International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-4, April 2019

Enhanced Learning with Augmented Reality and Virtual Reality

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Abstract: ***Innovation in training can impact understudies to adapt effectively and can persuade them, prompting a viable procedure of learning. Past research has recognized the issue that innovation will make a latent learning process if the innovation utilized does not advance basic reasoning [2], which means making or metacognition. Since its presentation, increased reality (AR) has been appeared to have great potential in making the learning procedure increasingly dynamic, powerful and significant. This is on the grounds that its cutting-edge innovation empowers clients to connect with virtual and ongoing applications and conveys the regular encounters to the client. What's more, the converging of AR with training has as of late pulled in research consideration in light of its capacity to enable understudies to be drenched in reasonable encounters [1]. Along these lines, this idea paper speaks to a technique for actualizing AR in training. The paper portrays the utilization of AR in various fields of picking up including Medicine, Chemistry, Mathematics, Physics, Geography, Biology, Astronomy and History. This paper likewise examines the upsides of AR contrasted with customary innovation, (for example, e-learning and courseware) and conventional showing strategies (chalk and talk and conventional books). The audit of the consequences of the examination demonstrates that, by and large, AR advances have a positive potential and preferences that can be adjusted in instruction.***

Index Terms**:** ***Artificial Intelligence (AI), Augmented Reality(AR), Virtual Reality (VR).***

I. INTRODUCTION

Augmented Reality is a technology by which any person can visualize the virtual objects. These objects can relate to real life models that not many people get to visualize. A perfect example can be heart, which will be used in this paper. An imperative element of AR applications is that they help to make students active by empowering collaborations with simulation, gaming models, and virtual items. They additionally give learning environment that help classes more engaging and fun to learn. At last, AR applications make it feasible for virtual concepts and theoretical ideas, to be presented with the help of physical articles, animation and hand movements [2].

Regardless of the benefits of AR applications, there are some academic issues that should be taken into thought when AR frameworks are actualized for educative purposes. AR is a moderately an innovation. In the same way as other educative advancements in the past, its implementation may be frustrated by limitations forced by schools or obstruction among educators. In some AR frameworks, the substance and the training course of action are fixed [5]. This is one of the educational issues related with this innovation. Ideally, instructors should be able to change the arrangements as per their students' needs. It is essential for analysts to apply AR innovation in the field of education and to share their reports in this process.

II. BACKGROUND OF PROBLEM

Instructors have started to look for advances that can possibly be coordinated in training so as to enable understudies to adapt effectively and to improve their seeing particularly in Science subjects. The accompanying sub-segments talk about the issues that have emerged in connection to the educating and learning of Science and the manners by which innovation, for example, AR can be connected to address these issues.

A. Diminishing Number of Students Interested in Science Subjects

Because of the well-known observation among understudies that Science subjects are hard subjects, less understudies are keen on seeking after their training in the Science stream. As indicated by Phang et al. (2012), the level of understudies seeking after their examinations in the Science stream has never achieved 60% and there was a stressing pattern of diminishing understudy numbers in this stream [1]. In the United Kingdom, there has likewise been a reduction in the quantity of understudies taking Mathematics, Physics and Chemistry subjects and a comparable pattern all through Europe where youngsters are not picking Science, Engineering and Technology subjects past necessary subjects [6]. Numerous examinations have been directed with the intend to gain from understudies about how to make them increasingly intrigued to ponder Science. One proposal made by understudies that a specialist ought to be available in the study hall to give them the applicable setting for the subject and make the homeroom exercises all the more energizing. Understudies want to learn in intuitive ways as opposed to the customary instructing techniques.

Manuscript published on 30 April 2019.
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Understudies are less keen on contemplating Science in light of their recognition that it is an exhausting subject including too many theoretical ideas.

B. Students' Difficulties in Visualizing Abstract Concepts

Understudies generally observe Science subjects to be unique, requiring a profundity of comprehension and representation aptitudes. At the point when understudies experience issues in understanding the idea well, it prompts misguided judgments [4]. Misguided judgment among understudies must be considered in light of the fact that it can meddle with the understudies' learning of logical standards and ideas. In this manner, the choice of training technique plays an essential factor in dodging or limiting the understudies' misguided judgment. Representation advances have energizing potential for encouraging comprehension and anticipating misguided judgments in the logical space. It is conceivable to improve understudies' perception abilities by introducing an assortment of unique visual pictures and enabling the understudies to control and investigate the pictures. There is a wide scope of accessible advances that can be utilized for the representation of dynamic ideas. Understudies can improve their authority of dynamic ideas using virtual situations that have been intended for learning. Robertson et al. (2008) found that liveliness together with fascinating information and a drawing in moderator enables the group of onlookers to comprehend the consequences of an investigation of data [3]. These representation innovations can be utilized to address the issue of misinterpretation and help understudies see better.

III. METHODS

The system, which is presented in this paper, has in a general sense been made for guidance of life structures in study halls, chronicled focuses or then again shows like cell phones. It revolves around heart, skull and couple of essential organs of the body like liver and lungs.

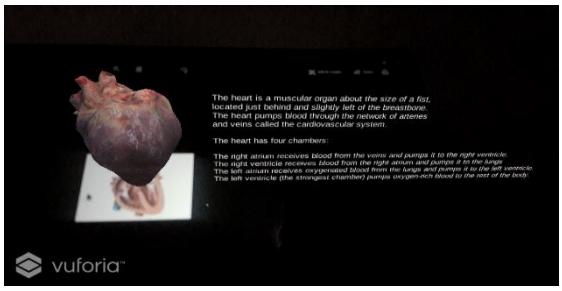

Fig 3.1(a) Human Heart representation

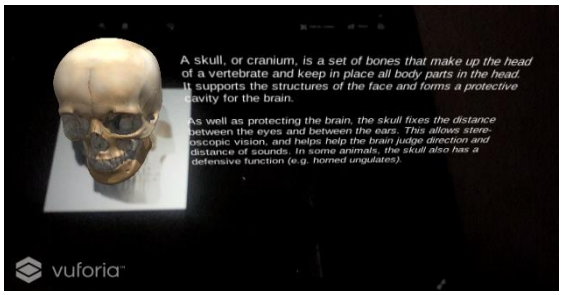

Fig 3.1(b) Human Skull representation

The above Fig 3.1(a) and Fig 3.1(b) show the 3D model representation of human heart and human skull in the app.

The principle part of the app is the AR Camera which is represented by the camera being used by the device. This camera will be the only source of images that are going to be read. These images will be further scanned to match the images on the database.

The second most important part of the app is the surface at 0 co-ordinates. This surface will be required to effectively scan the image and find out its image vectors. If the image is not on a plain surface, it will be difficult for the app to recognize it.

A. Interactive Method

The app uses a more interactive method for students to get more involved and interested in learning. The AR is an emerging technology in the computer field now-a-days. This implementation of AR in education can boost the learning process and make the students more enthusiastic.

This approach is way more interactive than the current methods that are practiced in education. 3D models make the students visualize and understand better than the 2D models.

B. Virtual Reality Approach

The learning becomes more interesting with the involvement of Virtual Reality (VR). VR makes the models more realistic as they appear more real to the eyes. Involvement of Virtual Reality provides a 360-degree view angle and every detail can be observed with more precision.

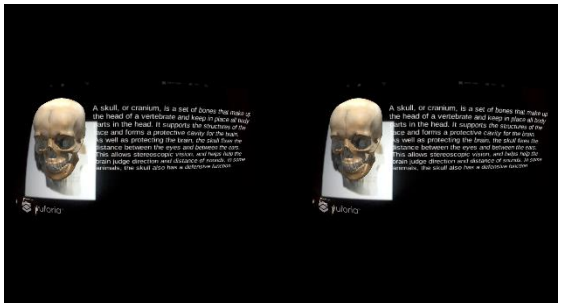

Fig 3.2(a) VR Representation of Human Skull

Fig 3.2(b) VR Representation of Human Heart

It is usually hard to learn things from book where students seldomly get actual perception of any minor detail of the diagram. Students need more practical experience to get things on track. With VR in action, students can learn about minor details of body parts and practise on them virtually as shown in Fig 3.2(a)(skull) and Fig 3.2(b)(heart).

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C. Sound Support

Sounds also can make studying more interesting. Thus, in the app, sounds of organs are provided with the 3D model representation. For example, the heartbeats can be heard when the heart model pumps in the app, bones produce a light crackling sound resembling the folding of bones from joints.

IV. ARCHITECTURE

When the app is opened, first thing that works is the AR Camera. The AR camera will continuously scan for images under its view and with each image scanned, it will process the image, and pass it to further sections of the app. The image processing step includes several sub-steps.

The app uses 2 databases. First one is the trained image dataset. It will contain the images that the app has already been trained of. The other database is for the 3D models. This database will have the 3D models which the app is going to show once images from databases are found on the AR Camera view.

Thus, after the AR Camera work, the processor image is send to a local dataset, where all the images from the image database are stored. There, the processed images are compared with the images on the dataset. If the processed image is found in the dataset, the image is further sent to the 3D model dataset. If the image is not found in the image dataset, the process goes to the initial step, or the AR Camera work.

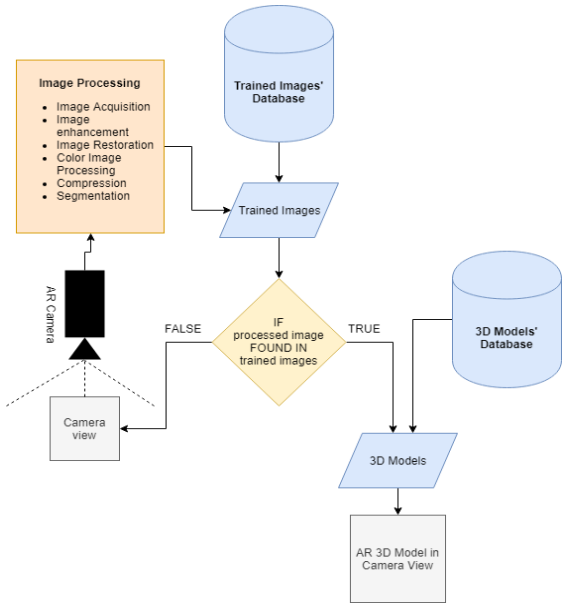

Fig 3.1 Architecture of process

After the image has been found on the image dataset, the image index goes to the 3D Model dataset, where all the 3D models from the database reside. Here, the corrosponding 3D model is bound with the processed image in the camera view. This whole process is repeated with every frame scanned by the AR Camera.

V. WORKING

The app will use the default camera of the android device being used. The camera will be used for scanning the plane under the view of AR camera. All of the images or textures will be under AR camera. The AR camera will try to process each frame under the camera. After processing, if the image matches with any of the images on the database, it will bind the respective 3D model with the image under the camera. Also, each frame is being scanned, thus the 3D model will move accordingly to the image scanned.

Furthermore, the app is using VR and Sound. Thus, these things are also bound with the image.

VI. RESULT ANALYSIS

Thus, when we see the results of the app and its benefits, the proposed system is a beneficiery method of teaching students. Not only students, but the teachers teaching through the proposed system will be more interested in the process. When we compare to the previous systems available in the field, the "**Mirracle: Augmented Reality in-situ visualization of human anatomy using a magic mirror**" system by Tobias Blum , Valerie Kleeberger , Christoph Bichlmeier and Nassir Navab is a perfect system for visualizing human organs. It does show human 3D organs to the human standing in front of it. But this was not a perfect idea for students who want to learn, not only visualize.

Another similar system, "**Visible korean human: Improved serially sectioned images of the entire body**" by J. Park, M. Chung, S. Hwang, Y. Lee, D. Har, and H. Park also focuses on showing human organs to the person standing in front of the MAGIC MIRROR. But theissue was still there. The students coul get more interested towards the mirror but they couldn't get wny knowledge about the topic.

The proposed system eliminates these limitations of the previous systems. The proposed system makes the students visualize the human organs in a real-time studying process. While the students are studying from the plain 2D diagrams from the textbooks, they can conviniently use the AR app, or AR+VR app to visualize the 3D models. An using the proposed system, they can not only visualize, but also get knowledge about the same. In the app, there is a text box which is bind to the 3D model. Thus, while visualizing the organs, students can read about the topic in the same app.Thus, the proposed system has proved to be a better system in many aspects.

VII. CONCLUSION

Though the app is a way more interactive, interesting and efficient approach in education field, the app has a few demerits. No app can be a fully efficient one in any field, they are just better than the rest. This app can boost the education and learning process for students.This is the best approach we currently have towards a better education system. Though, this app has a few demerits.

- The app scans the images under the AR camera, but the images need to be on the database. In short, all the images that need to be scanned must be there on the database or the app must be trained for the images. No other images will be scanned.

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- The text box available will also have a limited amount of data. Thus, the text included will also not be sufficiently enough for students. The 3D model is a interactive way and helpful too, but for getting more knowledge about the topic, the students will have to refer to other information sources.
- The app includes a huge amount of data with its .apk, thus it requires good device to manage the app and its data. The device may be laggy or sometime not working on low-end devices.

Although there are some demerits of the application, this can boost the experience of learning and can make students more interested towards education.

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