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An Augmented Reality Experience in Bey-Battle Gaming

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ABSTRACT

Gaming ecosystem is constantly evolving. Creators and developers in the gaming industry are constantly developing new games, methods, technologies to capture the attention and imagination of gamers around the world. From Mario to Tetris to Halo and now Augmented Reality (AR) powered games like Pokémon Go; the bar just keeps going higher. AR games allow the gamer to fight aliens, catch whimsical creatures or save the kingdom- all in the real world. The project proposes the use of the concept of Augmented Reality. It is an interactive experience of a real world environment whereby the objects that reside in the real-world are "augmented" by computer generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory. The overlaid sensory information can be constructive (i.e. additive to the natural environment) or destructive (i.e. masking of the natural environment) and is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real world environment, whereas virtual reality completely replaces the user's real world environment with a simulated one. Augmented reality is related to two largely synonymous terms: mixed reality and computer-mediated reality.

Keywords :— Augmented Reality, Virtual reality.

I. INTRODUCTION

AR superimposes computer-generated images on a user's camera-screen-view of the real world. Pokémon Go proved to be the catalyst and a game changer for AR. Following the resounding success of Pokémon Go, game developers readjusted their games in order to add and adapt the new technological trend- AR. Augmented Reality helps in creating a combined view for the player, which is an amalgamation of the real world and virtual images created by the computer.

In these prospects, we will consider the benefits of the Augmented Reality. Augmented reality is a technology that works on computer "vision based recognition algorithms" which helps in adding intense sound, video, graphics and even smell. All the real world objects are added using the camera of the user's device. Benefits derived from AR games are endless. Normal people (non-fanatics) are beginning to understand what it is like to play games using smartphones. Games have reached another level of sophistication, which is helping to engage the millennial generation. Another major application has been stimulation games. AR makes that cockpit or cabin feel real to the gamer and helps improve their real-life abilities in a safe environment. Similarly, it can help soldiers, drivers, and students to enhance their skills. So along with entertaining, AR games are proving to be a great learning tool as well.

II. BACKGROUND STUDY AND LITERATURE REVIEW

A substantial amount of research is being done in the field of Augmented reality and the possible advantages it may have

if rightfully utilized in the betterment of the community. Following are some of some existing work,

Ms.Akil H.Sayyad & Prof. S.A.Shinde [1], proposed an Augmented Reality Based Mobile Tour Guide System. In this, they have been praised by many fellow researchers. It also connects to the idea of initiating a new augmented world in terms of Google Maps. Google Maps can include this technology as a component module and thereby enhance the user experience. The International Research Journal of Engineering and Technology (IRJET) also recognized this work and also agreed to invest a substantial amount of funds if a viable solution to implement this idea is found.

The system is derived from the idea of augmented reality. They have introduced a new tour guide system utilizing augmented reality in mobile environment by considering limitations of paper based and mobile based tour guide systems. This system consists of tourist point of interest and properly guide tourist. The system uses the GPS technology consisting of viewing similar to that of Google Maps to precisely detect the user location. The cloud data is used to store the buffer of potential data that will likely be requested by the user. The use of Machine learning facilitates implementation of a large- scale system at low cost. The system provides a mechanism to prevent disputes in the simulation and helps to recognize and object using the smartphone. After logging into the system, the user can choose a suitable location or a real world object. Information on the selected location will be confirmed to the user via notification. Then, the system updates the user about the details of the location identified by the user. If after a certain period of pending time the system determines that user is offline then it changes the status to available. The system will

help plot the location of object identified using the smartphone camera in real time and can support the business with hourly parking charges.

Richard Sala, Santi Ristol [2], proposed a Augmented Reality Based Flood simulation System under ATOS Scientific Community on Mobile Augmented Reality. This research pertaining flood simulation and use of GPS technology along with Cloud Computing is a new concept which is actually implementable. This work was presented at the ATOS Scientific community was praised and also meant for implementation. The technology of augmented reality will be implemented using cloud computing which is a combination of greater possibilities. It will be a simulation software capable of determining the potential effects of Floods and the possible damages and repairs to be done.

The entire framework incorporates three modules: Cloud, Smartphone device and User. User must register in any of enrolled smartphone device and a unique user identification tag/ smart card will be assigned. To select the location of the flood affected region, user selects the location and sends request to cloud via smart phone, and also can view the respective selected area details. Cloud will calculate shortest distance between user & nearest water body in requested location, and simulate the flood reaction based on the water content and the respective weather condition over the years. They have stated the development of augmented reality in all the sectors of the industry and the position of in in the current state. According to their conclusion," Atos sees augmented reality becoming a part of everyone's reality in the next few years, transforming mobiles into advanced sensors and lives into connected networks. Augmented Reality Services will emerge from different sectors crossing over current niches to generate direct benefits to users, businesses and workers. Because users will need to download contents and information from the Internet, network performance and cost will be key. Indeed, the last market changes in flat-rate contracts may slow down AR adoption.

III.   PROPOSED SYSTEM

A. Problem Definition

Developing a multiplayer gaming module is a very challenging task in itself. Provided that the challenge is developing the game using the newest technology of augmented reality. The users will have to play using their devices which will connect with each other via broadcasting and networking module. This leads to the connection between the users. The common method of networking in this domain is it has never been performed before. Also deploying the virtual objects in the real world scenario as well as interacting using these objects in a 3D experience is a challenge that must be dealt with.
The purpose of this system is to use networking in the context of Augmented reality and thereby connect two users under strict time constraints . This system deploys the virtual objects using the camera of the associated devices.

B. Problem Statement

To develop a multiplayer interaction application using augmented reality which will take a marker-based recognition image using camera device and will provide virtual interaction between users.

C. Aim and Objective of the Proposed System

The Proposed System scope is to build an augmented reality based multi-player user interaction system which helps users to connect to each other using their smartphones and deploy their virtual objects in real world.

The system is proposed to have the following objectives along with functional requirements.

1.To create an adaptable system that can be used easily to connect multiple users.

2.To develop android application for users to experience 3D gaming experience using augmented reality.

3.To maintain the interconnectivity between the beyblade objects and users.

4.To use smartphone camera to detect smooth ground plane to deploy the virtual objects in real world.

D. Scope and Limitations of the Proposed System

The Proposed System scope is to build an Augmented reality based multiple user interaction system which helps users to connect automatically in the augmented reality world using android application. Virtual object identification and deployment can be checked through the network module. This system provides an effective solution to explore the gaming dimensionality in the augmented reality scenario. It provides new trends in the domain of finding solutions for various real life problems using augmented reality and also it eliminates unnecessary real life hard work of interaction in the real world too. So it reduces the time and it is even a cost effective alternative.

The proposed work will use the Computer Vision technology to determine the surface on which the object will be deployed. The proposed work will explore the multi-user network interaction dimension and will use it to connect the smartphones. The proposed project will involve two user communication through the applications installed on their respective smartphones.

IV.   PROPOSED SYSTEM

A. System Design

System design covers system architecture. System and the elements consist of design specification, for instance. System Architecture diagram shown in figure 2.1. The system is proposed to have the following modules along with following functionality:

• Function to log on the user in the module.

• Function to sense the ground plane using ground plane detection.

• Function to deploy the object on the detected ground plane.

• Function to fetch the user data and user data from server to client mobile application.

• Function to save user data on the server.

• Function to display blade health status on mobile application.
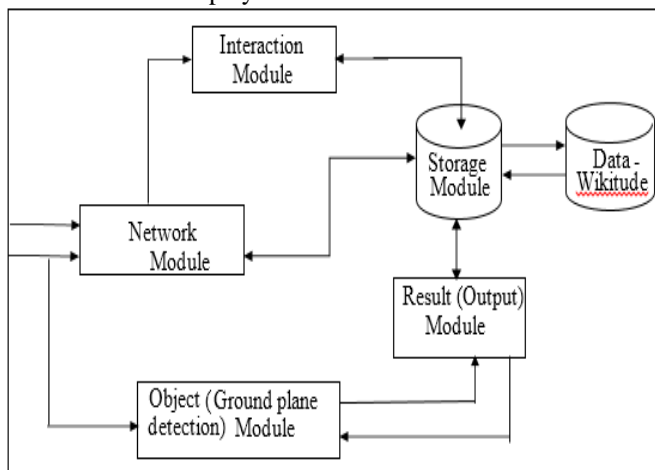• Function to display the winner of the battle.

Fig 4.1 - Module Methodology

B. Module Description

Figure 4.1 shows various components of the proposed work. It will include the various modules as per the distribution of the tasks in various phases. Following are the modules:

1. Network Establishment Module

The Network Establishment Module will be the entry point of the proposed work. It will provide the connection between the users in order to facilitate the communication between the objects thereafter in the module.

2. Interaction Module

The Interaction Module will facilitate the connection and actual interaction of the objects of the proposed work. It will provide the base for the objects for interaction and this will be supported using the network connection.

3. Object Module

The Object Module as the name suggests will be the repository of the proposed work. It will comprise of the objects developed for the proposed work. These objects will constitute the back end of the project.

4. Storage Module

The Storage Module as the name suggests will be the storage of the proposed work. It will store the objects developed for the proposed work. These objects along with the battle details will constitute the storage repository of the project.

5. Result Module

The Result Module as the name suggests will serve the result of the proposed work. It will comprise of scores of the individuals.

V. IMPLEMENTATION

A. Algorithmic description of each module

1. Login module
a.   Initiation

Step 1: Start
Step 2: If user is already authorized, go to step 4
Else If User should install the bey-battle showdown game on the smartphone device Go to step 3
        Else
i.   Start the hotspot of the smartphone device
ii.   Select the game icon and start the game
iii.   Select create game to initialize the game
Step 3: Wait for the other user to listen to the broadcast and connect
Step 4: If user is authenticated, allow user to connect
        Else
                Deny exit
Step 5: Stop

2. Game play and broadcast initiation
 a. Broadcast Initiation
Step 1: Start
Step 2: Select one of the options.
i   Create game
ii   Host game
Step 3: If option 1 is selected then,
Create a new game and broadcast the network IP address containing match id, IP address of host.
Step 4: If option 2 is selected then,
i.   Select join game
ii.   Click on join game button
iii.   Receive the broadcast
a.   Get the IP address from the broadcast
b.   Enter the IP address and click on connect
     Else
Try again to connect to the user or retry by reinitializing the grid and repeating from step 2
Step 5: Stop

 b. Game play
Step 1: Start
Step 2: Attack the bey blade object deployed by the corresponding opponent.
i   Use boost provided by boost button
ii   Check for the health indicated by the health bar
Step 3: If health of your object goes down to zero then,
The opponent will be declared as the official winner of the match.
     Else
Try again to connect to the user or retry by reinitializing the grid and repeating from step 2.
Step 5: Stop

3. Connection between Users via broadcasting and networking
Step 1: Start
Step 2: Initialize the grid detection algorithm
Click on initialize grid button once the ground plane is detected.
Step 3: Listen to the broadcast.

Click on the listen button and then the broadcasted IP address present in the packet is detected

Step 4: Initialize the connection on the same IP address

i   Accept packet from the connected user

ii   Set all values of each state as per the packet information (IP address) for the corresponding opponent player object

iii   Check for the change in state, note the same.

iv   Collect all the information and state of the corresponding user device.

v   Wrap the user data into network packet and send the packet as a reply or acknowledgement to the broadcast.

Else

Try again to connect to the user or retry by reinitializing the grid and repeating from step 2.

Step 5: Stop

B. Detailed Description of Modules

•Blade rotation

 void transform.rotate()

-The function executes multiple times throughout the gaming module in the program.

-The function is used to set blade rotation speed and the blade movement.

-We need to initiate the vector for the horizontal movement of the blade.

-The server sets the default speed and movement using this function.

 ovoid Start()

-blade.activeSelf()   function is called here to check the blade presence.

-client.connect() function is used to send data to mysql.

-transformPosition() function is used to get data for blade movement and subsequently update both systems.

-isLocalPlayer() method to identify the local user.

 ovoid Update()

-trails.setActive() function is used here for low and high movement of the trailing blade and the attacking blade.

-OnCollusionEnter() method is used here for calculating the health reduction after the blade collusion occurs.

•Gameplay module:

o void healthNetworkBehaviour()

-OnHealthChange()   function is called here to check the blade health and resuce health bar value.

-TakeDamage(int amount) function is used to get the blade damage data and send it to both server and client.

-gameObject.GetComponent() function is used to get data for blade movement and subsequently update both systems.

-CmdTakeHealth() method to reduce player health.

 ovoid HealthbarUpdate()

-healthbar.transform.localPosition() function is used here for low and high movement of the health bare module.

-trackerScript OnEnable() method is used here for calculating the health reduction after the blade collusion occurs.

•   Network modules:

o void loadClient()

-void GameObject.Find("Network UI") function is called here to start the broadcasting of the module packets.

-void LoadClientScene(int index) function is called here to load the initial client screen on start of the application of client side.

-void Start_Custom_Client() function is called here to load the custom client and start the game.

-void OnClientConnect(NetworkConnection conn) method uses the nwtwork connection string to connect the client to the server. o void loadServer()

-void GameObject.Find("Network UI") function is called here to start the broadcasting of the module packets.

-void LoadClientScene(int index) function is called here to load the initial client screen on start of the application of server side.

•   Support modules:

-void ScreenLoader(int index) function is called here to load the initial screen on start of the application.

-void LoadClientScene(int index) function is called here to load the initial screen on start of the application of client side.

-void LoadServerScene(int index) function is called here to load the initial screen on start of the application on server side.

-void LoadPlayMenuScene() method to display the menu bar on the home screen. o void SoundController()

-void PlayButtonSound() function is used here for controlling the sound of the application as per the module.

-void PlayExitSound() method is used here for deploying the exit game sound as the user exits the game.

•   Mobile Server

All the gameplay data collected by the game module of the user smartphone device application is send to the corresponding other user over the Wi-Fi connectivity. This data is accessed by gaming module using android application.

• Mobile Client

The other user smartphone connected to the first user's hotspot connectivity acts as the client and requests for information and after getting the information acts upon it thereby giving an uninterrupted gaming experience.

• Mobile Application

☐Details of all users and game play details is stored on the mobile server which is created. This server is further used for user connection, game play and updating the status subsequently.

☐ When user connects to other user, the data from server is fetched after authentication of user.

☐ When user clicks on the 'create game' button, the mobile application enables a network broadcast via the hotspot

connection. The IP address packets are broadcasted and other user connects using the IP address provided in the packet

▢ If user chooses join game, then the user waits for the broadcast IP address, after getting the address, the user chooses join game to start the game module.

▢The bey blade movement as well as their respective health status is displayed after user starts the game, then he/she can see the health status. The status data is fetched from server, as given to the client and vice versa.

▢The navigation buttons are displayed at bottom right side of the screen. If the user wishes to terminate the game and exit the application, he/ she can simply press the back or exit button. This will cause the user to exit the current screen and return to the main screen or pressing exit button will cause the user to exit from the application.

▢ If user selects the winner module tab he can see the current winner of the battle.

VI. PERFORMANCE ANALYSIS

In this section, we introduce performance of system with network and android system perspective.

1. Computer Vision modules are for identifying the ground plane and detecting the surface on which the grid is to be deployed. It performs well in the range between 1 m to 4 metre at normal rom[om conditions. We operated this sensor using smartphone camera at minimum range 3 cm apart from sensor at normal temperature. We are currently using two smartphones and their subsequent device cameras to detect the ground plane and deploy the objects.

2. The networking module in both devices serve as the client server architecture. One of them is responsible for hosting the game using the Mobile hotspot, an inbuilt feature of android smartphones.

3. Android smartphone thread management and quad core processor is used for data transfer from client to server. It is connected through Wi-Fi to provide network connectivity to game installed on the devices.

4. Mobile Hotspot Connection is used for internet connectivity between client and server. It works fine at normal user connection and speed of game play.

The sensed data by ultrasonic sensor is transfer to the server by using Ethernet shield. After every 5 seconds data is sensed and appropriate status is updated in the database located on server. It takes approximately 5 – 6 seconds to update data. The time needed to access the data solely depends on the internet speed provided to the Ethernet shield and to the NodeMCU.

Android:

-For logging it takes 5-6 seconds to connect users at normal speed of hotspot connectivity.

-For loading the grid and actual game module it takes 2-10 second. The average CPU usage is up to 28%. The overall average memory usage is up to 230 MB.

-Time required to parse the intermediate coordinates is up to 2-10 second.

VII. APPLICATIONS

The project's scope is to build an Augmented Reality based multiplayer user interaction system which helps users to connect via the networking and broadcasting module using android application.

This system provides an effective solution to use the augmented reality experience in a multi user domain. It helps user to connect with other user and interact virtually using augmented objects. So it reduces the time and it is cost effective also.

This technology can be used for many suitable applications in many fields of engineering like Non-destructive testing, flood simulation systems as well as medical sciences like cell modulation and testing.

VIII. CONCLUSIONS

Augmented reality is becoming integral part of everyone's reality. Due to advancement in hardware and software, user can use this technology for in day-to-day activities. In this paper, we have introduced virtual reality for gaming. In this game, multiple players can connect their mobile phones with each other to form a virtual arena. Such arena forms the battle ground virtually in which players blade collide and whoever's life will remain at last will be declared as a winner. In future, this can be taken for different areas including flood simulation systems, medical science and gaming of next generation.

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