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DEVELOPMENT OF AUGMENTED REALITY APPLICATION TO UNDERSTAND HUMAN BODY FUNCTIONS

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Abstract: This paper presents an augmented reality application for the working of human organ structures like digestive and respiratory systems. The Research uses marker less augmented to indicate an AR software that doesn't want an earlier understanding of a user's surroundings to overlay three-D content material right into a scene and preserve it to a fixed point in space. The few recent additions to the material pools are Smartphone apps using augmented reality with which the students can experiment on their own. The main aim is to present an augmented reality application for student's ease of use and understand the working of digestive and respiratory systems in 3D visualization with a vocal explanation. This voice feature will have a start, play, and pause feature with an interactive user interface.

Key Words: **Digestive System, Respiratory System, Marker less Augmented Reality, 3D Model, AR Application.**

I. INTRODUCTION

Augmented Reality (AR) is an advancement that incorporates a real object into a practical environment interactively. An augmented reality experience is created using the camera of the device like iPad, tablets, etc. to view an environment with real effect and the information gets digitally projected with the help of a camera. The impact of augmented reality on students is used to explain motivation in the context of learning. Augmented Reality applications as digital experiments for education with an earth-moon system example, here a textbook image of the earth is scanned and 3D models of earth and moon are placed to implement the system, it mainly aims in the 3D visualization and animation. A simple 3D animation can convey how a system works and thus this technology helps the students to understand the complex topics and motivates them to learn more about them with digital experiments and visualization [1].

Understanding the human body and its function become easier in biology courses prescribed for high school children.

The organ structure and its functions are very important in the study of biology. It will be seen that a human's body is made up of numerous different elements. The element is a type of bodily organ made up of tissues and cells. The respiratory system, circulatory system, and digestive system are all key components. Human body anatomy requires knowledge in a number of related branches of science. It is also critical to begin learning it at a young age. As a result, people can get a general idea of how bad things are if they have a sickness that affects their body (organ). They can anticipate in the form of body health prevention. As a result, knowing human body anatomy is an important topic that should begin in junior high school as part of the biology class. Learning mediums are mostly available in the form of mannequins or puppets, books, videos, etc. but it is still unsatisfactory to help students in understanding human body functionality. The proposed application is to design augmented reality applications for human body function systems like digestive system and respiratory system 3D models visualization and vocal explanation of its working by importing game engine unity the AR software. Application helps users to gain the information related to the human digestive system and respiratory system and their working can be conveyed interestingly and interactively.

Marker-less Augmented Reality is used to indicate an AR software that doesn't want an earlier understanding of a customer's surroundings to overlay three-D content material right into a scene and preserve it to a fixed point in space. Marker less AR merges digital data with input from actual-time, actual-global inputs registered to a physical space. To check-in three-D graphics in the real world, the innovation blends software, audio, and video graphics with the cameras, gyroscope, accelerometer, haptic sensors, and location services of smartphones or headsets. Apple's AR Kit and Google's AR Core SDKs have made less AR available on loads

of tens of thousands and thousands of smartphones and tablets. Marker-less AR's ability to overlay digital facts in the actual world is a boon to educators who use the equipment to demonstrate complicated concepts. Apps like Anatomy 4D (for college kids gaining knowledge about the human body) or Elements 4D (for those reading chemistry) are a part of this early wave. Museums use AR to reinforce their physical well-known shows with beneficial digital content. Corporations and the U.S. army use Microsoft's HoloLens to create educational physical activities and reviews on the whole thing from repairing aircraft engines to fight medication and survival. surgeons can overlay 3-D models of human anatomy on an affected person to carry out virtual-assisted surgical procedures using an effective AI at the same time as faraway attending surgeons supervise in real-time.

II. LITERATURE REVIEW

The augmented reality applications have been presented to have advantageous features to make the process of learning to be more active and significant. Authors have proposed new technologies in the field of biology education such as human anatomy and organ structure which helps the students to learn more effectively by developing a specific mobile application on Unity3D application.

This study was aimed at developing an original application for education consisting of AR technologies and thus usage in biology education. And it was revealed it is effectively used in the field of human anatomy and physiology by developing a 3D interactive mobile-based AR teaching system to help biology students to improve critical and complex topics more easily [1].

The author has proposed an application that helps students learning in human anatomy more Easily and interesting by developing an AR application that can interact in the form of 3D objects with sounds and animations not just the videos and provides solutions to the users who have difficulty in visualizing 2D objects, textbooks, puppets, etc. [2].

In, this survey author aimed to develop an application which was designed to facilitate teachings in anatomy, a camera is used to track users and show them on the screen, then an image viewer is generated and superimposed on it, which is when the internal organs of the human body become visible, giving the appearance that the user is looking inside of his or her body [3].

In this paper, the method described is to help students by providing an AR vision to anatomical studies and describes whether augmented reality is an effective tool to learn anatomy concepts. Author claims that with the help of AR technology, it is to be expected that it provides more engaging and effective learning experiences. As this technology-aided learning provides flexible accessibility [4].

The author aims to develop an augmented reality application such that students can easily understand the anatomy of the human body using 3D image visualization. Method used in this system is an AR marker on a mobile platform. The strategy utilized in this framework is an expanded reality marker on a versatile processing stage. The marker is caught by snapping a photo. At that point the caught picture is partitioned into pieces and the example is coordinated with pictures put away in the data set. In this exploration, the author utilized a floating euphoria framework and consolidated it with the SQLite data set. Increased reality life structures arrangement of the human body has been highlighted that can intelligently show the entire body or parts of the human anatomy of the human body. The outcomes have shown that augmented reality visualization helped students learn more easily [5].

In this survey, the author presents an increased reality learning framework that uses the input of a depth camera to intelligently instruct life systems to secondary school students. The goal is to exemplify human life structures by showing 3D models over the body of an individual continuously, utilizing the Microsoft Kinect profundity camera. The clients can see how bones, muscles, or organs are circulated in their bodies without the utilization of targets for tracking [6].

In this research, the author proposed to assemble the item to be used, and used blender programming for the object modelling process. To have the option to show 3D items, authors apply target picture strategies, to be specific by utilizing a marker acquired from the book Sobotta Human Atlas Anatomy is adjusted to necessities of preclinical medical students. At the point when an AR camera catches the marker, the camera recognizes the example contained in the marker, and then matches the data stored in the database. At the point when the example is found and there is an adjustment to put away in the database, the application will show the 3D objects of the organ of the respiratory system with augmented reality innovation [7].

In this study, authors utilize the human anatomy of a 3D and interactive multimedia animation framework that makes a difference with the Leap Motion Controller device that supports the movement of fingers and hand as controlling the system. With this instrument, objects with 3D models on the respiratory system can be taken care of with gestures from the hands of two hands of the client. The interaction brought about a consolidation of augmented reality frameworks and the Leap Motion Controller in which the framework creates animated developments and virtual 3D item use marker which estimated 21cmx29, 7cm where the outcomes utilizing best distance while camera distinguish the marker is 20cm45cm, camera can recognize the item utilize the slope distance between 350 degree-1450 degree [8].

In this paper, the author presents an Augmented Reality framework for learning the inside of the human body. The Authors have tried the framework with children of the Summer School of the Technical College of Valencia. In this test he has dissected if the utilization of a Head-Mounted Display or a typical screen impacts the experience of the students. Results don't offer significant critical contrasts utilizing both visualization frameworks and confirm that students appreciated learning with the framework and consider it as a valuable instrument not just for learning the inside of the human body yet additionally for learning different subjects [9].

These progressions in life system instruction, different reciprocal techniques with innovation of three-dimensional perception have been attempted, and the blast of picture innovation during the most recent couple of many years and this has brought anatomical schooling into another world. In this investigation, we expect to utilize increased reality (AR) innovation to make an intuitive

learning framework, which assists clinical students with comprehension and retain the 3D life systems structure effectively with substantial increased reality support. And guessed that by working straightforwardly with 3D skull models with visual help and unmistakable control, this AR framework can assist youthful clinical students with learning the complex life systems structure preferred and quicker over just with conventional methods [10].

In this paper, we present an AR application to help the instructing of the stomach related and circulatory frameworks created in a cooperative manner with a few instructors, with the reason for improving the understanding of the stomach related and circulatory cycles, developing an inspirational perspective in students and improving the learning measures [11].

III. PROPOSED SYSTEM

The proposed application is to design augmented reality applications for human body function systems like digestive system and respiratory system 3D models visualization and vocal explanation of its working by importing into game engine unity the AR software. It is developed using marker-less augmented reality that does not want an earlier understanding of a customer's surroundings to overlay three-D content material right into a scene and preserve it to a fixed point in space. These apps are usually developed in a partial way that is What You See Is What You Get application development system called the Vuforia extension, allowing the use of position tracking AR. Thus, it helps users to gain information related to the human digestive system and respiratory system and their work can be conveyed interestingly and interactively. The user's input is given as touch input signals from the user are obtained by clicking the button and selecting an option. As the button is clicked OnClick() method is triggered which calls the methods to project 3D models. When the button is clicked it results in showing the necessary information on the display screen, information can be 3D models, audio, textual data.

The application shows the information (3D models and audio explanation) of the digestive system and respiratory system when pointed at a particular position. Here the 3D content will be already embedded within the marker-less AR platform and the target audience is the learners who are interested in knowing about functions of organ structure using the application. The Audience can be anyone, student or lecturer or any person, so generally considered as learners.

IV. RESEARCH METHODOLOGY

The research method used in this application development is a systematic design method to AR content development that includes two steps: creating 3D models from MRI objects with the 3Ds max application and blender, converting the 3D model into an AR asset with 3D unity, and designing the interactive interface.

The proposed AR application consists of 3parts [i] importing 3D models and databases into Unity 2019, (converted formats – fbx, obj, dae, 3ds). The models are imported into unity by creating the folder in the unity editor and drag into the hierarchy section in the unity 2019. (ii)Adapting the contents into the AR environment – Once the 3D models of the digestive and respiratory system get imported. Two scenes are created in unity one for the digestive system and respiratory system. Properties are to be set to the models in the scenes like the Vuforia camera, adjusting the ground plane, adding the materials, and adding the voice property to the models in the Unity editor. (iii) Using the inbuilt SDK, NDK, and Android build support package in the unity, can export the android apk into the user mobile as android application.

The user can begin utilizing the mobile application once it has been installed on his or her mobile device. When the application is first launched; the user is presented with a user interface that allows them to choose a model from the home page. After choosing a model from the digestive and respiratory systems, the Vuforia camera is loaded and searched for a position in the ground plane. Once the 3D model's position in the ground plane has been tracked, the model is projected to the location that the user has chosen on the main page. After the 3D model has been created, the user may begin engaging with the application's voice feature by pressing the play button. A speech explanation of the model will begin and can be interrupted by using the pause button. Also included a user interface that is simple to understand for the students.

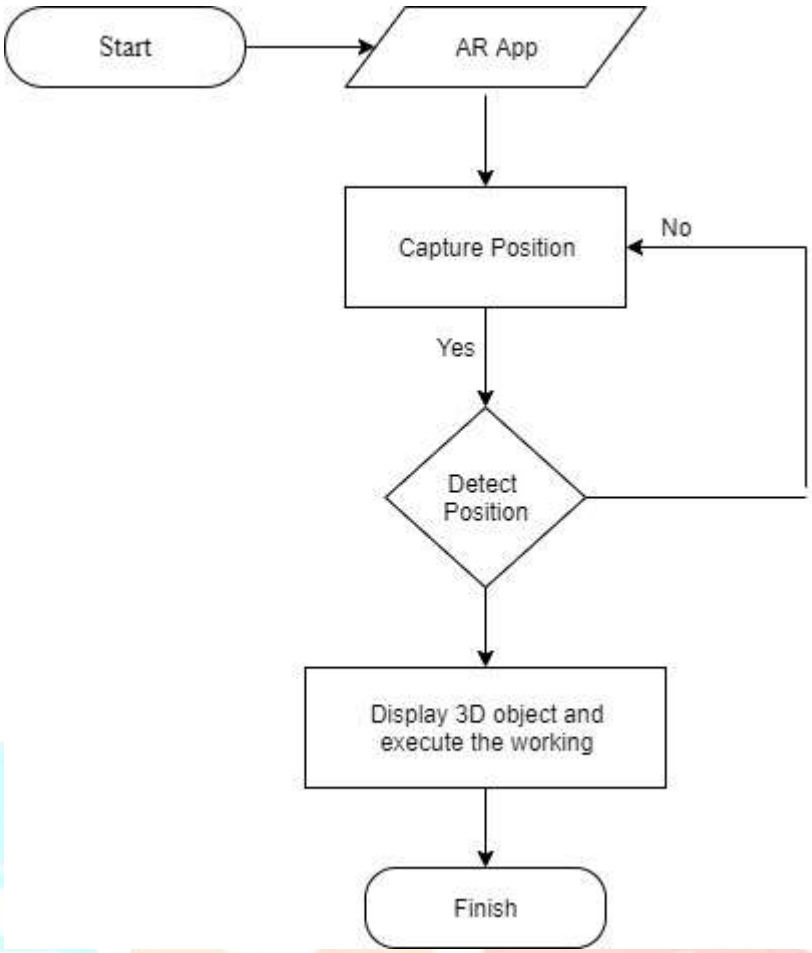

Figure 4.1 Block Diagram of Developed AR Application

V. RESULTS

The modules have been implemented and evaluated. Along with the screenshots, the findings are addressed.

Figure 5.1: Home Page

once the user opens the app the main page is viewed displaying the models name to be selected.

In this figure1, if the user selects the model, the next task will be loaded or clicking on exit button closes the application completely.

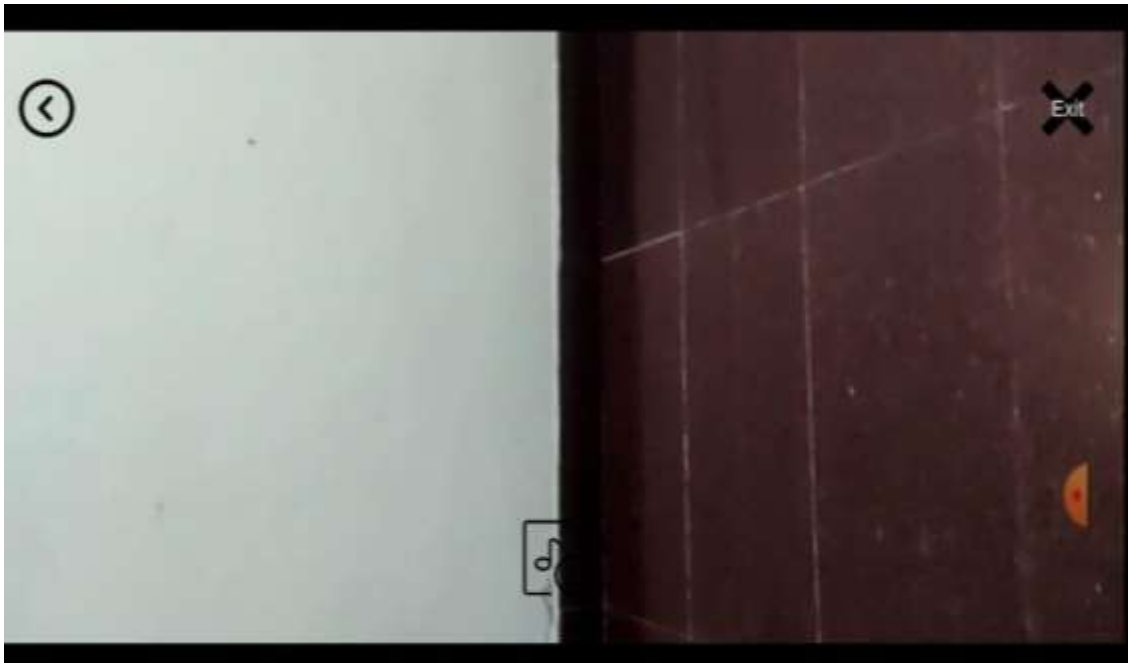

Figure 5.2: AR Camera view

In this figure next task loaded when the user selects any model in the main page and the camera gets opened and waits until position gets tracked in the ground plane.

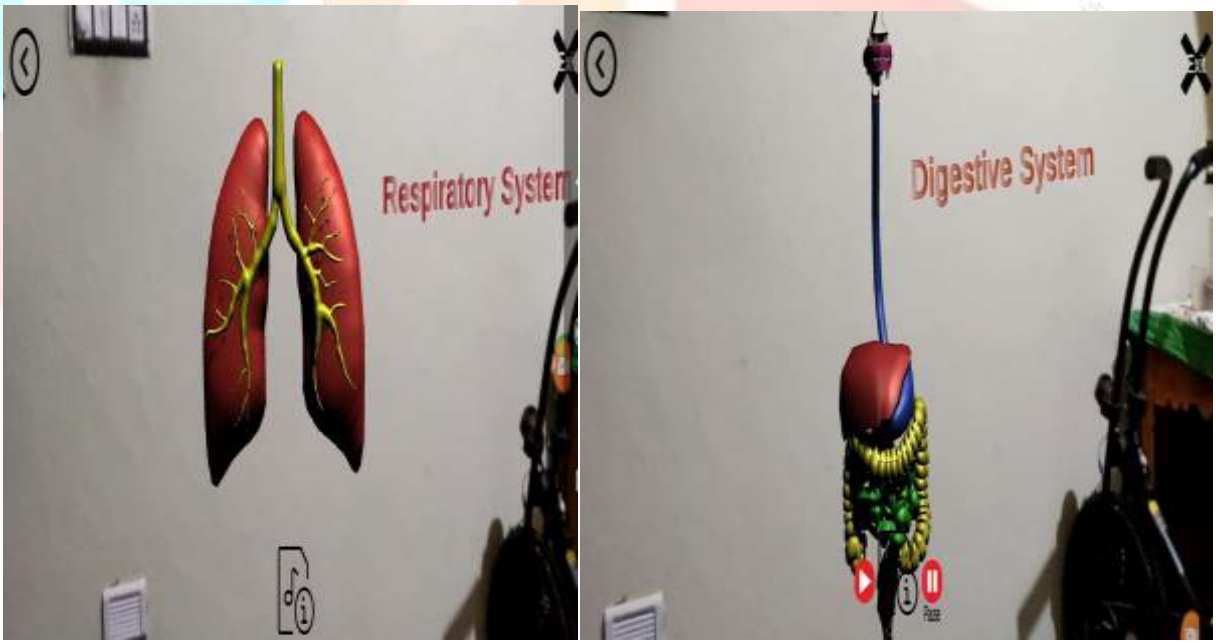

Figure 5.3: 3D models of Respiratory system and Digestive system

When the position is tracked, a 3D model will be projected in the camera whichever model has been chosen by the user. And the user can interact with the voice feature by clicking on the play and pause button which gives audio information about the model and navigate to the main page by clicking the previous button.

VI. CONCLUSION & FUTURE SCOPE

Conclusions of this study are: (1)This AR application provides 3D models of organ structures like the digestive and respiratory systems helps in making the understanding much easier and interactive; (2)The AR technology in this application can be used as an alternative to textbooks and props for learning human body anatomy; (3)It increases the interest of high school students in learning

about the human body easily; (4) This solution will help the students who have difficulty in visualizing the organ structure of a 2 view into a 3D view. Modules that can be implemented as a further enhancement of the application would be implementing the complete procedure into a Head Mounted device or an AR glass. It can also be expanded to include other human anatomical systems and animations. The application might be improved to provide a cross-sectional view of various portions of the digestive system, which would be extremely beneficial to medical students and doctors.

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