VIRTUAL VISIT USING VR

REPORT

Submitted by

SHUJAT HUSSAIN (19IT091)

SREERAM B (19IT100)

SRI RAM PRASAD S (19IT103)

GUHAN S M (19IT032)

in partial fulfillment for the completion of course Engineering Design Project

of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI–15

(A Govt. Aided, Autonomous Institution, Affiliated to Anna University)

JUNE 2022

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-15

(A Govt. Aided, Autonomous Institution, Affiliated to Anna University)

BONAFIDE CERTIFICATE

Certified that this project report "**VIRTUAL VISIT USING VR"** is the bonafide work of "**SHUJAT HUSSAIN (19IT091), SREERAM B (19IT100), SRI RAM PRASAD S (19IT103), GUHAN S M (19IT032)"** who carried out the project work under my supervision during the Academic Year 2021 -2022.

SIGNATURE

Mrs.R.Parkavi,

ASSISTANT PROFESSOR,

INFORMATION TECHNOLOGY

THIAGARAJAR COLLEGE OF ENGINEERING,

MADURAI-15

TABLE OF CONTENTS

1. Abstract:

As humans, we are always eager to visit different places around the world that we heard or imagined. But, it is not possible for many people because of time and money constraints. We can find many normal, panoramic and 360 images and also videos of those places on the internet. But we're not fully satisfied with those things on the internet. Also, the main problem is that we can find many images and videos only for famous places around the world.

Just imagine how it will be when we're able to experience our entire college campus or work place or famous tourist spots virtually by just using a low cost device and a mobile application and also teleporting from one place to another for exploring the whole place.

Our main motive is to create a low cost model which enhances all the features and also that all peoples can experience. A mobile phone with the mobile application that we developed and a google cardboard lens or samsung gears are enough to experience the whole real world virtually. Although Augmented reality and Virtual reality is booming nowadays, It still remains unreachable to all the peoples because of its complexity and cost of tools. So, we have found a solution with a low cost device in which all people can experience Virtual Reality at an affordable price.

Also, nowadays the usage of google cardboard has been reduced and even stopped because of lack of experience with videos or applications. Some videos are available on youtube nowadays which helps the people to understand the usage of cardboard devices. Also, the successful implementation of our project will enhance the usage of cardboard devices again. This also can be developed as a new business in future. In a pandemic situation, all of us experienced a work from home situation. Many employers and students are unable to visit their workplace or college or a school campus. This project will help all of them to experience their own workplace or college or school.

2. PROBLEM DESCRIPTION:

All peoples are always eager to explore new places around the world. But, we can't afford to explore all the places we wish to visit due to financial or time constraints or any other issues. Before joining our dream institution or company, how it will be to explore the whole place virtually without accessing that place.

Humans evolved technology and the time and cost of traveling is considerable but that is not true for everyone. Exploring new places not only refreshes us, but also teaches us a lot of ideas, cultures and lessons. So what are the other main things people should consider replacing the cost and time of traveling to explore them.

There are lots and lots of images, videos and 360 panoramic images in google. But, those images and videos won't satisfy us. Also, in other Virtual reality fields, the cost of the tools are more high like HTC vive and Oculus Quest.

3. Background:

a)Literature Survey:

S. No	Title of the paper	Authors	Methodology	Observations
1.	Toward Hyper-Realistic and Interactive Social VR Experiences in Live TV Scenarios	Sergi Fernández Langa et al.	This article explores the applicability and potential of Social VR in the broadcast sector, focusing on a live TV show use case, by providing three main contributions: 1) a novel and lightweight social VR platform; 2) a professional piece of VR content to recreate an interactive live TV show; and 3) an analysis of the performance and user experience.	It allows a real-time integration of remote users in shared virtual environments, using realistic volumetric representations and affordable capturing systems, thus not relying on the use of synthetic avatars It enables low-latency interaction between volumetric users and a video-based presenter (Chroma keying) and a dynamic control of the media playout to adapt to the session's evolution.
2.	Text2 Gestures: A Transformer-Based Network for Generating	Uttaran Bhattacharya Nicholas	This paper is based on the transformer-based learning methods to generate interactive full body gestures for virtual	From this paper we have observed that their network can generate gestures at interactive rates on a commodity GPU. they

	Emotive Body Gestures for Virtual Agents	Rewkowski Abhishek Banerjee Pooja Guhan Aniket Bera Dinesh Manocha	agents which is aligned with natural language processing for text inputs Here in this paper they trained and evaluated the network on the MPI Emotional Body Expressions Database and observed that this network would produce state of the art performance in generating gestures for virtual agents aligned with the text for narration or conversation.	also conducted a web-based user study and observed that around 91% of participants had indicated that our generated gestures would be at least possible .and they also observed that the emotions perceived by the participants from the gestures are also strongly positively correlated with the corresponding intended emotions, with a minimum Pearson coefficient of 0.77 in the valence dimension.
3.	The Influence of Avatar Representation on Interpersonal Communication in Virtual Social Environments	Sahar Aseeri Victoria Interrante	This paper shows that Current avatar representations were used in immersive VR applications, it may lack some features like natural behaviors and effective communications among one another. But This updated method has come up with the three methods namely a)No_Avatar (HMD and controllers only), b)Scanned_Avatar (wearing an HMD), c)Heal_Avatar (video-see-through).	We observed that Users reported higher levels of trustworthiness in the Real_Avatar condition In Heal_Avatar and Scanned_Avatar conditions, users reported that higher levels of co-presence is here In the Scanned_Avatar condition, we observed that the users have higher levels of attention to body posture Overall exit survey 66.67% gave preference for

			In this method they have designed for two physically co-located users in a shared virtual environment Space they have allocated is 2-3m x 4-5m curved section of their 30'x29’ lab space, with floor 10’ high walls covered by large sheets of green-screen fabric Used two laptops to immerse both of the users in a virtual environment Rendered in unity game engine In No avatar conditions they two saw tracked positions and orientations of each user's head and hands in real time. In Scanned avatar conditions they represented full body virtual avatar In Real avatar conditions they saw video images of everything in green screen fabric, including their own body.	Real_Avatar, 25.00% for the Scanned_Avatar, and 8.33% for the No_Avatar It also improves major things like interpersonal communications,trust,satisfaction, and the number of unique words spoken.

4.	Egocentric Distance Judgments in Full-Cue Video-See-Through VR Conditions are No Better than Distance Judgments to Targets in a Void	Koorosh Vaziri Maria Bondy Amanda Bui Victoria Interrante	In this paper they are using a custom built in video through HMD device based on that participants will be judged with their distances in a real world environment. they done this under three different conditions namely a)raw camera view, b)Sobel-filtered camera view, c)complete background subtraction.	Based on this paper we observed that there is any significant difference in the three VST conditions walked by the users, but there is also some significant differences in the ratings of visual and experiential realism,it suggests that reliance on angular declination to the target, independent of context.
5.	Virtual Tourism Using Samsung Gear VR Headset	Mahnoor Qadri M.Shah Hussain Shafaq Jawed Syed Atir Iftikhar	In this paper they are focussing on virtual tourism which could be beneficial for travelers. It can bring the feeling of real experience as if we are in that place physically but actually they are using that with VR headset.	Users can gain the virtual tourism without having to actually visit that place, through the VR headset the developers made the real experience of the places but there is also some limitation we can't wear the VR headset continuously as it might cause the users to have mild eye irritation .
6.	Development of a use case for virtual reality to visit a historical monument	Ilyas Maach Ahmed Azough Moham	This paper deals with the production of virtual tourism of imperial cities, many of which are still not reachable to large majority of touristers, so they made	It uses devices like oculus rift,gear devices etc..this paper can give the users with the real experience when they are experiencing with the VR kit.

		med Meknassi	the virtual tour of the historical monuments of the city FEZ, in this paper they took 360 degree images of the city which is then later rendered in VR.	
7.	VRSA Net: VR Sickness Assessment Considering Exceptional Motion for 360° VR Video	Hak Gu Ki et al.	This paper proposes a novel objective VR sickness assessment (VRSA) network based on a deep generative model for automatically predicting the VR sickness score. The proposed VRSA network consists of two parts, which are VR video generator and VR sickness score predictor. By training the VR video generator with common videos with non-exceptional motion, the generator learns the tolerance of VR sickness in human motion perception. As a result, the difference between the original and the generated videos by the VR video generator could represent exceptional motion of VR video causing VR sickness. In the VR sickness score predictor, the VR	Experimental results demonstrated that the proposed VRSA network achieved a high correlation with human perceptual score for VR sickness.

			sickness score is predicted by projecting the difference between the original and the generated videos onto the subjective score space.	
8.	A Comparison of Procedural Safety Training in Three Conditions: Virtual Reality Headset, Smartphone, and Printed Materials	Fabio Buttussi et al.	This article conducts a comparison of procedural training with (immersive) VR headsets and (non immersive) smartphones in the aviation safety domain. Recently, consumer VR headsets make it possible to deliver immersive VR training with six-degrees-of-freedom tracking of trainees' heads as well as hand controllers, while most smartphones can deliver non immersive VR training without the need for additional hardware.	Results show that both VR setups allowed gaining and retaining more procedural knowledge than printed materials, and led to higher confidence in performing procedures. However, only the VR headset was considered to be significantly more usable than the printed materials, and presence was higher with the VR headset than the smartphone. The VR headset turned out to be important also for engagement and satisfaction, which were higher with the VR headset than both the printed materials and the smartphone.
9.	An Efficient Algorithm for Generating Harmonized Stereoscopic 360° VR Images	Da-Yoon Nam et al.	This paper proposes an efficient algorithm to generate stereoscopic 360° VR images from pictures captured using affordable conventional cameras. To overcome	Experimental results show that the proposed algorithm provides better-harmonized images than other methods both qualitatively and quantitatively.

			the limited ability of conventional cameras to harmonize left and right VR images, we propose a model that represents the relation between left and right views using Euler angles.	
10.	Taming the Latency in Multi-User VR 360°: A QoE-Aware Deep Learning-Aided Multicast Framework	Cristina Perfecto et al.	This paper aims to improve VR experience in multi-user VR wireless video streaming, a deep-learning aided scheme for maximizing the quality of the delivered video chunks with low-latency is proposed.Therein the correlations in the predicted field of view (FoV) and locations of viewers watching 360° HD VR videos are capitalized on to realize a proactive FoV-centric millimeter wave (mmWave) physical-layer multicast transmission.	Extensive simulation results show how the content-reuse for clusters of users with highly overlapping FoVs brought in by multicasting reduces the VR frame delay by 12%. This reduction is further boosted by proactiveness that cuts by half the average delays of both reactive unicast and multicast baselines while preserving HD delivery rates above 98%. Finally, enforcing tight latency bounds shortens the delay-tail as evinced by 13% lower delays in the 99th percentile.
11.	VR Panorama Mosaic Algorithm Based on Particle Swarm Optimization and Mutual	Zhonggao Yang et al.	Based on the existing research, this paper presents a VR panoramic image mosaic algorithm based on particle swarm optimization.. The proposed algorithm has	After a large number of comparative experiments, it was found that the proposed method significantly improved the ability of feature region block extraction in VR

	Information		the advantages of small computation time, fast splicing speed, high splicing quality, and high splicing confidence. This algorithm is based on particle swarm optimization, combined with the advantages of traditional mutual information algorithms, according to the characteristics of virtual reality imaging, a new model is established.	panoramic image mosaic when compared with the traditional method. At the same time of improving the accuracy, the mapping time is shortened by more than 1 / 3, and the mapping efficiency is improved.
12.	TogetherVR: A Framework for Photorealistic Shared Media Experiences in 360-Degree VR	Martin J. Prins et al.	The researchers have presented TogetherVR, a web-based framework for the creation and evaluation of social and shared VR experiences in which users can communicate with a high degree of presence and in photorealistic video quality. They further elaborate on three multiuser VR cases: watching TV together in VR, social collaboration in VR, and social VR conferencing in a mixed reality setting.	This paper provided the solution to the biggest gap we see in VR experiences - the lack of social and shared aspects of VR usage. Inclusion of multiuser VR use cases can be used to eliminate the current VR applications' isolated endeavor.
13.	D2D-Assisted VR Video Pre-Caching	Hongcheng Huang et	The enormous amount of distributed VR videos and the high density of	Numerical results show that the paper's proposed pre-caching algorithm

	Strategy	al.	VR users may impose a heavy burden on base stations. On the other hand, the quality of experience (QoE) may seriously suffer from the transmission delay and monetary costs of VR videos. To address the above issues, a D2D-assisted VR video distribution system is designed, and a pre-caching algorithm based on QoE gain is proposed. More specifically, by observing the user residence time at a given node, a user can pre-cache VR videos at the nodes to be visited for improved QoE. To achieve better veracity and efficiency of the pre-caching algorithm, the probability of a user entering each node is calculated based on that user's interest and nodes' popularity. Furthermore, the set of candidate schemes can be greatly narrowed down to a range of feasible schemes according to the real-time popularity threshold, the available	improves the level of user's QoE while maintaining superior stability compared with the random-caching and greedy-caching algorithms.

			storage space, and the energy of the user's equipment. The scheme with maximized user's QoE can finally be selected from the candidate sets according to user's QoE gain.	
14.	QoE Driven VR 360° Video Massive MIMO Transmission	Long Teng et al.	In this paper, the researchers consider a massive MIMO system where multiple users in a single-cell theater watch an identical VR 360° video. Based on tile prediction, base station (BS) delivers the tiles in the predicted field of view (FoV) to users. By introducing practical supplementary transmission for missing tiles and unacceptable VR sickness, they have proposed the first stable transmission scheme for VR video. They have formulated an integer nonlinear programming (INLP) problem to maximize users' average quality of experience (QoE) score. Moreover, they derive the achievable spectral efficiency (SE) expression of predictive	Extensive simulation results validate that the proposed algorithm effectively improves QoE.

			tile groups and the approximately achievable SE expression of missing tile groups, respectively.	
15.	Implementation and Evaluation of "Just Follow Me": An Immersive, VR-Based, Motion-Training System	Ungyeon Yang et al.	Most VR-based training systems that are currently being used are situation based, but this paper examines the utility of VR for a different class of training: learning to execute exact motions, which are often required in sports and the arts. The proposed method, called Just Follow Me (JFM), uses an intuitive "ghost" metaphor and a first-person viewpoint for effective motion training. Using the ghost metaphor (GM), JFM visualizes the motion of the trainer in real time as a ghost (initially superimposed on the trainee) that emerges from one's own body. The trainee who observes the motion from the first-person viewpoint "follows" the ghostly master as closely as possible to learn the motion	Evaluation results show that JFM produces training and transfer effects as good as—and, in certain situations, better than—in the real world. The researchers strongly believe that this is due to the more direct and correct transfer of proprioceptive information from the trainer to the trainee.

b) IPR Search:

1)Title: Real estate Virtual Reality (VR) tour experience and proprietary booth and system to maximize user's VR immersion.

Inventor: Abdulhakim Aa Azour, Abdulhakim Azour
Application CA2896196A events

2015-07-06: Application filed by Abdulhakim Aa Azour, Abdulhakim Azour

2015-07-06: Priority to CA2896196A

2017-01-06: Publication of CA2896196A1

Status: Abandoned

2)Title: A CLOUD-BASED SYSTEM AND METHOD FOR CREATING A VIRTUAL TOUR

Inventors: Thompson SANJOTO (Vancouver), Ashton Daniel CHEN (Vancouver), Dong LIN (Vancouver), Ben HO (Vancouver), Yiting LONG (Richmond), Xinhui QIU (Vancouver), Pan PAN (Vancouver)

Publication number: 20200264695

Type: Application

Filed: June 20, 2018

Publication Date: Aug 20, 2020

Applicant: EYEXPO TECHNOLOGY CORP. (Vancouver, BC)

3)Title: VIRTUAL REALITY SHOPPING EXPERIENCE

Inventors: Elliott GlazerCarol Lee HobsonElizabeth Sandra DemingCoby RoyerJeffrey Scott Fehlhaber

Patent number: US8326704B2

Type: Application

Filed: Feb 09, 2012

Publication Date: Dec 04, 2012

Applicant: Liberty Peak Ventures LLC

c) Scope of the problem / Objective:

1. To Create a Virtual 3D environment at an affordable price and satisfies the user needs.
2. To develop a range of various scenarios inside the college campus (like Staff room, Classroom etc) and workspace.
3. To provide a virtual tour to the students and employees to view or experience their own campus or workplace.
4. Our main objective is to provide a low cost product to the consumers / users, to experience Virtual Reality.
5. Also, the main motive of this project is to increase the usage of google cardboard devices and gears.

6. To bring the VR experience to all the people in and around us on a low budget.

d) Constraints / Limitations:

1. Cracked mobile screens will reduce the quality.
2. Even this price may be expensive for some people.
3. Long Time Usage can cause eye pain / eye irritation.

4.Design Requirements or Project Specification:

a)Schedule – Timeline chart

Sl.No.	**Milestones to be achieved**	**Estimated date**	**Remarks**
1.	Project Selection	01.04.2022-03.04.2022	Identifying suitable problems in the society to find solutions
2.	Stakeholders review for upgrading	05.04.2022-10.02.2022	Meeting with stakeholders to get better ideas and upgrade the project idea
3.	Project design	12.04.2022-25.04.2022	Designing the project and start working on it within given time
4.	Project estimation and funding	27.04.2022-30.04.2022	Finalizing project estimation cost and providing fund for project

5.	Project supervising	02.05.2022-18.05.2022	Guiding team members in the right path so that the project can be completed successfully and also before the deadline date
6.	Design	17.05.2022-27.05.2022	Designing the project requirements
7.	Final Testing/Verification	28.05.2022-03.06.2022	Final testing and Verification of the project or the product
8.	Implementing to Stakeholders	04.06.2022	Project is ready to be implemented in the society and to the stakeholdersProject is ready to be implemented in the society and to the stakeholders

b)Budget:

Although AR/VR is a booming field nowadays. But, still the VR kits are still not reachable to the public because of its high cost. So we have specifically planned our project to be implemented on Google cardboard devices or Samsung gear devices whose cost range is from Rs.369 to 3000, so people can get their own devices and download the mobile APK application and they can experience the Virtual tour at their place of stay. Google cardboard costs around 350 rupees which is super affordable to the general public and even many cheap alternatives are available in the market.

c)Risk factors:

First one of the main risk factor includes health issues which includes:

Anxiety:

The immersive nature of virtual reality can induce stress or anxiety after wearing a headset for more than a few minutes.

Depending on what images they are seeing, virtual reality can bring in waves of emotions more than just looking at the surroundings .

For example: Virtual reality footage of a height location can cause the viewer to feel fearful, stressed and shocked.

It can take a while to get over this anxiety because the viewers experience everything as if they were there in the scene.

Nausea:

Some people who use VR headsets complain of dizziness and nausea. Its realistic simulated motions can affect a person's perception of time and space and can induce fatigue, nausea or dizziness.

It is recommended that users take frequent breaks from virtual reality to avoid nausea. They can adjust the fit of the headset, tighten or loosen straps, as well as fixing the focal distance or eye distance.

Eye strain:

VR headsets can cause severe eye strain among users. They strain their eyes in order to focus on a pixelated screen that uses a single refractive optic element. Headsets do not usually address the optic issues with near-to-eye devices, and they quickly become uncomfortable after a few minutes.

Headset designers must find a way to maintain a large field of view (FoV) for the users. Humans typically have a field of view of 200 degrees, involving 140 degrees of binocular vision for depth perception, and 60 degrees for peripheral vision. Headsets today are at 35 degrees FoV, giving the user the experience of merely "watching" the content. Increasing it to 60 degrees FoV or more can make users feel completely immersed in the displayed content and it becomes experiential.

Headsets should also mimic how human vision really works, to provide the most comfortable viewing experience for both 2D and 3D content. In physiological terms, headset makers need to solve this tension known as the "accommodation/convergence conflict," and eliminate eye strain.

d)Team members roles and responsibilities:

1. SHUJAT HUSSAIN (19IT091) - Project Designer (will provide and enhance the assistance in project design and development activities based on customer requirements and given inputs)
2.SREERAM B (19IT100) - Project Manager (planning, organizing, and directing the completion of projects and ensuring the projects are finished on time, on budget, and within the scope)
3.SRI RAM PRASAD S (19IT103) - Project liaison officer (will provide top-quality advice, facilitating effective knowledge management required for the project , and to provide technical assistance to project planning, coordination, and monitoring)
4.GUHAN S M(19IT032) - Executive Sponsor (Responsible to monitor the budget and control the spending, Ultimate decision maker of the project, to align the project to organizational strategy , performing some designing works based on the societal needs and to provide feedback)

5.Proposed methodology:

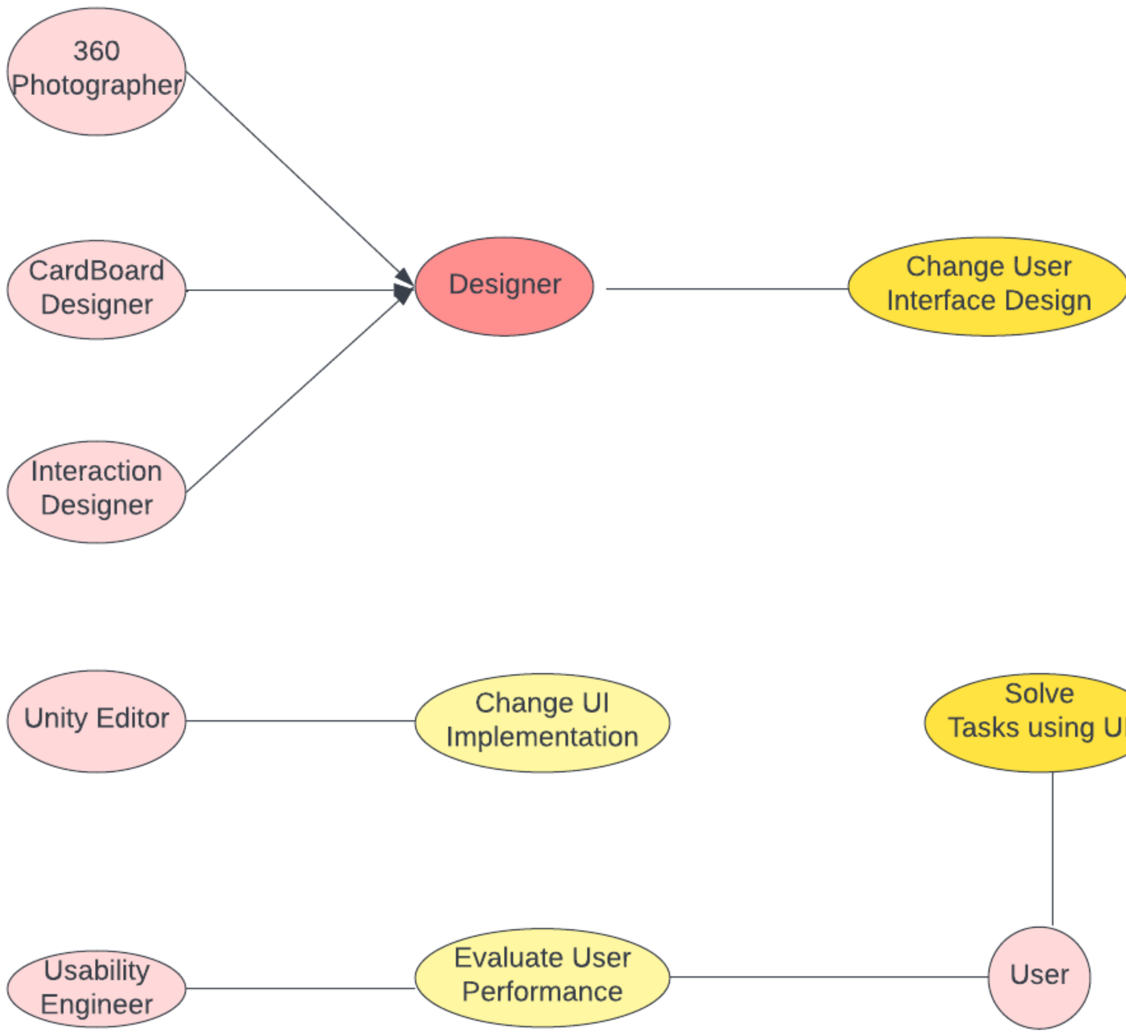
At the beginning, 360 degree photos of our campus should be captured for different locations / scenarios. Each of these panoramic 360 degree photos can be captured using a DSLR camera and finally stitch each photo as a 360 panoramic image using softwares like PtGui. But, this process is quite time consuming and hard to implement. The simplest and easiest method, these 360 images can be captured using a 360 degree camera which converts the whole point of view image to an instant 360 panoramic or photo spheric image.

But, in our project, we have used the google street view application to capture these 360 degree images. Then, finally to build / develop the application, we have used UNITY 3D software.

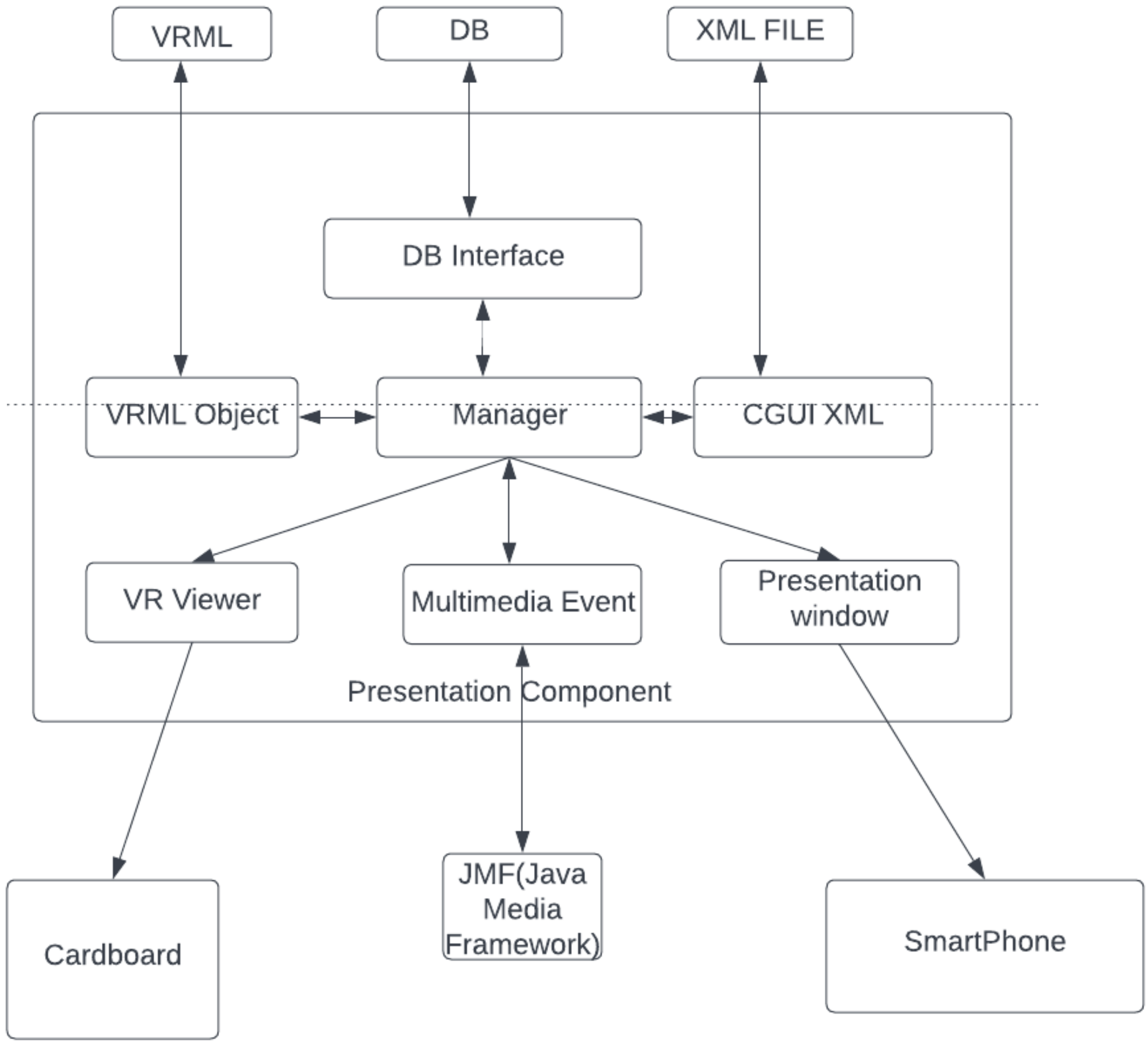
We are in a plan to implement this Virtual reality for our whole college campus. Also in a future development, we will introduce a 3D human structure who will explain the features of our college departments. We can also introduce this as a web service, so that directly we can experience it through the website.

6.Design:

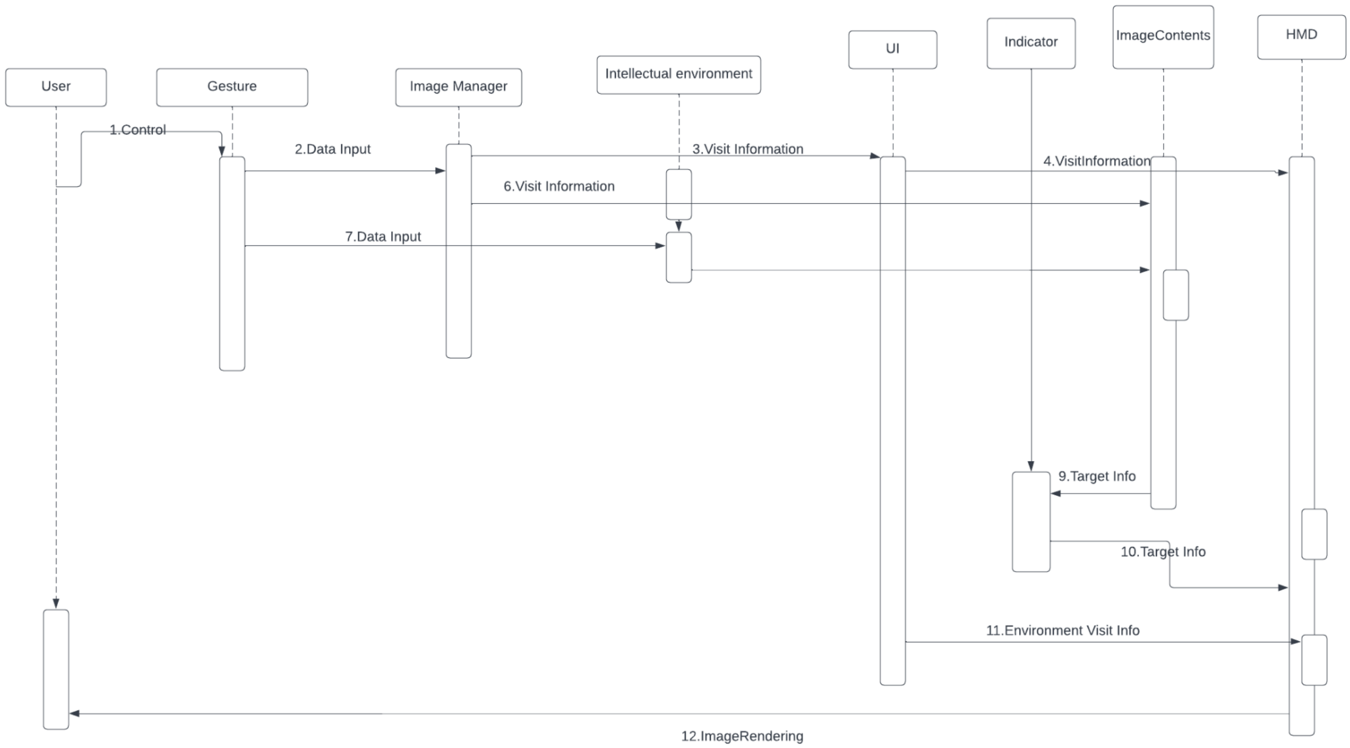
a)Use case diagrams:



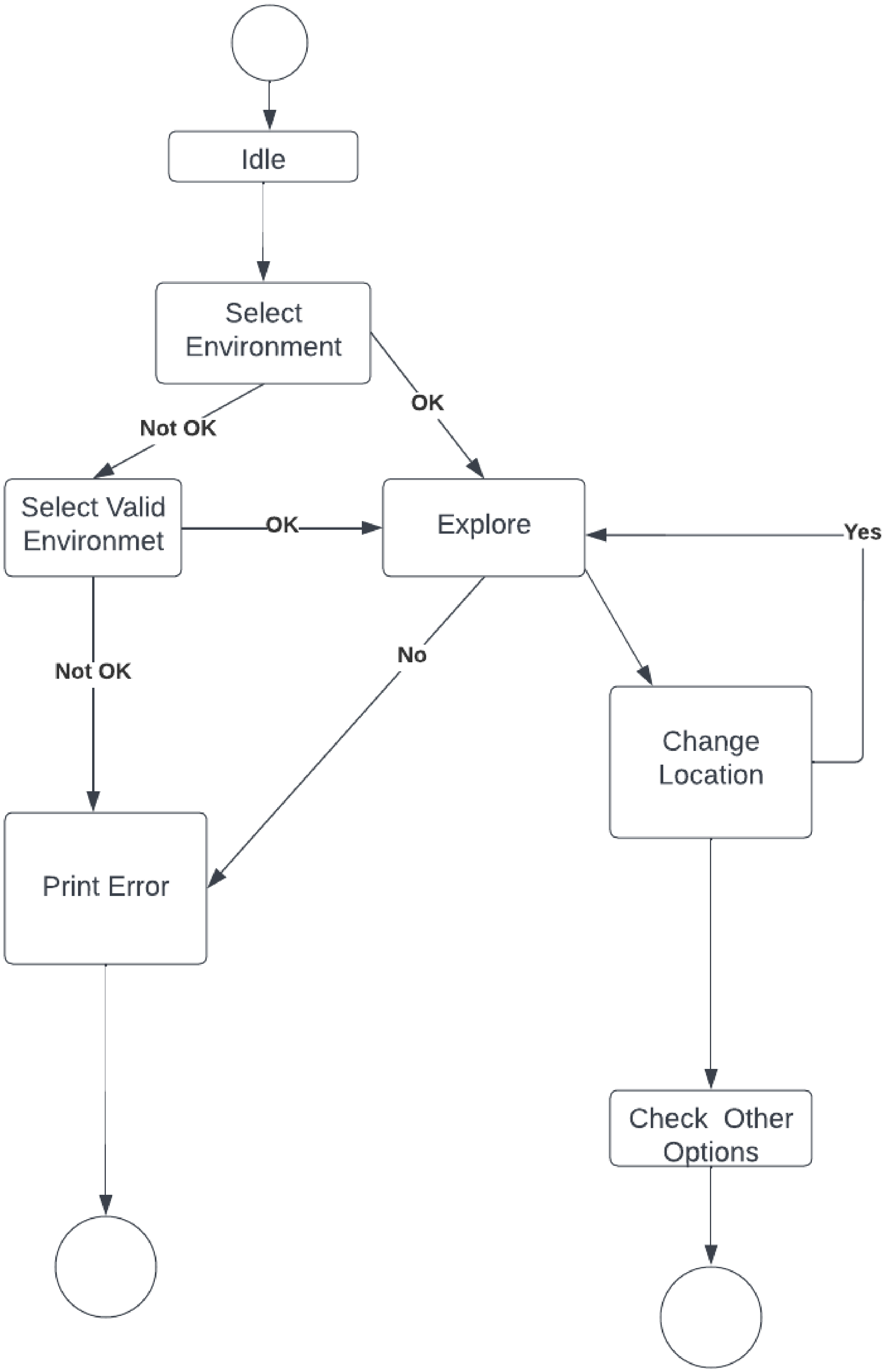
b)Class diagram:



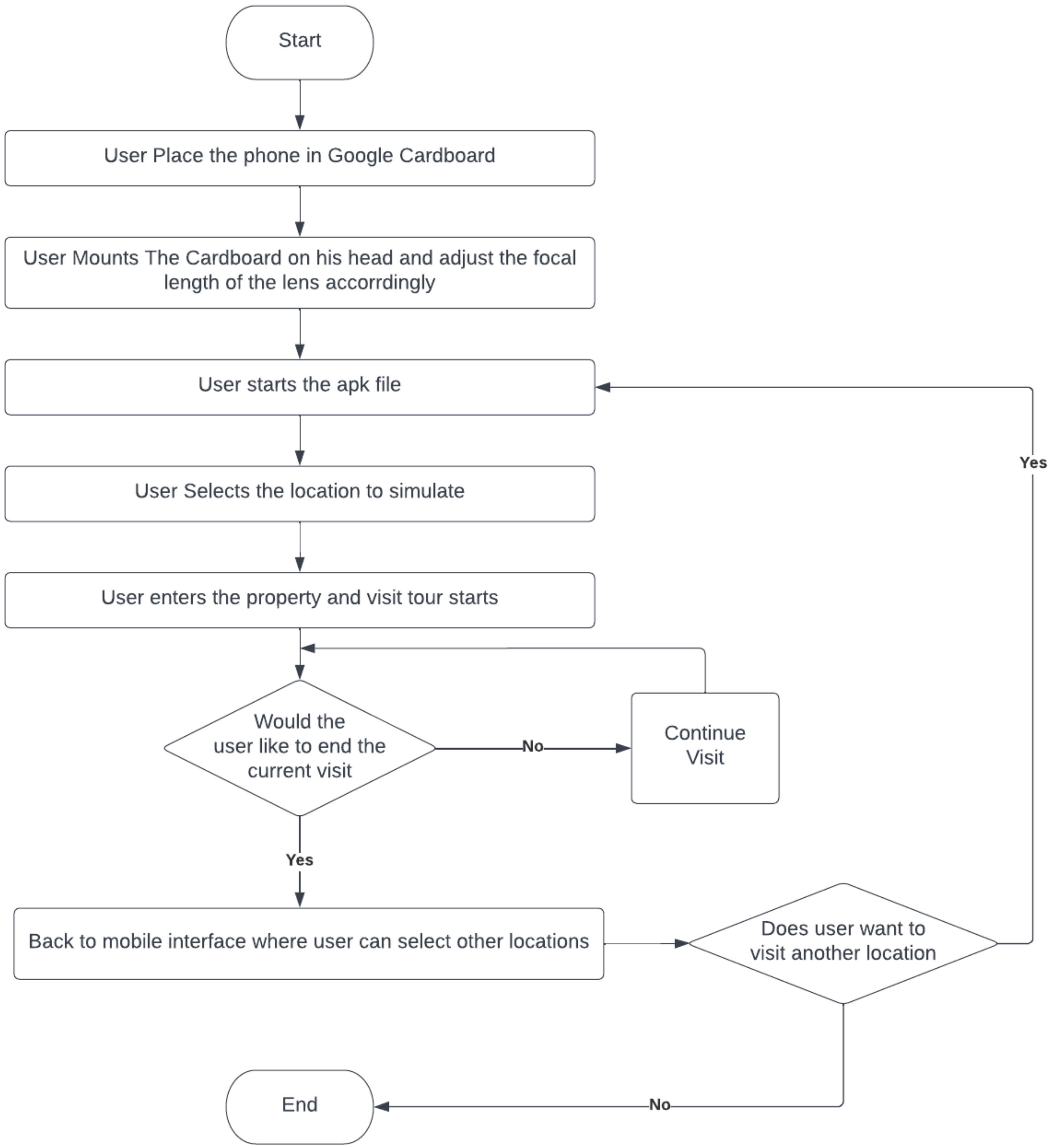
c)Sequence diagram



d)State chart diagram


Idle
Select Environment
OK
Not OK
Select Valid Environmet
OK
Explore
Yes
Not OK
No
Change Location
Print Error
Check Other Options

e)Activity diagram



7. Design Verification matrix

a)Identification and preparation

In this stage of design verification we have identified the specifications needed for our project so that the design can be verifiable by the tester and the designer can start designing the project, and we also came across many methods and we finalized with google cardboard method which is low cost and will be affordable one and then we have reviewed this entire plan with the stakeholders and with the design team and identified the major issues that will occur/not and finalized the plan

b)Planning:

In this stage of design verification matrix we have planned our project output and started working towards it we have done this stage with core and development teams and this stage occurs till the completion of entire project and we had frequently updated the output whenever if there is a change made in the input here at this stage we had also the project implementation has been recorded in a document also in this stage had identified critical milestones to reduce the error in the project

c)Developing:

At this stage the development of our project Virtual visit using VR has been worked on the basis of given input to meet the required output of the project during this stage we had observed a variety of test methods and finalized with a better and good working plan. we majorly focussed on to meet the required output which was given as input, so we had tested each stage of our project

d)Execution:

The test procedures made in the development stage had been executed as per the plan given as inputs and we strictly followed as per the inputs and if any errors were found during the execution of all the tests we had changed that in input parameters also at starting one issue occurred and we marked that as a defect and later we had rectified , finally we had executed our project plan based on the input parameters given

e)Reports:
This is a report of entire design verification matrix each stage is tested, we had tested each stage and identified some updations in our project and incorporated those in our project, we also updated as per the review suggestions which was given to us during the project review with staffs and with the adjunct faculty

8. Business Aspects:
Once completing this project, we have more business aspects in future. Each and every institution and Professional workspaces will approach us to develop this project for their own place.
The main difference to notice from our project to other institutions' projects is that they have developed this kind of project using HTC Vive and Oculus, which costs around 1.5 Lakhs to 3 Lakhs which cannot be experienced outside their institutions / campus.
Hence, we have developed this project in a very low cost tool which is a google cardboard / samsung gear. So, we are very much confident that this project will definitely get successful and can increase the reuse of google cardboard devices.

9.Final Implementation
a)Technology stack:
Unity (For developing the whole project)
GoogleStreet (To capture and convert images o 360)
b)Hardware Requirements:

Google Cardboard (To experience the Virtual Reality)

Mobile Phone or 360 Degree Camera (To capture the images or 360 degree image)

10.Testing & Validation
a)Usability testing
User Specifications and Experience testing
We have tested out application in different aspects with our stakeholders in different smartphones and observed major pros and cons of our applications and

we also identified the drawbacks that could happen in future and experienced in different angles to solve all the issues at the earliest

While Experience testing we have observed that we can't continuously use the AR/VR devices as it causes littlebit eye irritation so in future we will try to add some more better features to resolve this issue, also we had experienced with oculus rift device which produce us with the immersive VR gaming experience , the games we are experienced with that device is unbelievable it shows us a real life but actually it was a game but it gave us a real world experience , we had experienced that oculus rift with multiple games, it was actually a VR experience but it makes us to fear whether we would fall down or it gave us a real life experience

b)Real Device Testing:

AR/VR often depends on specialized hardware for its execution, so it is required to ensure the proper working of the devices, the devices include Oculus rift or HTC vive both of these devices have connected to the computer for the powerful experience of VR also other hardwares like Samsung gear, GoogleCardBoard should also be tested many times with different smartphones, so that we can identify in which system it is functioning smoother and in which system it is faster/slower and etc..

In oculus rift device sometimes it will not connect but it may be due to the small reasons like drivers updations,we must plug in our USB cable before plugging in the display port cable, So like that some small issues may happen, but we can resolve the issues

c)Compatibility testing:

In this testing it helps us to identify non functional issues like device overheating and helps to measure the the performance of the application when we are accessing the app with low specifications mobile systems

11.Deliverables

With this Virtual Visit using VR, we came up with a virtual tour of the real environment of our college campus, where all the students, faculties and even public people inside/outside the campus can view the entire campus virtually in their mobiles by installing the apk file of our project. At the end, the deliverables of our project is an apk file, by installing the file users can get through the virtual environment of our college campus.also when experiencing with oculus rift it may be a real life for those whole are experiencing with oculus rift touching the directions will give the experience to walk in the virtual tour as if they are walking on the college campus

12.Performance Test results

TimeRestrictions:

VR testing often leaves the testers and common users to have side effects such as emotion sickness, eye irritation and headaches. Thirty minutes is the recommended time limit for AR/VR devices to be used on. In the future we will try to reduce these side effects by introducing some new features to the AR/VR devices or even in our application.

Multiple Testing Platforms:

To effectively test the VR software and AR applications, a multi level platform is required. So, instead of testing the output on a mobile phone alone will not produce the exact result, so it is recommended to test the application file on the desktop and also we can test with AR/VR devices to see the exact Virtual environment and also we have to test the application without using the VR devices (raw output on the mobile phone).

GoogleCardboard and Mobile Phone:

Quality of the experience is always based on the quality of the users mobile phone screen (It should be without any scratch) and also Google cardboard / samsung gear lens (without any scratch or damage in the lens placed inside)

13. Financial consideration:

As a Developer, we need a system to work unity with at least 4 GB RAM and no need of graphic cards.

We Have adjusted to capture 360 panoramic images using a mobile phone, but in the future, to express this project in a more professional way, a 360 Degree camera is required.

Although AR/VR is a booming field nowadays, But still the VR kits are not reachable to the public peoples which costs Too high so we have specifically plan our project to be implemented on Google cardboard device or Samsung gear devices which is of range Rs.369 to 3000 so people can get their own devices and download the mobile APK application and they can experience the Virtual tour at their place of stay.

14. Deployment:

a)User manual report:

1. Download a mobile apk from google play store. Initially, this project was implemented for our college. Hence, the apk link will be posted on the college website. All can access the college website and download the apk.
2. After installing, run the mobile application.
3. Even without samsung gear or google cardboard we can experience the environment.
4. After running the application, the mobile phone needs to be placed inside the google cardboard or samsung gear. The lens view can be adjusted according to the mobile phone screen size.
5. A Bluetooth remote attached with the google cardboard or samsung gear can be used to teleport from one scenario to another.
6. There are no minimum requirements for this project. Even this project a=can work in a very basic api level.

b)Code report

For Changing From one Scene To Another:

```
using System.Collections;

using System.Collections.Generic;

using UnityEngine;

public class SphereChanger : MonoBehaviour {

    //This object should be called 'Fader' and placed over the camera

    GameObject m_Fader;

    //This ensures that we don't mash to change spheres
```

```
    bool changing = false;

    void Awake()

    {

        //Find the fader object

        m_Fader = GameObject.Find("Fader");

        //Check if we found something

        if (m_Fader == null)

           Debug.LogWarning("No Fader object found on camera.");

    }

    public void ChangeSphere(Transform nextSphere)

    {

        //Start the fading process

        StartCoroutine(FadeCamera(nextSphere));

    }

    IEnumerator FadeCamera(Transform nextSphere)

    {

        //Ensure we have a fader object

        if (m_Fader != null)

        {

            //Fade the Quad object in and wait 0.75 seconds

                                                  StartCoroutine(FadeIn(0.75f,
m_Fader.GetComponent<Renderer>().material));

            yield return new WaitForSeconds(0.75f);
```

```
            //Change the camera position

            Camera.main.transform.parent.position = nextSphere.position;

            //Fade the Quad object out

                                                            StartCoroutine(FadeOut(0.75f,
m_Fader.GetComponent<Renderer>().material));

            yield return new WaitForSeconds(0.75f);

        }

        else

        {

            //No fader, so just swap the camera position

            Camera.main.transform.parent.position = nextSphere.position;

        }

    }

    IEnumerator FadeOut(float time, Material mat)

    {

        //While we are still visible, remove some of the alpha colour

        while (mat.color.a > 0.0f)

        {

              mat.color = new Color(mat.color.r, mat.color.g, mat.color.b,
mat.color.a - (Time.deltaTime / time));

            yield return null;

        }

    }

    IEnumerator FadeIn(float time, Material mat)

    {
```

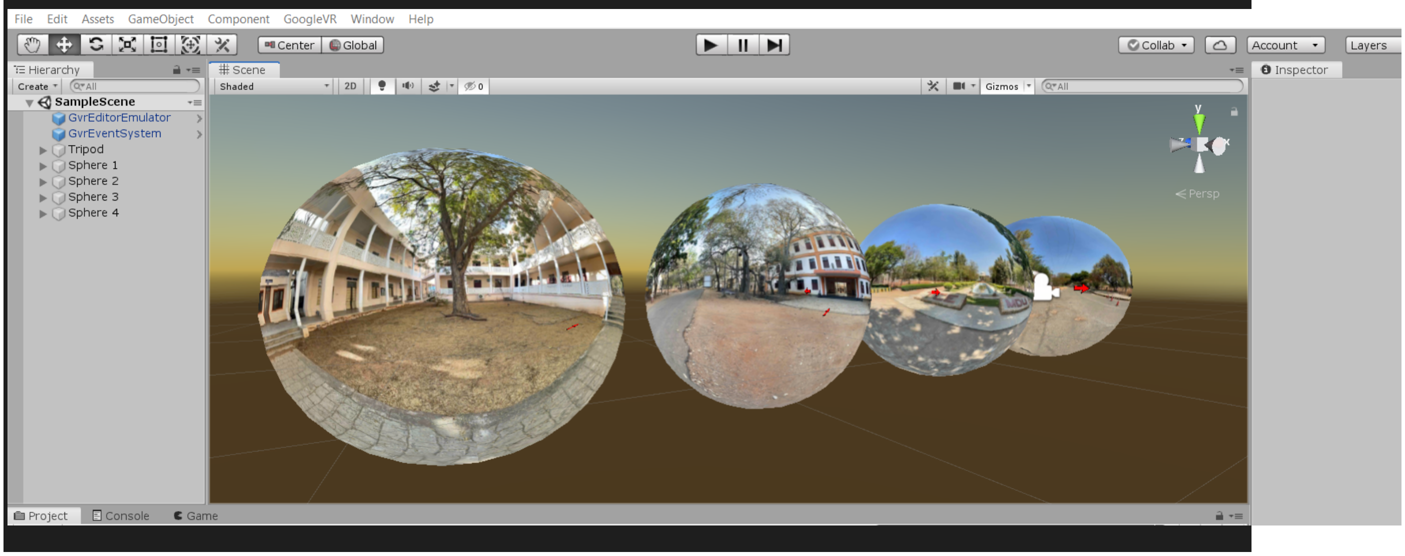
```
        //While we aren't fully visible, add some of the alpha colour

        while (mat.color.a < 1.0f)

        {

              mat.color = new Color(mat.color.r, mat.color.g, mat.color.b,
mat.color.a + (Time.deltaTime / time));

            yield return null;

        }

    }
```

Code For Shader Implying 360 Image to Sphere Inside Out:

```
//     Upgrade     NOTE:     replaced     'mul(UNITY_MATRIX_MVP,*)'     with
'UnityObjectToClipPos(*)'

// Based on Unlit shader, but culls the front faces instead of the back

Shader "Insideout" {

Properties {

    _MainTex ("Base (RGB)", 2D) = "white" {}

}

SubShader {

    Tags { "RenderType"="Opaque" }

    Cull front    // ADDED BY BERNIE, TO FLIP THE SURFACES

    LOD 100

    Pass {

        CGPROGRAM

            #pragma vertex vert

            #pragma fragment frag
```

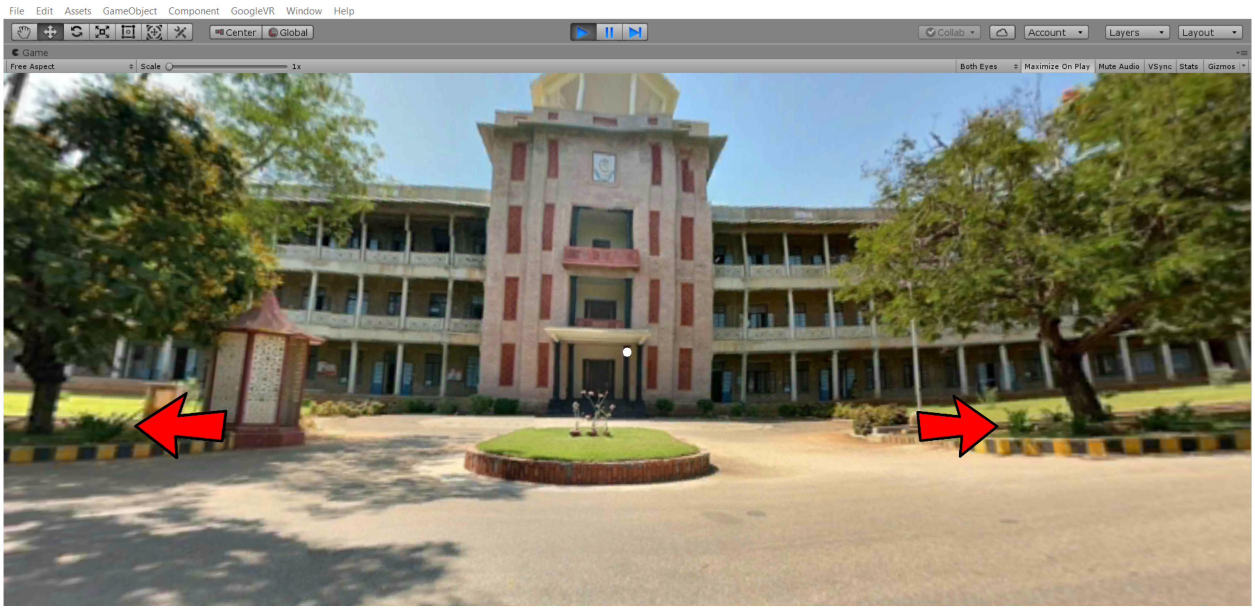
```
#include "UnityCG.cginc"

struct appdata_t {

    float4 vertex : POSITION;

    float2 texcoord : TEXCOORD0;

};

struct v2f {

    float4 vertex : SV_POSITION;

    half2 texcoord : TEXCOORD0;

};

sampler2D _MainTex;

float4 _MainTex_ST;

      v2f vert (appdata_t v)

{

    v2f o;

    o.vertex = UnityObjectToClipPos(v.vertex);

    // ADDED BY BERNIE:

    v.texcoord.x = 1 - v.texcoord.x;

    o.texcoord = TRANSFORM_TEX(v.texcoord, _MainTex);

    return o;

}


fixed4 frag (v2f i) : SV_Target

{

    fixed4 col = tex2D(_MainTex, i.texcoord);

    return col;

}
```

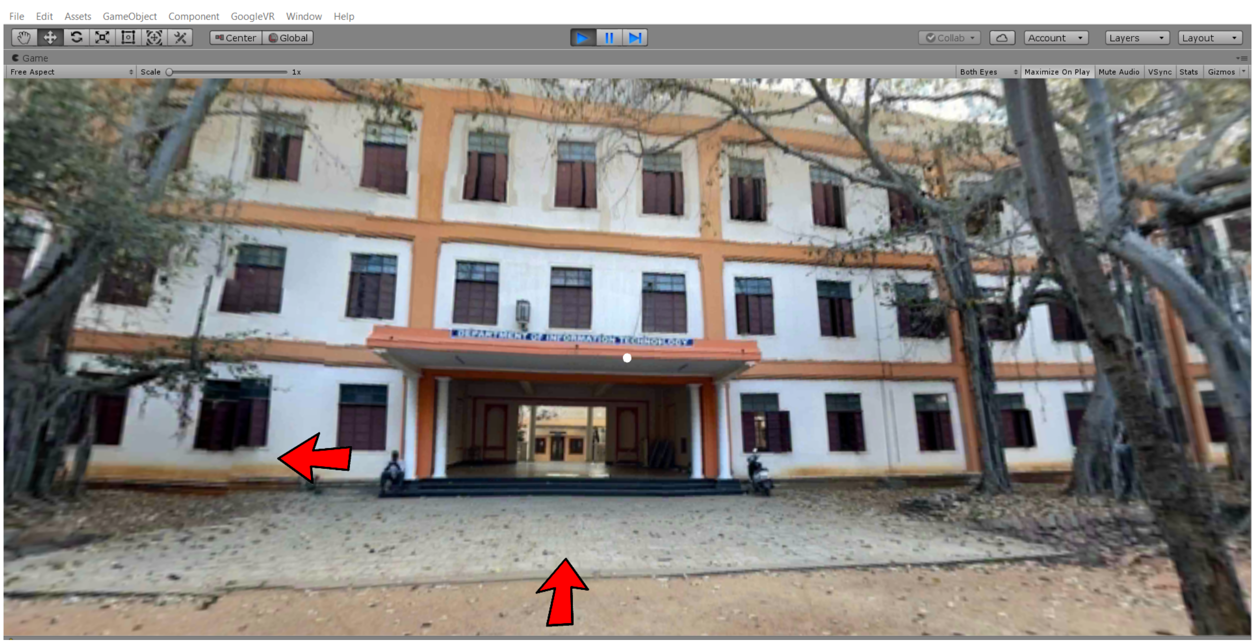
```
            ENDCG

      }

}
```



File Edit Assets GameObject Component GoogleVR Window Help
Center
Global
Collab
Account
Layers
Hierarchy
Create
SampleScene
GvrEditorEmulator
GvrEventSystem
Tripod
Sphere 1
Sphere 2
Sphere 3
Sphere 4
Scene
Shaded
2D
Gizmos
Persp
Inspector
Project
Console
Game

Center
Global
Collab
Account
Layers
Layout
Game
Free Aspect
Scale
1x
Both Eyes
Maximize On Play
Mute Audio
VSync
Stats
Gizmos


File Edit Assets GameObject Component GoogleVR Window Help
Center Global
Collab Account Layers Layout
Game
Free Aspect Scale 1x
Both Eyes Maximize On Play Mute Audio VSync Stats Gizmos


File Edit Assets GameObject Component GoogleVR Window Help
Center Global
Collab Account Layers Layout
Game
Free Aspect Scale 1x
Both Eyes Maximize On Play Mute Audio VSync Stats Gizmos
DEPARTMENT OF INFORMATION TECHNOLOGY


File Edit Assets GameObject Component GoogleVR Window Help
Center
Global
Collab
Account
Layers
Layout
Game
Free Aspect
Scale
1x
Both Eyes
Maximize On Play
Mute Audio
VSync
Stats
Gizmos
Camera "Main Camera" has Near clipping plane set to 0.3 meters, which might cause the rendering of the Daydream controller to clip unexpectedly.
Auto Generate Lighting On