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Augmented Reality based Video Generation

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Abstract - *Increasing fusion of the real and virtual world has caused a rise in technologies related to augmented reality, virtual reality, and mixed reality. Augmented reality provides a real-time world environment and allows the viewers to interact with images live. It synchronizes the environment with a graphical structure to provide an ultimate virtual experience. In this paper, we explore the possibilities in the field of augmented reality and human interaction, namely, a social media application that successfully exploits current augmented reality technology. The tools used in this project are Unity and ARCore are highlighted. Unity provides a powerful platform to make rich, deeply engaging AR experiences that intelligently interact with the real world. ARCore is a platform that helps us build augmented reality apps on Android. AR Foundation, a part of ARCore allows you to work with augmented reality platforms in a multi-platform way within Unity.*

Key Words: Augmented Reality, Unity, Android, ARCore

1. INTRODUCTION

Augmented reality means when a different reality covers your pre-existing reality using certain devices such as smart mobile phones. To augment reality is to alter the view of the physical world through the use of computer-generated sensory and image processing. The uses of augmented reality range from displaying critical information about a patient during surgery, to show which the highest-rated restaurant in a food court is. Augmented Reality saw its record growth in 2018. There is huge commercial support for Augmented Reality, with big tech names like Microsoft, Amazon, Apple, Facebook, and Google making serious commitments. As of May 2019, the installed user base for Augmented Reality-supporting mobile devices reached 1.5 billion. AR is defined as a system that satisfies 3 basic features: integration of real and virtual worlds, real-time interaction, and correct 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. In this project, we build a platform to augment 3D components on real-time video input feed. The proposed system will make use of the recent advancement in smartphone technology and augmented reality development platform to curate a mobile Augmented Reality application, discussing a generic framework required for its development. This project offers a platform to create a video using Augmented Reality by giving the user a list of filters and effects to augment. These effects will be mainly related to festivals and exchanging greetings on special occasions. The main motive is to provide users with a system that will increase social interaction during festivities whilst keeping up with technological trends. The platform allows the user to share and store the video created effectively.

1.1 ARCore and Unity

With the evolution in smartphone technology and social media platforms, the way humans interact has been revamped. From text and calls, we have moved to an era of communication via media ascribing to applications such as Snapchat and Facebook. Furthermore, in recent years, intending to integrate the real and virtual worlds, technologies like Augmented and Virtual reality have witnessed a huge amount of research. ARCore by Google has been made available for aiding developers to build their augmented reality applications and contribute in a creative and technologically advanced manner. ARCore provides two different SDKs for using Unity to develop AR apps for Android and iOS.

ARCore is a platform by Google which enables a phone to carry out the following in an enhanced manner[1]:

- World tracking
- Plane detection
- Point clouds
- Light estimation
- Environment probe
- Face tracking
- Image tracking

Unity provides powerful tools to make rich, deeply engaging AR experiences that intelligently interact with the real world. AR creators can prototype, test, and visualize robust AR apps as they will run in the real world while choosing from a diverse set of built-in environments.

Augmented Reality applications like Snapchat and PokemonGo have managed to create a massive user base in India over the past few years. India has a SnapChat user base of around 23 million. This number along with the number of smartphone users shows that the potential for augmented reality in social media is huge and can be leveraged to conserve cultures and traditions whilst transitioning from the real to the virtual world.

- ARCore SDK for Unity: ARCore SDK for Unity is a standalone SDK that lets you access all of ARCore's features.

- ARCore Extensions for Unity: ARCore Extensions is a package that provides additional ARCore functionality that is designed to be used with Unity's AR Foundation.[2]

Features such as plane finding, CPU Image access, Basic light estimation, local anchors, etc are made available as a part of the ARCore SDK for Unity to build Android apps.

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1.2 Related Works

A variety of methods have been proposed to bring the realism of AR experiences to mobile devices. Among them, one study proposes a new method for applying Augmented Reality where a user can view virtual furniture and communicate with 3D virtual furniture data using a dynamic and flexible user interface. The AR-based application aims to cut down the process where a customer explains his/her idea to the designer using a Marker-less Augmented Reality experience. [3] Another study uses software named Vuforia (QCAR) to implement augmented reality in mobile applications for marketing residences. Vuforia provides convenience to the Android mobile platform in the shooting in 3D objects. Here, the results show that an image with a good feature will have a minimum probability of error when Vuforia generates the target image into a 3D object. To get a good 3D Object, edge detection and light detection have become the main factor in image processing. So the results of the application depend on the image being used as a marker.[4] In another study involving ARCore, where the primary focuses were routing, localization, and object detection, the system took advantage of the ARcore motion tracking feature and used anchors as way-points to improve accuracy. Object detection was implemented by tracking the positions of certain feature points detected by ARcore.[5] Light estimation, face tracking, plane finding such tasks are carried out by ARCore efficiently. Faces are versatile human characteristics, so naturally tracking faces is a very important aspect of advanced human-machine interaction technology. As a further analysis of how ARCore tackles face tracking with its new 468 points dense 3D face mesh which paints detailed textures that accurately follow a face along with light estimation and quick adept plane finding, we have proposed the following system.

2. PROPOSED SYSTEM

Though there is on-going research in the field of Augmented Reality, not much has been done to bring these technologies to daily life. Our project aims to tackle the lack of clear understanding amongst users for Augmented Reality. There is no social media application earmarked for extending the cultural and social welfare of Indian society. So whilst keeping this idea at the center of our work we will be working on current technology i.e. ARcore (version 1.16) and Unity(version 2019.2.4) required to develop a mobile Augmented Reality application with a smooth user interface.

The main scope of our system will be as follows:
• Using the model the user will be able to shoot videos and apply effects and filters as per his/her liking.
• Scalable 3D components
• Augment music
• The user can then share the video he/she created with their friends and family and also, store them on his device.

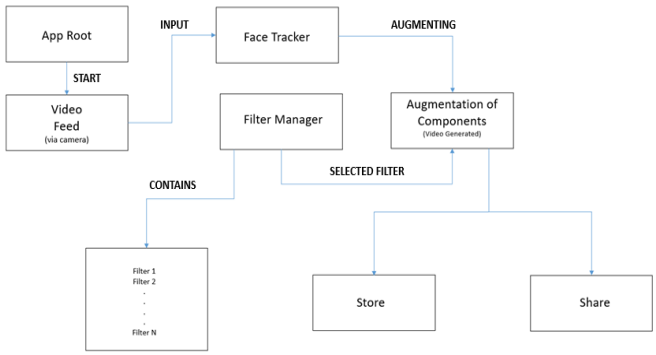

Fig 1: Architecture Diagram of Proposed System

The system architecture is developed to shoot videos using augmented reality. The user selects a filter of his/her choice and that filter is augmented onto the incoming feed. Thus, the whole system performs three major functions:

1) Filter selection and augmentation
2) Body tracking
3) Sharing and storage

1. Filter selection and augmentation

The user selects one filter from the list that appears on the screen.

This filter is then augmented on the real-time feed which is acting as input and thus the components and image effects are superimposed on it.

2. User tracking

Using Unity3D and ARCore, the user will be tracked. The positioning of the components and effect application will be determined based on the movement of the user.

3. Sharing and storage

Once the video is shot, the user can either share it via messaging platforms or store the final video on his device.

3. METHODOLOGY

- Create an AR session.
  An AR session refers to an AR instance.
- Add ARFace script to AR session in Unity.
  ARFace script carries out the face tracking of the user.
- Configure face prefab.
  Each prefab manages the ARCore session. When active in the scene, this prefab will create and initialize an ARCore session and render the background image from a Unity camera that follows the device's position and orientation as estimated by ARCore.
- Add textures and materials to prefab. Based on the filter that is being set up, the 3D components or textures will be added to the select prefab.
- Add prefab to the scene and configure it to ARFace.
  Set up, test, and modify the Prefab quickly and easily using the Scene view, Hierarchy, and Inspector.
- Add the script to change the scene.
- Configure the camera and recording buttons using Unity.
- Build the application using unity.

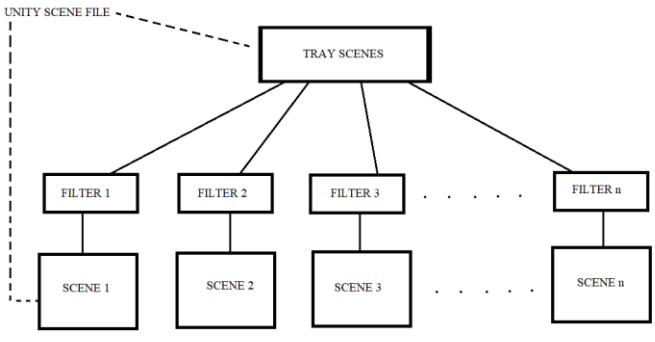

Figure 2: Component Diagram

Figure 2 represents the component diagram of how each filter is stored in Unity. Each filter has a scene. All these filters are then combined and represented in a menu i.e. 'Tray' for the user to choose from.

Once recorded, these media can be shared via other social media platforms.

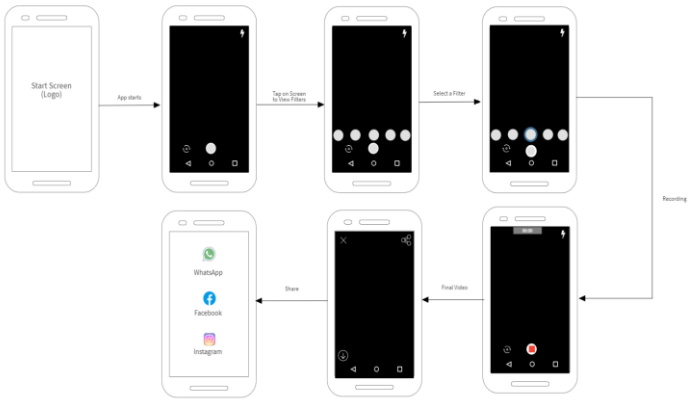

Figure 3: Wireframe of the process

Figure 3 depicts the flow of the android application.
1. User taps on the menu button and all the filters are displayed for selection.
2. The user chooses which filter he wants to use by tapping on the icon for the particular filter.
3. The user uses the filter and correctly positions it, then presses and hold the record button to record the video.
4. Video is stored on the device and can be shared via social media platforms.

4. RESULT ANALYSIS

The evaluation aimed to test the level of realism of the AR experience implemented using the SDKs for app development. Experiments were carried out in a real-world environment. With ARCore there is efficient-

- Motion tracking, which allows the phone to understand its position relative to the user.
- Environmental understanding, which allows the mobile device to detect the size and location of horizontal, vertical, and angled surfaces and adapt accordingly.
- Light estimation, which allows the mobile device to estimate lighting conditions for a more realistic effect.
- Plane Finding, ARCore looks for clusters of feature points that appear to lie on common horizontal surfaces, like tables and desks, and makes these surfaces available to your app as planes.
- Augmented Faces, ARCore with its 468 points 3D face mesh, tracks the user's face efficiently having identified different regions of it and uses those regions to overlay assets such as textures and models in a way that properly matches the contours and regions of an individual face.

5. CONCLUSIONS

ARCore and Unity are highly advance with steep learning curve technologies for developers today to participate in the current fusion of the virtual and real worlds. With our Augmented Reality application, there would be an enhancement in how people interact with each other and exchange greetings. Moreover, with the use of this system, the need for learning complex video editing software is eliminated. With progress in Augmented Reality in the form of apps like ours, users can interact with each other during festivals and special occasions using the latest technologies. Augmented reality has a huge market open for creativity and innovation. The result of this project is to facilitate the social media platforms by incorporating upcoming fresh technology in it via augmentation of 3D objects using augmented reality technology for usage on a mobile platform. Thus, the proposed application is beneficial in both the social and cultural aspects.

6. FUTURE PROSPECTS

With the advancement in technology for building Augmented Reality applications, the performance of this application and several other similar applications can be enhanced. There is scope for Augmented Reality applications in mobile devices as mobile device models get upgraded and advanced. With newer versions of ARCore and Unity, better plane tracking and full-body tracking too can be expected to be employed in the future. ARCore and Unity, along with other similar technologies to build AR applications have opened doors to futuristic experiences on handheld mobile devices. From the automobile industry to healthcare, Augmented Reality poses new challenges that can be turned into exhilarating opportunities for growth in these industries.

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