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AUGMENTED REALITY BASED BUILDING MODELLING

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Abstract - *Augmented Reality based Mobile App with gesture recognition to accurately analyze the design for assemble the construction of the building model, which provides a new way for architects and project designers to identify any design flaws and make any adjustments in just a few taps, for which the Vuforia as the cloud database is used which can handle large number of 3D models to be projected on the mobile screen and by using Zxing packages from Unity tool the real world construction materials and it can accurately measures the real world coordinate length for construction's base and people can view their inline connections inside the building. Our proposed system gives a new way for architects through Augmented Reality based mobile app will take over the advantage of possible of occurrence of errors in building construction, it projects the 3D model of the building in a procedural format to build it in a better manner.*

Key Words Vuforia, Augmented Reality, 3D Models, Zxing and Gesture recognition.

1. INTRODUCTION

Augmented reality (AR) is vital for next generation of computer learning. Augmented Reality is a Medium that overlays digital information to the users view, the image of physical Surrounding is a user view. The project uses an Augmented Reality-core and that integrates with Building Information Modelling (BIM) to improve the users understanding of complex building designs and the construction process. The diagrams prepared from the Bioenvironmental is scanned by phone camera and sends to the AR-core. Augmented Reality core is a platform for creating augmented reality experiences.it scans the photo and understands the environment and provide a building structure.

1.1 Natural User Interface

An NUI (Natural User Interface) makes available for users the more appropriate and instinctive experiences which will tremendously increases the advantages of Augmented Reality. Cloud environment allow users to access and retrieve information from a 3D model of the building from almost anywhere. The 3D projection of building material along with the assembly instruction in the cloud backend which can simplify the process. When the request is made from the mobile app to the cloud by the ID given in the Scripting in unity, it fetches the 3D model from the Database and sends the response to the mobile app as a 3D object. When the hand gesture like taping is made between the mobile and 2D printed material, it captures it and further projects the next 3D object's model.

When the building architects normally designs the building model in the cardboard, may lead to occurrence of errors in the building, where our proposed system gives a new way for the architects through AR based mobile app will take, over the advantage of possible of occurrence of errors in building construction, it projects the 3D model of the building in a procedural format to build it in a better manner.

2. OPEN SURF

Open surf algorithm is used in our proposed work. Surf is an acronym of speeded-up robust feature is an OpenCV algorithm.it is used for feature detection and feature matching, the feature include edges, corners or part of the images. The advantage in this is computation time is faster, good handling of the images, Repeatability property of feature. It does the detection, description and matching. Based on the pixel points in the image and the key points from the image it compares the key points with the image in the cloud (Vuforia) and proceeds with the further processing of the image. If the image has been matched in the cloud it will be called by the mobile client for the 3D projection of the building architecture. In case of any deviations from the pixel matching the 3Dmodel will not be visualized on the mobile screen. The Markerless AR will helps in the real time projection of the model.

2.1 Edge Based Marker Detection

An edge based marker detection will consider only the edge pixels of the image for the projection of the model to the real world. On comparison with the other methodologies this method will provide more stability in the architecture model. This method will scans only the edges of the image and not the entire pixel count and the key points, this increases the robustness of our proposed work. After the detection of the image target from the mobile camera it scans the image target. Image Lightning plays a major role in the scanning process. The Software Development Kit (SDK) provided by the cloud helps in the faster retrieval of the image pixels from the mobile camera.

The image target for scanning process can be of 2D blueprint of the building model. The image must be of RGB color format rather the black and white image. Because the

cloud environment can be able to analyze the color images rather than grayscale image. It is of 24 bit representation of color code, the major color used here is Red, Green and Blue. The main advantages of this algorithm is, if it captures only two edges of the image the other edge points of the image can be connected so it helps in the efficient way of projecting the 3D model and it I also a recursive algorithm.

3. PROPOSED WORK

In our proposed work, our mobile app will scans the 2D image of the building architecture. The image will be compared with the collection of images in our cloud environment, the visualization of the 3D imitation of the building imitation will takes place in the mobile screen of the client in the real time environment. And the user can be able to interact with the 3D model, users can see the interior structure of the building architecture, before getting into the construction part. Each and every parts in the building can be seen separately and the users will see the assembly of the building constructive parts in Augmented Reality mode. Vuforia cloud environment will handles the storage of the image. Every process will run on the cloud platform which in turn reduces the usage of memory resources in the mobile applications.

3.1 Architecture Diagram

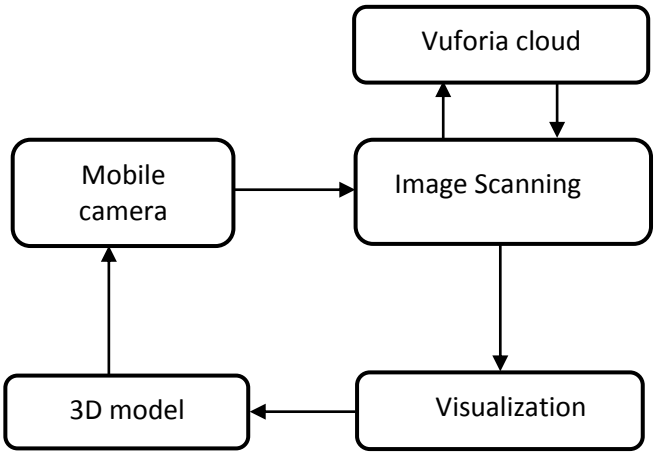

Fig -1: Flow of 3D Model Projection

3.2 Image Recognition and Tracking

For the development of our work we will be using Unity3D tool as the platform, because it provides many open source packages and inbuilt mechanism of Augmented Reality camera system to build the android app. The platform provide us AR Core package and Vuforia Software Development Kit (SDK) as the additional features. From the cloud web portal we can able to have images above than 1000.When the image has been searched by the mobile camera and the image has been found in the cloud portal, the image can be easily replaced with the 3D model or above the 2Dimage.For the initial step of image recognition, first the image has to be present inside the frame of the camera. Before the recognition, the trackable manager in the unity must look for the referenced images in the unity library.

For tracking the images in the platform it requires more resources, and in our proposed work multiple image targets can be tracked simultaneously. Name collision of the image will not be happened and texture for the image can also be replaced or updated at the run time. The Augmented Reality plugin in the unity tool will also keep track of the device's orientation and the physical space. If the sample image has been presented in the dark environment it might lose tracking, then the mobile device cannot be able to determine the image position and the real time orientation.

4. VUFORIA CLOUD

Vuforia is an Image recognition solution that allow developers to host and manage the images in a target. An application that want to query a cloud database with the image and need a matching data that uses a cloud recognition like Vuforia e.g. some augmented reality applications. For each target we store the Meta data URLs 3D models and etc. Our application reads the Meta data of a target and it is identified by Vuforia cloud and the corresponding image or video is shown in Targeted image. It can be accessed by platforms like unity, android and iOS. It provides the API (Application Program Interface) for. NET, c++ and objective c++.

For the development of Augmented Reality apps in the android platform, Vuforia cloud provides the platform to develop such kind of apps. Our proposed work it plays a major role. All the image targets has been stored in the cloud database in a secure manner. When the developer has the access to the cloud environment, a separate access token has been provided to that user. By using this key developer can able to connect the cloud with the mobile app. When the image has been uploaded to the cloud portal, it will automatically analyze and rate the image based on color and the pixel count. If the image is colorful the rating would be more rather than single color image or grayscale image and tracking will be faster in the mobile app when it scans. It uses the edge detection mechanism for image tracking. It first detects and analyze the feature points of the target image in the cloud and it will analyze the data and tries to compares the image features in the image target and the frames from the android camera.

4.1 Scale Invariant Feature Transform

By using this algorithm in our proposed work, if the image has many features it will useful in providing the feature description of the image target. It will be useful in locating the containing many other targets. This algorithm will reduce the noise in the image. First this algorithm will detects the stable location of the key point reducing the error contribution. Then the two neighboring points are compared with each other. After comparison it will eliminate some key points that are having low contrast in

the edge and assigns the orientation to the key points. It has more accuracy and it is faster than other algorithms. The images are constrained to have good lightning and the image should not be blurred. The original scene will not change from one image target to another. From the wide range of key point features our algorithm takes the accurate points and further process to projects the 3D model. Placing lot of 3D models on the same target will leads to high resource usage, our work will reduce the higher usage of resources by matching with the exact key points.

5. LITERATURE SURVEY

5.1 Integrating building information modelling with Augmented Reality for inter disciplinary learning

Shahin vassigh etal-2016 IEEE symposium on mixed and augmented reality

This project describes about the integration of augmented reality with building information modelling to provide a workspace for the students to learn about the applications of visualization in the field of civil and architecture to investigate about their various prototypes in real time environment.

5.2 3D Selection Techniques for Mobile Augmented Reality Head Mounted Display

Kasim ozacar-Interacting with Computers 2016

It aims in the 3D model interaction in the real time environment using the Head Mounted Displays consisting of 3D point cursor with the gestural action for selecting the projection using the fingers and the cursor points are more accurate. The head rotation along with the head mounted displays will helps in the selection of the speed of the visualization.

5.3 Using Augmented Reality (AR) Technology for the Development of the learning Application

Kai Yi chin etal-2017

This study proposes on making a clear understanding of the historical building and also the information about the buildings by using Augmented Reality (AR) methodology in the mobile platform to enhance the study on histological monuments. After the 3D modelling of the building questionnaire survey has been made and it also helps in exploring the information about the building.

5.4 Augmented Reality on Building Information Models

Christoph sydora-2018 IEEE
An android based mobile application prototype which integrates with the Building Information Tools can uses the model's geometric information for visualization and augmenting the scene to the mobile's camera feed, the models has been imported from the remote server. It also contains the textual description about the models. It is based on computer aided design for creating 3D models. When the device is calibrated there is a chance the model can be of out of synchronization.

5.5 Comprehensible and Interactive visualization of spatial Building Data in Augmented Reality

Joao p. Carneiro Et al-computing In Civil Engineering 2019

It speaks about the interactive visualization of the real time appliances and the building systems. Users can able to interact with the 3D model data in the building to get the appliances information. To visualize all the objects the datasets has been generated from the appliances and to estimate the energy bused by the appliances in an organization.

6. CONCLUSION

The study on Augmented Reality in Building modelling mainly for the architects, will enables the user to solve the real time problems and can be able to visualize the 3D model in a better manner and the augmented environment will change dynamically. Augmented Reality has been one of the trending technology that will digitalize the real world to interact with them. The solutions are beyond the human's perception enhancing the real time simulation.

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