3D OBJECT TRACKING AND MANIPULATION IN AUGMENTED REALITY.

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Abstract - Augmented Reality (AR) is a technology which combines virtual objects and real-world environments. Technologies like Computer Vision and Object Recognition can be used with AR to create an interactive and enhanced user experience of the real world. We plan to use AR to leverage the increased computing power of smart-phones to build a system that displays 3D objects using a printed image without using any complicated equipment. The purpose of this system is to accelerate learning and understanding of concepts such as structures or mechanisms. Instead of reading long manuals, the user can watch and interact with a 3D video manual through AR. The average person learns better by observing and listening something than by simply reading something. We will be using this specific property of the human mind to accelerate learning.

KeyWords: **Augmented Reality, Unity Graphics Engine, Fiducial Marker, Camera, Vuforia, Pattern Matching, Image Targets,**

I. INTRODUCTION

Augemented Reality(AR) combines virtual world objects with real environments. Over years, augmented reality has been used in many domains for a multitude of purposes. In most fields, AR is used as an assistive system for performing human tasks. AR has proven to be useful in increasing the efficiency and accuracy of the tasks especially in the domains related to surgery and aeroplane manufacturing. In case of surgery, it can be used as a tool to render 3D models of the patients operated area / organ that can help doctors perform surgeries with minimum risk and complications. In aeroplane manufacturing, AR can be used as a tool to assist wiring the electrical harness of a plane which is a long and tedious task and is still done manually.[4] The 'Black-board' system of education is still used in many countries around the globe. Although this is a traditional system, it is not efficient for learning. However if AR is used in classrooms as a tool to teach, it accelerates learning because it is an audio-visual method of learning. It is a property of the human brain to absorb audio visual information more than textual information. AR in classrooms takes advantage of this property and accelerates learning.[3]

IMPLEMENTATION

AR TOOLKIT+ ALGORITHM

- The camera captures video of the camera view and sends it to the computer.
- Software on the computer searches through each video frame for any square shapes (square markers).
- If a square marker is found and the image content embedded by the square, the pattern, is matched and identified, the software uses mathematics to calculate, relative to the camera, both the position of the black square and the pattern orientation.
- Once the position and orientation of the camera are known, a computer graphics model is drawn using an offset to the calculated position and with a matching orientation
- This model is drawn in the foreground of the captured video and tracked against the movements of the background video causing the model to appear attached to the background.
- The final output is shown back in the display, so when the user looks through the viewer, they see the rendered graphic model over a real world video stream; seemingly homogeneous with the camera view.

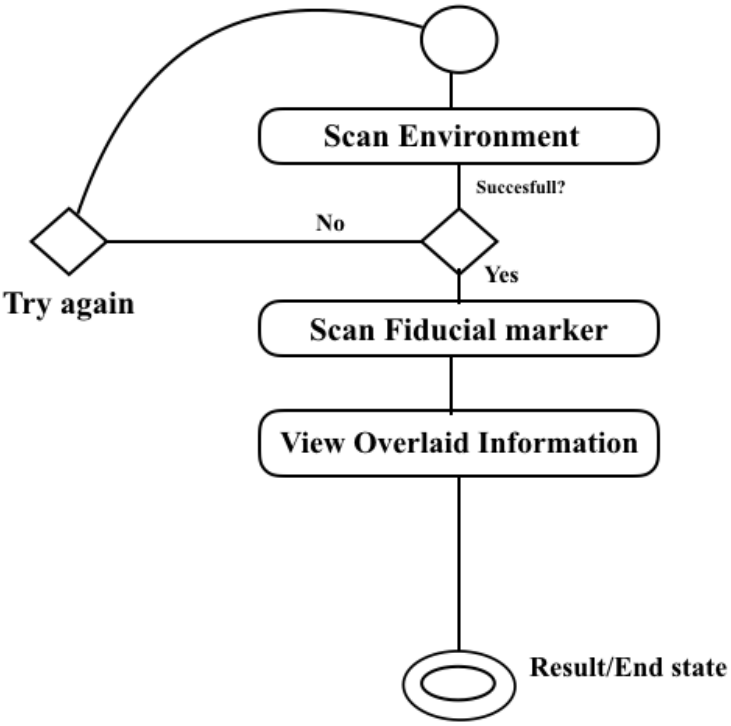

Figure 1: Activity Diagram

II. PROPOSED SYSTEM

The proposed system aims at creating high quality 3D video manuals using AR. Fiducial markers (ImageTargets) are tracked using a camera and the 3D models are mapped to the marker. These 3D models are representations of a product or concept that the user can see on his screen. The user can interact with these 3D models and observe the animations to understand the mechanisms, workings and details of a certain product or concept.

III. Proposed Method

We are planning to use the following components for developing an application that can run on smartphones as well as desktopclients. It will have the following components.

1. Smartphone/Computer

2. Unity

3. Vuforia

4. Server

1.Unity

Unity is a graphics and physics engine that is used to build scale-able applications that can be built for multiple platforms with the same codebase. Supported platforms include Linux-x86/x86-64, Mac-x86/x86-64, Windowsx86/x86-64, iOS, Android and WebGL . Unity also allows the user to select a graphics API of their choice (DirectX 9, Direct X11, Direct X12, Vulkan, OpenGL, Metal, OpenGL ES 2.0, OpenGL ES 3.0, WebGL 1.0, WebGL 2.0). Unity uses C# for internal scripts and logic.

2. Vuforia

Vuforia is an SDK that provides detection and tracking of image targets by using feature detection. A feature is any point in an image that is on the edge of multiple coloured sections. A coloured cube has 4 feature points. It was available as a plug-in for Unity and has been integrated into the engine with the release of Unity version 2017.2.

IV RESULTS

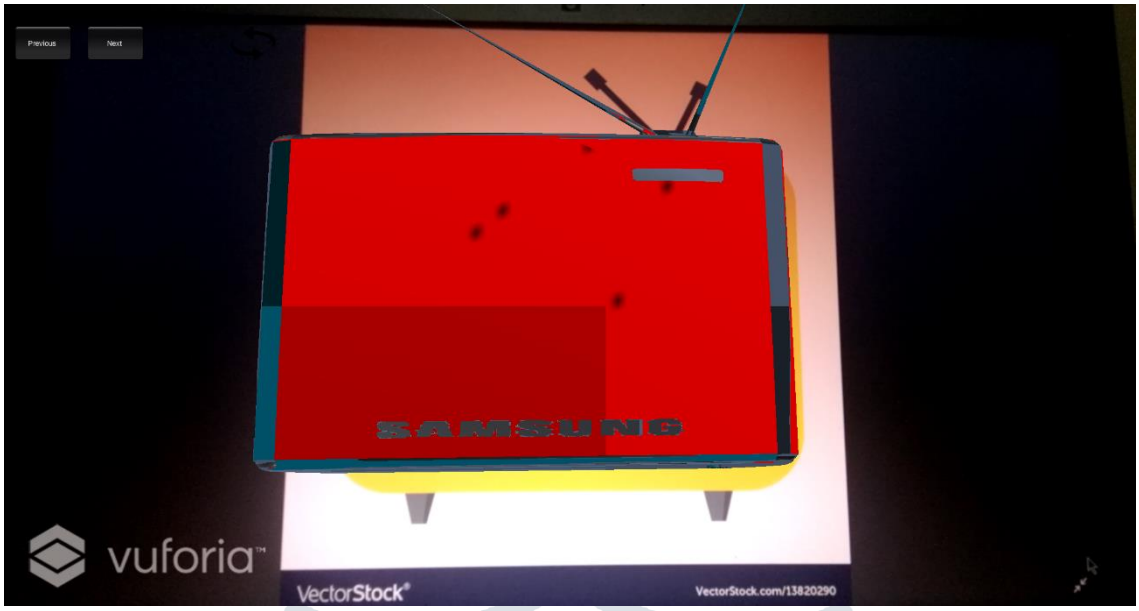

Fig.2 Outcome

V CONCLUSION

We will develop a system, that will be use AR technology to improve learning and understanding of a product for electronics products consumers. In teaching, our system will help teachers to explain concepts to students effectively and enhance their learning. In the manufacturing sector this product will help workers understand a manufacturing process and assist them in doing so. Our system aims at helping and developing better training systems, 3D user manuals and interactive courseware materials that will aid efficient learning and training for people.

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