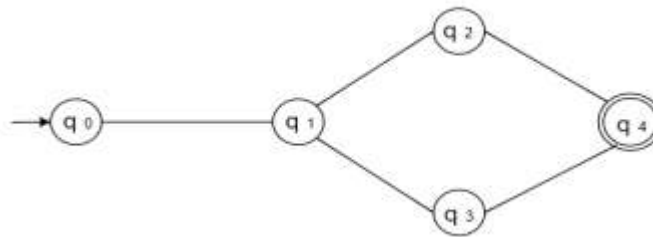I=Input:

Image selection



Figure 3.4.1 – Mathematical Model

I = Input : f u1, u2, u3, ..., ung; Where, I is a scanning of marker.
u1; u2; u3, ..., un are the number of markers.
Process Augmented Object
P = Process :fp1, p2, p3, ..., png; Where, P is represented as image Co-ordinates conversion process to detect the physical structures of environment, sections and sections of number of markers. p1, p2, p3, ..., pn are the number of Parsing modules.
Failure Condition(FC): ffc1, fc2, fc3,.., fcng; Where, FC is represented as a unsuccessful conditions. fc1, fc2, fc3,.., fcn are number of final output.
Failure(F): image is not generated.
Deterministic Data(DD): image with extensions
Non-deterministic Data(NDD): Unstructured images

## IV. RESULTS AND DISCUSSION

This method is used to automatically generate AR view considering the important point from the QR code or locked GPS co-ordinates. Augmented reality provides a better way of understanding for architectural firms by using 3D model increasing firms productivity, transparency and understanding. Thus, Augmented reality will solve a huge gap of visualization in the architecture industry in an efficient way reducing the resources required.

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