Seminar Report

On

Camera Translator for Kanji

By

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TC131

Under the guidance
of

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Marathwada Mitra Mandal's
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CERTIFICATE

This is to certify that **Manasi Khillare** from **Third Year Computer Engineering** has successfully completed his/her seminar work titled **"3D Kanji Translator"** at Marathwada Mitra Mandal's College of Engineering, Pune in the partial fulfillment of the Bachelors Degree in the Engineering.

Date: 15/06/21
Place: MMCOE

Sankirti Shiravale	Dr. H. K. Khanuja	Dr. S. M. Deshpande
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Acknowledgment

I take this to express my deep sense of gratitude towards my esteemed guide Prof. Sankirti Shiravale for giving me this splendid opportunity to select and present this seminar and also providing facilities for successful completion.

I thank Dr. H. K. Khanuja, Head, Department of Computer Engineering, for opening the doors of the department towards the realization of the seminar, all the staff members, for their indispensable support, priceless suggestion and for most valuable time lent as and when required. With respect and gratitude, I would like to thank all the people, who have helped me directly or indirectly.

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Abstract

Learning any new language is the hardest task in itself. Specifically languages like Chinese or Japanese along with their array of over 2000 characters that are used in daily life. The three scripts used in Japanese namely Katakana, Hiragana, and Kanji(the adopted Chinese characters) make it furthermore difficult. This difficulty arises due to lack of visualization of the meaning of the pictographs namely Kanji.

In this project the application that was created caters to this puzzle by generating a visual of the character/ pictograph after image recognition. This is where Augmented reality plays a role in the processing of the image, recognizing it and then augmenting the respective visual to the image. Thus making learning an easier and enjoyable process.

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Augmented Reality and App Development

1.2 Technical Keywords

Android

AR - Augmented reality

ARCore

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ARSession component

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GameObject

Handheld Displays

Headsets

HiddenARCore

PNG

Qualcomm

SDK

SQLite

Unity

Vuforia

XRReferenceImageLibrary

Chapter 2

Introduction

Japanese is a language that has started becoming popular since the past few years. Since Japan is in need of engineers and young population more and more people are attracted to migrating to the land of the rising sun and look for better opportunities. In this case the barrier of the language remains. Considering that Japanese is one of the languages that is in the list of difficult languages with its combination of three scripts of Kanji (Chinese characters), Hiragana (local script), and Katakana (script for foreign words).

The hardest part of learning Japanese is its Kanji and their numerous readings. Thus this idea of designing this app came into being when I had started learning Japanese too. With the objective to simplify the kanji learning for beginners and making the learning process creative and fun.

Kanji is basically pictographs. The idea behind them is also representation of objects, words, emotions, in a pictographic manner. But the number of kanji is innumerous and thus making it a tedious job for the beginners to learn them.

Although the physical world is three dimensional, the usage of two dimensional media is being preferred in education. An approach with augmented reality could help the education process since we humans understand audio visuals better. The same pictographs if they could be represented in a three dimensional manner it could help the brain visualize the meanings behind the characters. Thus encouraging the process of learning this language.

Augmented reality technology is not a new issue. Since it has been used previously in fields such as military, medicine, engineering design, robotic manufacturing etc. Displaying information that the user can't detect directly through his senses enables the person to interact with the real world in ways that were earlier unimaginable.

Moreover Augmented Reality enhances collaborative tasks. A survey showed that students would gather around a single PC even when they were provided their individual PC's, in order to discuss the current topic. Thus with a floating model of their text book definition would certainly enhance the discussions.

Augmented reality has been earlier used in translation but only for the purpose of overlaying the test with the translated text. Thus providing translations for momentary usage and not entirely for learning the languages. Augmented Reality (AR) is one technology that dramatically shifts the location and timing of education and training. This literature review research describes Augmented Reality (AR), how it can be applied in learning characters, and the potential impact on the future of language studies.

2.1 Domain Description

Augmented Reality
Augmented reality is a method or technology for inserting virtual objects into the real world through devices in a realistic way. Augmented reality adds some virtual content to the real world and offers a real-time interaction to users, unlike Virtual reality, where the user is immersed in a fully different or digital world. Virtual objects provide relevant and contextualized information providing a new meaning to the user of the AR system. The main objective of an augmented reality system is to know the pose of the camera by recording the scene in relation to a known object in the scene. The goal of the pose The estimation is to find the translation and rotation between a known object in the real world and the camera. It is assumed that the intrinsic parameters (focal length and main point) of the camera are known , that is, the camera is calibrated, this problem is solved by giving a list of correspondences between the known 3D points of the object and their 2D projections on the camera screen .
The Depth API present in an AR supporting device helps that device's camera to understand the size and shape of the real objects in a scene. It creates depth images, or depth maps, thereby adding a layer of realism into your apps. You can use the information provided by a depth image to enable immersive and realistic user experiences. This API contains a depth sensors that locate feature points tracking specific features in the real world. The API further calculates the device's position and orientation too. Enabling occlusion, or accurately rendering a virtual object behind real-world objects, is paramount to an immersive AR experience.
The Depth API uses a depth-from-motion algorithm to create depth images, which give a 3D view of the world. Each pixel in a depth image is associated with a measurement of how far the scene is from the camera. This algorithm takes multiple device images from different angles and compares them to estimate the distance to every pixel as a user moves their phone. It selectively

uses machine learning to increase depth processing, even with minimal motion from a user. It also takes advantage of any additional hardware a user's device might have. If the device has a dedicated depth sensor, such as ToF, the algorithm automatically merges data from all available sources. This enhances the existing depth image and enables depth even when the camera is not moving. It also provides better depth on surfaces with few or no features, such as white walls, or in dynamic scenes with moving people or objects.

Such evolution of Augmented Reality technology development created the most available and best fit AR mobile app development for various purposes. Let us have a look at the types of Augmented reality.

1. Marker-Based Augmented Reality

Here the The other name for Marker-Based AR is also called Image Recognition or Recognition based AR. This type of AR provides us more information about the object after it focuses on the recognition of objects. Marker-based AR technology has diverse uses according to market purposes. It detects the object in front of the camera and provides information about the object on the screen. The recognition of the object is based on the marker where it replaces the marker on the screen with a 3D version of the corresponding object. Therefore, the user can view the object in more detail and from various angles. Apart from that while rotating the marker user can also rotate the 3D imagery as well. This acts as a reference for the AR app running on the system.

2. Marker-less Augmented Reality

Here instead of markers or images surfaces a re detected through the depth API. For example, location based AR like the Game Pokemon-Go. It provides the location of the device with respect to the surfaces. The device's GPS tracking system, accelerometer and the digital compass comes into action here.

3. Projection based Augmented Reality

One of the simplest type of simplest type of AR which is the projection of light on a surface. It requires a mini-projector that throws augmented data on a small prism. This technology offers a whole lot more in every sense. This piece of tech is used for creating a virtual object for much larger deployments for experiencing Augmented Reality.Google Glass is the best example of Projection based Augmented Reality.

4. Superimposition Based Augmented Reality

As the word itself explains the superimposition of the objects. This AR provides a replacement view of the object in focus. The AR here provides for object tracking and therefore giving an augmented view superimposed over the original view of the object.

AR is creating its own space in the industry in several different ways and is used for many different purposes. The growing market of augmented reality app development services is helping the business, education, science and many other fields to explore innovative ways to harness the potential of this technology. That is why new innovations and implementations are happening rapidly in this space. Brands and enterprises and newer applications are evolving creative ways to leverage AR. Therefore, there are many successful AR apps running in the business. The market is leveraging this modern technology to understand its potential while exploring and evolving the fundamentals of augmented reality technology.

2.2 Problem Definition

Starting to learn any new language, every person finds himself a tad bit dyslexic. The new words that we cannot imagine the meaning of dance infront of our eyes and make scholars go feral. The hardest part comes when a language has three scripts and one of which has logograms. Definitely uncountable in number but 2000 of which are a part of language in daily use. The language in concern being Japanese and the characters being talked about being Kanji.

The Kanji characters being logograms as well as ideograms that depict something or give an idea about something are certainly numerous. Learning which from a young age makes it a tad bit simpler. But when it comes to a foreigner learning the same language it is a lot more confusing. Especially because of the lack of visualization of the meaning of a particular character or deciphering the symbolism or idea behind it.

Thus, in order to enhance this visualization there is no better platform than AR. The need for Augmentation arose to cater to this aspect of visualization that was lacking in students.Aiming to create a marker based AR application that would generate a 3D(three dimensional) model of the meaning, idea or the symbol of what the kanji character depicts, this seminar presentation gives an idea of the above. Using Unity's AR-Foundation packages and XR Plugin's and Blender's modelling pipeline to make the 3D camera translator for Kanji is the motive of this seminar.

2.3 Motivation

The hardest part of learning Japanese is its Kanji and their numerous readings. Thus this idea of designing this app came into being when I had started learning Japanese too. With the objective to simplify the kanji learning for beginners and making the learning process creative and fun. This is something that I realized the need to do when I first started learning this language.

People are most familiar with 2D graphics in traditional cartoons. 2D graphics are widely used in animation and video games, providing a realistic, but flat, view of movement on the screen. Whereas, 3D graphics provide realistic depth that allows the viewer to see into spaces, notice the movement of light and shadows, and gain a fuller understanding of what's being shown. 3D motion graphics work with the brain's natural tendency to explore what we see and enrich our understanding of the world. While both 2D and 3D graphics can connect with people on some level, richly-detailed 3D graphics are more effective at communicating complex information and inspiring genuine feelings. They illuminate abstract ideas, providing a much richer experience that feels real.

From a Neuroscience standpoint, the human brain (specifically the Middle Temporal area of the cortex) has evolved to become finely attuned to both stereo and motion cues, which indicates why people might find 3D representations of complex, multi-step tasks and actions easier to understand than 2D representations.

Since learning is best done with audiovisuals the "3D Kanji Translator" app was thought of. AR has been catering to the text translations of many languages overlaying the translated text and so on. But the usage for language studies has not yet been completely discovered. To uplift the usage of AR in this field too was the motive behind this seminar.

Chapter 3

Literature Survey

3.1 Existing Methods/Tools/Techniques

Earlier systems for semi-automatic and automatic vision-based translation have previously been proposed of them are based on a client-server architecture to offload expensive operations (detection, extraction and translation) and hence cannot operate without network connection or provide immediate feedback. [6] The translation is provided either in the form of speech synthesis or a simple text display on the screen.

Widhi Muttaqien from Blastocode Studio developed an augmented reality product in the year 2016. This AR application helps children memorize Arabic letters, numbers and words using Augmented Reality. The methodology used in this application was Blender + Unity pipelining and use of Vuforia Development Portal for AR generation. The Vuforia development portal requires purchasing a license key for publication now in order to access its services. Making an Augmented Reality app becomes easier with the use of Vuforia Portal but at the same time its use is limited to Marker based AR development.

NTT Cyber Space Laboratories had presented a portable translator that recognizes and translates phrases on signboards and menus as captured by a built-in camera. This system can be used on PDAs or mobile phones and resolves the difficulty of inputting some character sets such as Japanese and Chinese if the user doesn't know their readings. [5]Through the high speed mobile network, small images of signboards can be quickly sent to the recognition and translation server. Since the server runs state of the art recognition and translation technology and huge dictionaries, the proposed system offers more accurate character recognition and machine translation.

3.2 Literature Survey

The future of AR as a visualization technology looks bright, as shown by the interest generated in business and industrial circles as well as discussed in popular periodicals and research papers in the education and training fields. [3] Many questions still linger in terms of efficiency and when compared to traditional methods, particularly given the investments needed in research and design. However, there is much optimism of AR in education and training for the future. New technologies and information communications are not only powerful and compact enough to deliver AR experiences via personal computers and mobile devices but also well developed and sophisticated to combine real world with augmented information in interactively seamless ways.

Augmented Reality in Education :
Current Technologies have the potential for education give an introduction to the AR technology and its future prospects in education. And discuss key technologies and methods within the context of education. [**?**] Thus reflecting on how Augmented Reality offering unique Affordances in combining the physical and virtual worlds. Furthermore, explaining the applications of AR through Handheld Displays and Headsets.

"Although the physical world is three dimensional, we mostly prefer two-dimensional media in education." Rather have been preferred till date. Changing this concept of learning is a major task. Augmented Reality has the power to change the concept of how computers are used. "In order to achieve realistic solutions we need to use realistic solutions." We would need educators to work with the researchers to bring about such changes in education.

Augmented reality has many advantages in the field of education. AR interfaces allow users to see the real world at the same time as virtual imagery attached to real locations and objects. Although AR technology is not new, it's potential in education is just beginning to be explored. Single user Augmented Reality interfaces have been developed for computer-aided instruction manufacturing and medical visualization. Although the cost and expenses lower the prospects of implementation in general institutions. [1] Augmented Reality technology is not new, it's potential in education is just beginning to be explored. Unlike other computing technologies, AR interfaces offer seamless interaction between the real and virtual worlds, a tangible interface metaphor and a means for transitioning between real and virtual worlds.

Application Development with Augmented Reality Technique using Unity 3D and Vuforia:
The study Unity 3D modeling to create a three-dimensional model of the scene and to detect and track the totem functions of the Vuforia engine was done. So that it can set animation and play a video. This paper researches the application of Unity 3D -the integrated game development tool of multiple platform. It employs the mobile device augmentation of the real application software development kit developed by Qualcomm. The game that has been developed cannot be published since the publishing requires a paid Vuforia license. This paper emphasizes the Unity 3D technology and Qualcomm QCAR development tool, Vuforia and then introduces the basic concepts and framework. Based on this, the three-dimensional model of scene is simulated by the means of Unity 3D. [4]

Virtual Universal Translator for Android:
Provision of a Virtual Universal Translator (VUT) is provided for a mobile device so that a user of such mobile device can use the camera and display of the mobile device to translate text from one language to another language. The mobile application database is connected to the Image recognition server which with the help of a database identifies the database and connects to the translation server to generate the translation. [7]It is a big hassle for the user to register for the platform and thereafter connecting to the server. The ease of a mobile phone translator provided to the user has come handy to a lot of use with students and travelers. Thus making it a feasible translating device.

Framework based on Mobile Augmented Reality for Translating Menu Cards:
To design a framework based on mobile AR and OCR was developed for translating Thai language to Malay language. This translation could play important role in assisting Malaysian tourists to explore Thailand with ease. Scanning is done firstly using mobile camera. The tracking component processes the captured images with two main steps. Firstly, the captured image is decoded using an OCR engine which is Tesseract. By using local database, SQLite. The identified Thai texts are matched with Thai word contained in the database and translated into Malay words. There is also a list of food menu that cannot be translated accurately using ARThaiMalay translator. [2]A framework based on mobile AR and OCR was developed for translating Thai language to Malay language. This translation could play important role in assisting. With which Malaysian tourists could explore Thailand with ease.

Carny: Learn Arabic letters and numbers with Flashcards and AR:
This was an application developed in 2016 to help children memorize Arabic letters, numbers and words using Augmented Reality. The methodology used in this application was Blender + Unity pipelining and use of Vuforia Development Portal for AR generation. The Vuforia development portal requires purchasing a license key for publication now in order to access its services.Making an Augmented Reality app becomes easier with the use of Vuforia Portal but at the same time its use is limited to Marker based AR.development.

AR Foundation for Augmented Reality in Unity:
Introducing Unity's AR Foundation. Its functionality differs depending on the use of the user to detect, track and place one or more than one object, point or features in a scene. In this paper, we will discover AR Foundation and one of its SDK, ARCore, an open library that not only displays, but also detects a virtual content in the real world. AR foundation does not implement any AR features on its own, instead, defines a multiplatform API that allows you to work with functionality common to multiple platforms. AR Foundation parts/features which are relevant on ARCore and ARKit. Since AR foundation does not implement any AR features on its own the programmer has to use the API's libraries to code what kind of AR is to be used. It is very fair that AR can be deployed for many eventual conveniences.with Unity's platform that is free of cost.

When building the Player for Android, each reference image library is used to generate a corresponding imgdb file, which is how ARCore represents reference image libraries. These files are placed in your project's Streaming Assets folder, in a sub-directory called HiddenARCore, so they can be accessed at runtime.

ARCore's AR reference images can be either JPEG or PNG files. If a different type of source texture is specified in the XRReferenceImageLibrary, the ARCore build processor will attempt to convert the texture to a PNG for ARCore to use. Exporting a Texture2D to PNG can fail for several reasons. For example - the texture must be marked both readable and uncompressed in the texture importer settings. If you plan to use the texture at runtime (and not just as a source Asset for the reference image), you should create a separate PNG or JPEG as the source Asset, because those texture import settings can negatively affect performance or memory at runtime.

An AR scene should include an ARSession component. The AR Session controls the lifecycle of an AR experience by enabling or disabling AR on the target platform. The ARSession can be on any GameObject.When you disable the ARSession, the system no longer tracks features in its environment, but if you enable it at a later time, the system will attempt to recover and maintain previously-detected features. If you enable the Attempt Update option, the device tries to install AR software if possible. Support for this feature is platform-dependent. The image tracking subsystem is an interface which is implemented in other packages. Each implementation is called a "provider". For example, you might have a different provider package for each AR platform.

Chapter 4

Proposed System Architecture

4.1 System Architecture

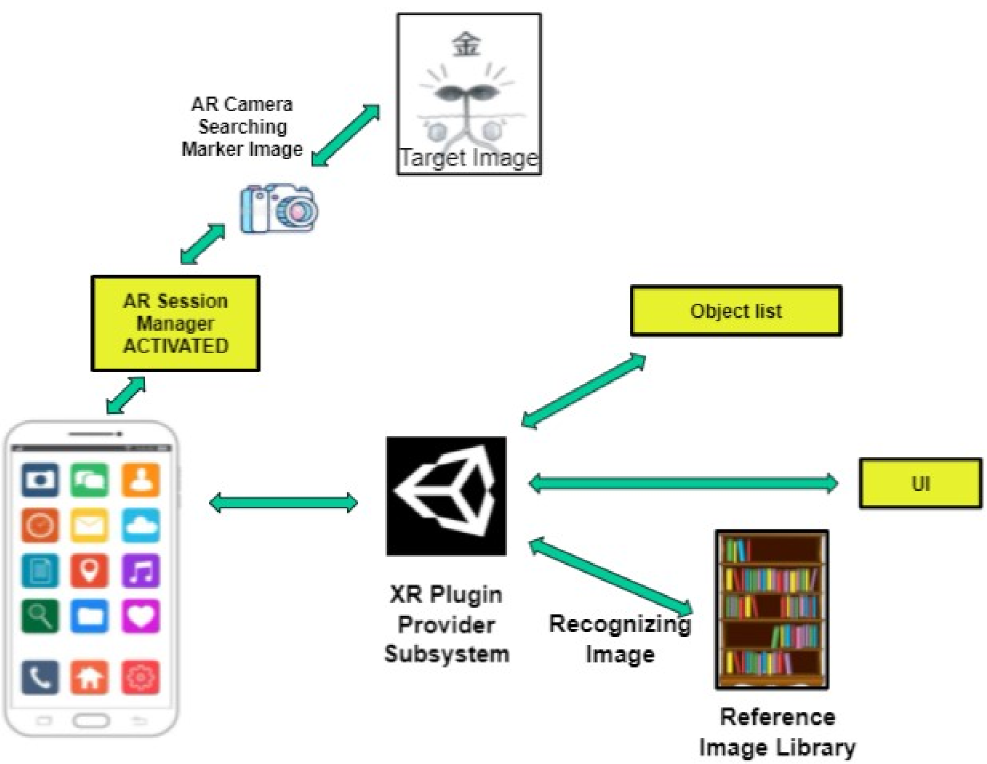

Figure 4.1: System Architecture

AR Session Manager:

A "session" refers to an instance of AR. While the other AR subsystems provide specific pieces of functionality, like plane detection, the session controls the life cycle of all AR-related subsystems. If you Stop (or fail to Create) an XRSessionSubsystem, the other AR subsystems might not work.Start starts the session. Stop pauses it. When the application is opened this session manager is activated which in turn starts the functioning of the AR scene after triggering the AR Camera.

AR Camera:
The camera subsystem manages a hardware camera on the AR device. It provides the following data:
Camera image as an "external" texture on the GPU as well as a buffer of bytes available on the CPU.
It provides a Projection matrix, used to set the field of view and other properties of the virtual camera according to the physical one.
Display matrix, used to orient the camera image correctly.
Camera intrinsics that describe a mathematical model of the camera, useful for computer vision algorithms.
Camera conversion utilities for converting the CPU image to RGB and grayscale.
Light estimation information (color and brightness of the environment).
And lastly Camera focus mode (autofocus or fixed)
All this data is provided to the InputTracking Subsystem which then further processess the data and works on the calculates and centers the tracking features on all InputDevices to the current position and orientation of the head-mounted device.

XR Plugin Provider System:
The image tracking subsystem is an interface which is implemented in other packages. Each implementation is called a "provider". For example, you might have a different provider package for each AR platform.

Reference image library:
A set of reference images. When you start an image tracking subsystem, you must first provide it with a library of reference images so it knows what to search for.A reference image is an image that the XRImageTrackingSubsystem attempts to find in the real world. The subsystem associates detected images with the reference image used to detect them. Each detected image has a pose in the world.
ARCore's AR reference images can be either JPEG or PNG files. If a different type of source

texture is specified in the XRReferenceImageLibrary, the ARCore build processor will attempt to convert the texture to a PNG for ARCore to use. Exporting a Texture2D to PNG can fail for several reasons. For example - the texture must be marked both readable and uncompressed in the texture importer settings. If you plan to use the texture at runtime (and not just as a source Asset for the reference image), you should create a separate PNG or JPEG as the source Asset, because those texture import settings can negatively affect performance or memory at runtime. When building the Player for Android, each reference image library is used to generate a corresponding imgdb file, which is how ARCore represents reference image libraries. These files are placed in your project's StreamingAssets folder, in a subdirectory called HiddenARCore, so they can be accessed at runtime.
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Object List:
In this application we have included objects such that they contain the same name as their respective marker images. Which when tracked the particular object animation is displayed.

4.2 Design with UML Diagrams

The diagram shows the expected behaviour out of the application and the user interaction with the system. The simplest application where when the marker image is tracked. the XR Plugin Provider will extract the details and then after recognizing the image it will overlay the 3D Model.

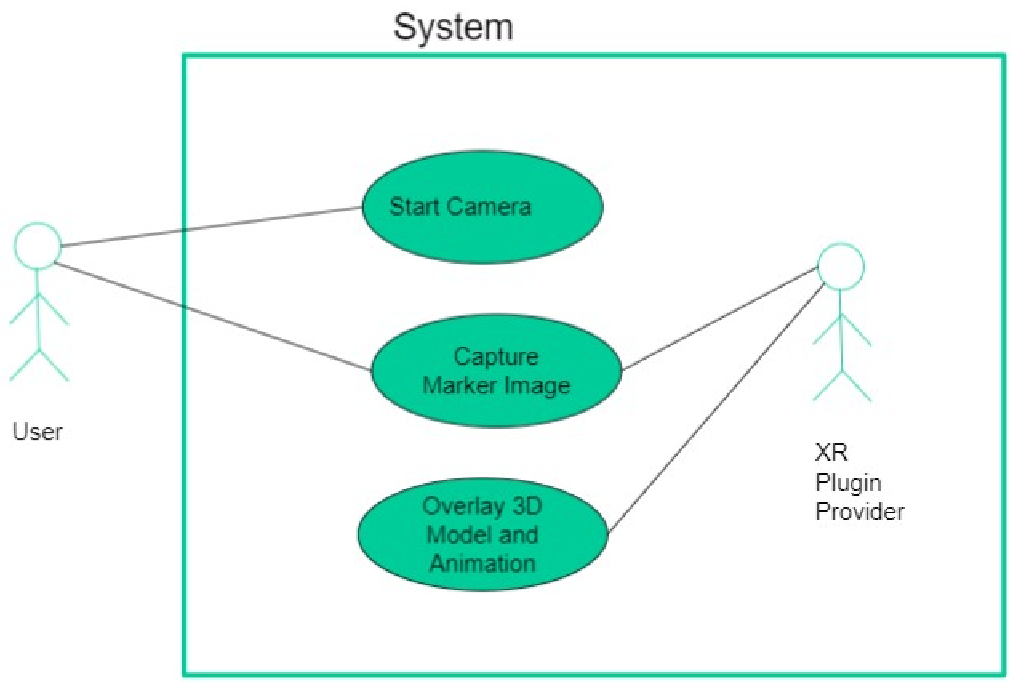

Figure 4.2: Use case Diagram

4.3 Algorithms

The workflow of creating the application is as follows:
1.Create the models using Blender

2.Import the models to Unity as object files

3.Convert them to prefabs and animate them.

4.Create a Reference Image library for Image recognition

5.Enable Multiple Image recognition through C sharp code

6.Add the prefabs to the scene keeping their respective names of the images and the prefabs same.

7.Test the output

Firstly we need to create the models using blender. Adding all the important features and animations. Thereafter importing the models to unity in the form of object files .obj. Next converting the collected objects to prefabricated objects and saving them. Lastly creating a reference image library for the ARCore to access them at runtime for recognition. Then write the source code to enable multiple image recognition. Lastly adding the prefabs to the scene keeping the names of the target image and respective object the same.

4.4 Implementation/Proof of Concept

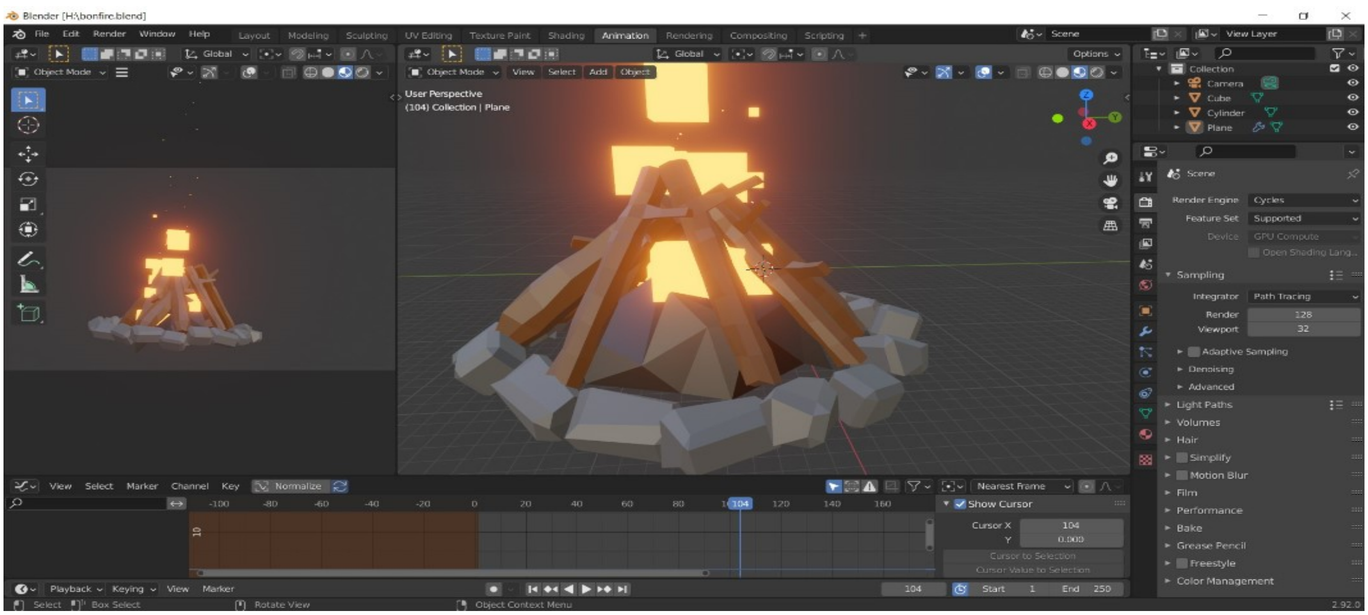

Figure 4.3: Modeling fire in Blender

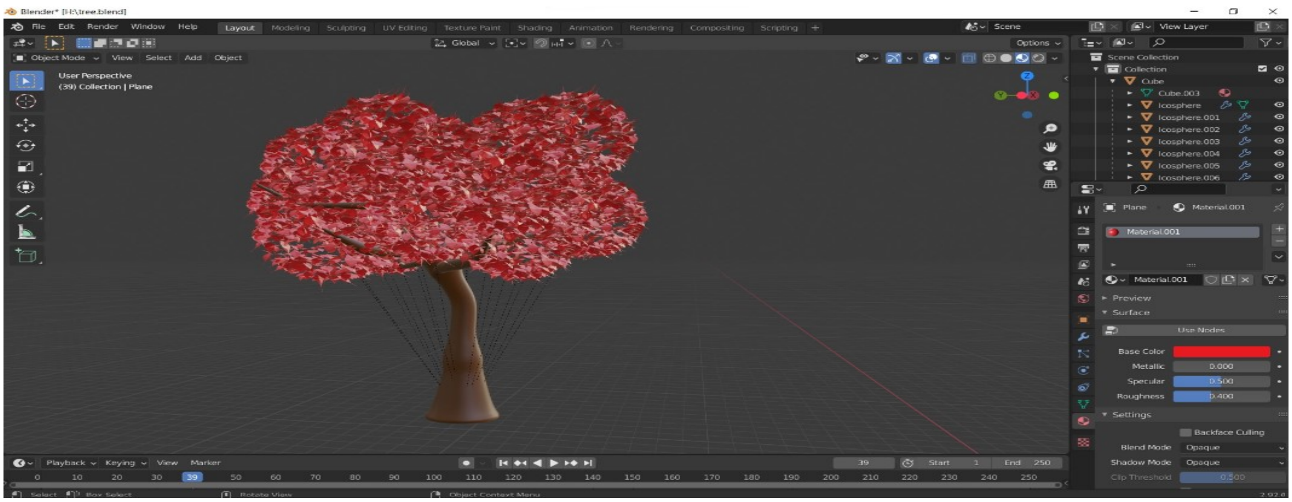

Figure 4.4: Modeling tree in Blender

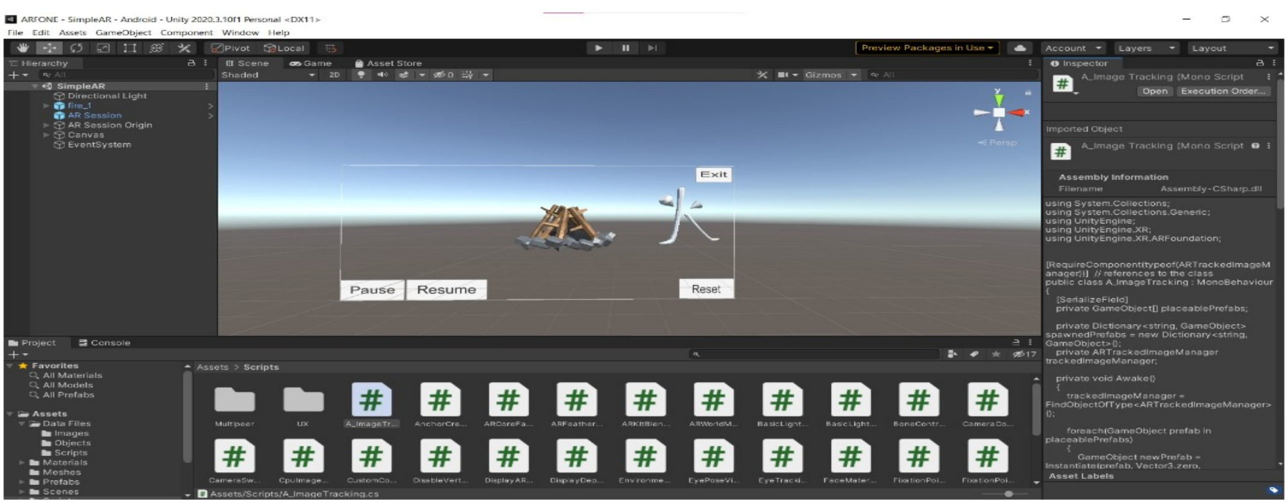

Figure 4.5: Final Scene View in Unity

4.5 Important Source Code

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.XR;
using UnityEngine.XR.ARFoundation;


[RequireComponent(typeof(ARTrackedImageManager))]  // references to the class
public class A_ImageTracking : MonoBehaviour
{
    [SerializeField]
    private GameObject[] placeablePrefabs;

    private Dictionary<string, GameObject> spawnedPrefabs = new Dictionary<string, GameObject>();
    private ARTrackedImageManager trackedImageManager;

    private void Awake()
    {
        trackedImageManager = FindObjectOfType<ARTrackedImageManager>();

        foreach(GameObject prefab in placeablePrefabs)
        {
            GameObject newPrefab = Instantiate(prefab, Vector3.zero, Quaternion.identity);
            newPrefab.name = prefab.name;
            spawnedPrefabs.Add(prefab.name, newPrefab);

        }
    }

    private void OnEnable()
    {
        trackedImageManager.trackedImagesChanged += ImageChanged;
    }

    private void OnDisable()
    {
        trackedImageManager.trackedImagesChanged -= ImageChanged;
    }

```

Figure 4.6: Source code

```
    private void ImageChanged(ARTrackedImagesChangedEventArgs eventArgs)
    {
        foreach(ARTrackedImage trackedImage in eventArgs.added)
        {
            UpdateImage(trackedImage);
        }

        foreach (ARTrackedImage trackedImage in eventArgs.updated)
        {
            UpdateImage(trackedImage);
        }

        foreach (ARTrackedImage trackedImage in eventArgs.removed)
        {
            spawnedPrefabs[trackedImage.name].SetActive(false);
        }
    }

    private void UpdateImage(ARTrackedImage trackedImage)
    {
        string name = trackedImage.referenceImage.name;
        Vector3 position = trackedImage.transform.position;

        GameObject prefab = spawnedPrefabs[name];
        prefab.transform.position = position;
        prefab.SetActive(true);

        foreach(GameObject go in spawnedPrefabs.Values)
        {
            if(go.name != name)
            {
                go.SetActive(false);
            }
        }
    }

}
```

Figure 4.7: Source code

4.6 Result screenshot and Analysis

Figure 4.8: Implementation Model 1

Figure 4.9: Implementation Model 2

AR Foundation allows you to work with augmented reality platforms in a multi-platform way within Unity. This package presents an interface for Unity developers to use, but doesn't implement any AR features itself. To use AR Foundation on a target device, you also need separate packages for the target platforms officially supported by Unity:AR Foundation is a set of MonoBehaviours and APIs for dealing with devices that support that support it.

As compared to the use of Vuforia Development portal this method is a lot more feasible since it takes less implementation time.

Chapter 5

Advantages / Disadvantages

Advantages:

The major advantage of this application is that it is portable and user friendly. For the user it makes learning fun and easy with its visuals and animations.
For this application the process of making the application is rather simple and everything from designing models and augmenting can be done free of cost since all the softwares used are free of cost. As compared to Vuforia Development portal which requires purchasing a license.

The most noticeable advantage is with the use of AR Foundation. AR Foundation lets you take currently unavailable features with you when you switch between AR platforms. If a feature is enabled on one platform but not another, we put hooks in so that it's ready to go later. When the feature is enabled on the new platform, you can easily integrate it by updating your packages rather than having to completely rebuild your app from scratch.

Moreover having the ARCore having the ARCore platform for building augmented reality apps for Android devices is an advantage. ARCore uses three key technologies to integrate virtual content with the world through the camera. It uses motion tracking, environmental understanding, and light estimation. ARCore works by tracking the position of the device as it moves and builds its own understanding of the real world. It is able to identify interesting points and readings from the phone's sensors and has the ability to determine both the position and the orientation of the phone as it moves.

Disadvantages:

Talking about the disadvantages of the application, it might become a hassle to carry around the photocards that are used for image tracking and recognition.
Since ARCore is supported only on a few latest models namely:
Google Pixel,Pixel XL, Pixel 2, Pixel 2 XL, and Samsung Galaxy S8 it can be accessible only to a limited users.

Chapter 6

Conclusion and future work

We live in a three-dimensional world, a complex visual and spatial environment that we must navigate to discover places and objects of interest. Even brief glimpses of visual scenes are sufficient for us to determine properties such as the category (e.g., kitchen) and layout (e.g., fridge to the right, door to the left) of the local environment. To reveal how visual information is processed in the human brain to allow such understanding, much attention has focused on three regions identified using functional magnetic resonance imaging (fMRI) that respond more strongly when viewing scenes than when viewing objects or faces. This is why the brain understands better with realism than two dimensional models. Catering to that realism is what augmented reality has done and enhanced the teaching and learning process in many fields.

Here the seminar supports audio visual learning by introducing an Augmented Reality application in the study of Japanese Language. By attaining that realism thus making the learning and visualization process easier for the student.

In addition to the model generation for Kanji, features such as voice overs and word recognition could be added to the application to make it a language learning application entirely and thereafter extending this idea to other languages could be a future prospect for this application

Chapter 7

Appendix

7.1 Log Report

Academic Year 2020-21 Sem-I

The Progress Report Format of the Seminar

Roll No. :-TC131

Name of the Student:-Manasi Khillare

Name of the Guide :- Sankirti S. Shiravale

Product Based Seminar Title :- Camera Translator for Kanji

Sr. No.	Date	Time	Name of the topic discussed	Meeting Recording Link	Remark
1	20/10/20	1:00	Synopsis and other format discussion	https://drive.google.com/file/d/1fFxigdsS0YVMCTSiFRskv5LlkUAcCYa9/view?usp=sharing	Title of the seminar is decided
2	04/02/21	12:15	Synopsis Review -I		Changes in formats
3	15/06/21	12:00	Final Presentation		Seminar completion

Figure 7.1: Log Report

Bibliography

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[4] Xinqi Liu11, Young-Ho Sohn, and Dong-Won Park. Application development with augmented reality technique using unity 3d and vuforia. *International Journal of Applied Engineering Research*, 13(21):15068–15071, 2018.

[5] Hideharu Nakajima, Yoshihiro Matsuo, Masaaki Nagata, and Kuniko Saito. Portable translator capable of recognizing characters on signboard and menu captured by its built-in camera. In *Proceedings of the ACL Interactive Poster and Demonstration Sessions*, pages 61–64, 2005.

[6] Muhammad Pu, NAA Majid, and Bahari Idrus. Framework based on mobile augmented reality for translating food menu in thai language to malay language. *Int J Adv Sci Eng Inf Technol*, 7:153–159, 2017.

[7] Hannah Reuterdahl. Mobile marker-based augmented reality as an intuitive instruction manual, 2014.