International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 11 Issue 3 ǁ March 2023 ǁ PP. 376-378

A Survey Paper on Learn Smart using Augmented Reality

Nidhishree D S
Computer Science and Engineering Dept.
Global Academy of Technology
Banglore, India
nidhishreeds19@gmail.com

Sowmya R
Computer Science and Engineering Dept.
Global Academy of Technology
Banglore, India
sowmyanaidu.r@gmail.com

Spoorthi P M
Computer Science and Engineering Dept.
Global Academy of Technology
Banglore, India
spoorthipm2803@gmail.com

Suchetha J
Computer Science and Engineering Dept.
Global Academy of Technology
Banglore, India
suchethaj13@gmail.com

Prof.Sameena H S
Computer Science and Engineering Dept
Global Academy of Technology
Bangalore, India
sameena.hs@gat.ac.in

Abstract*-The Usage of Technology in education has influenced the students to learn effectively and motivates them while learning. Augmented Reality and its advanced technology have proved that it has good potential and it enables user to interact with virtual and real time applications in number of fields. The review summaries the applications of AR in various domains of learning like Medicine, Chemistry, Mathematics, Physics, Geography, Biology, Astronomy and History. The majority of research studies showed that participants had good feedback on how using AR technology improved subject teaching and learning, which benefited both students and teachers. Study on AR in education field has gained lot of importance because of its active growth in terms of developing technologies and research. Some paper reviews are very limited in the sense that they only covered a limited sample of articles published in the field and narrow time limit and some reviews have only considered journal articles and other documents.*

Keywords*—Augmented Reality, education, technology, marker, application,3D models*

Date of Submission: 06-03-2023 Date of acceptance: 19-03-2023

I. INTRODUCTION

Researchers claim that after more than 10 years of diligent study and development, augmented reality is now a practical solution to a variety of cutting-edge real-time issues. Technology has advanced significantly thanks to augmented reality. One of the emerging technologies in industry 4.0 is augmented reality. This essay examines the integration of augmented reality utilising smartphone-based Android application development in technical training for engineers. Such training necessitates a perfect harmony between practical and theoretical knowledge. One needs to learn the topic in a more visually appealing approach if they want to build abilities that are applicable to the workplace, and augmented reality can be the ideal instrument for this. This technology makes it easier to understand difficult subjects in a more straightforward and broad way because it uses graphical and 3D based learning. To the digital world another major stage is augmented reality, which will eventually display enhanced content and media directly in front of us through a smartphone, glasses, windows, and car windshields. These applications aid in the production of the greatest products in the economic sector, ones that are secure and include valuable data. In addition, holographic projections that surround the environment without the usage of enabling technology may cause our surrounds to be enhanced to display data that is based on our own interests and utilize built-in RFID tags. It would be amazing to no longer need to worry about how to go somewhere, where to eat, or what to do. It will be difficult to distinguish between genuine and virtual objects.

II. AR Technology

[1] Augmented Reality systems to estimate the position and alignment, utilizes computer vision technology in order to blend virtual objects with real environment in which estimation done by two methods, one the marker based and the other marker-less based. In marker-based approach the target images are called markers which are scanned either by website or AR device. Marker based applications consists of scan code like QR code, which will be scanned and they perform specific actions that will be encoded behind it whereas marker-less applications will detect pattern and features and perform actions encoded behind it. There AR tools with zero programming such as Wikitude Studio, Playme AR Creator, Aurasma, Blipp builder and Layar Creator in which small changes made to these applications can enhance learning process considerably. The study made on Media Learning for Biology application consists of techniques such as reading and natural tracking features.

This application was successful and significant improvements made was noticed but research done on complex methods was generally not adopted. Based on the survey of AR technology in various domains of education, an AReD application was developed for anatomy students to study anatomy 3D models. Thus, this paper is a proof that AR plays a crucial role in educational field and it keeps enlarging such that it will be adopted worldwide and also further enhancements and improvements in AR have to be made to increase its role in education.

[2] A proposed method of converting 2D images to 3D images is described. A 2D image, known as a tracker image, is taken using a mobile phone. The next phase, pattern recognition, uses an image processing model to detect patterns hidden in the 2D image. The third step involves connecting the 2D image to a 3D object. There are four basic steps in the building of an AR Android application: The first step is creating 3D models, which can be done with commercial open-source technologies like Max 3D, Autodesk Maya, Blender, and many more. Second: Tracker image creation, which can be done with Vuforia software development kit or AR core. since each image that will be loaded onto the page will follow their unique pattern. Third: Integrate both the Tracker image and the 3-D model into the Unity package. Users of Unity can scale and edit objects using the X, Y, and Z axes. Unity lets users develop in JavaScript and C# to make applications more dynamic and personalized. The fourth: When creating APK files with Android Studio and Java (SDK), Unity can produce Android files that can be run on Android mobile devices. The tracker image duration and camera resolution are crucial for creating 3D models while conducting the experiment and developing the AR mobile app.

[3] The study on AR illustrated the benefits of teaching chemical ideas using a variety of methods, including AR learning and teacher-centered and student-centered demonstrations. Students who were being taught by the same chemistry teacher were used in the experiment. The students came from several junior high school classes of ninth graders. It had 36 chemical components and their corresponding reactions. The experiment was set up so that the results of various tests, including the students' pre-test, immediate post-test, and delayed post-test, could be compared. The hands-on AR learning group had superior performance on chemical reaction ideas in the experiment, and following the learning activities, conceptual comprehension of the chemical concepts was effectively kept for four months, indicating that it had a long-term impact. This experiment has a disadvantage in that class-related effects could not be eliminated because the participants were not divided into groups at random.

[4] A new system was put forward named "ARChemistry" by analyzing current trends in AR to help anyone learn chemistry on smart devices and support Romania's education system. The main aim of this study is to know how productive AR applications are in education. Multi-colored and explanatory visual elements were used in this application to provide a good learning experience. Unity and Vuforia are the technologies used in this application.

There are various modules in this application. The first module allows the user to place his phone on any word in a chemistry book, and it will obtain the related data from Wikipedia and its 3D representation. It is based on text recognition. The second module requires cards which are made in Adobe Illustrator, which are the image targets that hold the full name, periodic table, and chemical formula of the substance. Image targets are recognized with the help of Vuforia. Cards are brought together to combine and form substances. An indication of the correct substance is given if the wrong cards are brought together. The next module is used to test the user's knowledge and earn points. The last module of this application is for the admin to add or remove chemical compounds.

[5] Most of the experiments are conducted with the help of cards as the image target; using a lot of cards will cause problems to use, and the user's real sense of interaction reduces with single-modal interaction. As a solution to these problems, a multimodal interaction algorithm based on augmented reality (ARGEV), which uses gestures instead of card mark recognition is proposed. AR and gestures are combined to propose a system that recognizes gestures in virtual experiments. User's gestures, a virtual model, and intelligent equipment are used to develop an Augmented Reality Chemistry Lab (ARCL). Complex AR tasks are turned

into simple coordinate transformation problems by ARGEV using Microsoft Kinect. VRFITS is developed by combining gestures and intelligent equipment. Perceptual feedback is triggered when gestures interact with virtual models. A convolutional neural network (CNN) is used to train the gesture recognition model. The price of intelligent sensing equipment is very high, which makes it difficult to use in a large number of classrooms, but this design uses intelligent equipment that contains inexpensive sensors. Changes in external signals are detected by VRFITS using sensors in the intelligent equipment. Kinect RGB sensors are used to build a real environment. A prototype system called ARCL is designed and implemented in this research, which improves the interactivity and real sense of operation in virtual experiments. The limitation of this system is that it can recognize only a few types of gestures, so there is a shortage of gesture types when users interact with the virtual experiments.

III. CONCLUSION AND FUTURE WORK

The main goal of this study paper is to improve the current methods of teaching and learning by introducing the idea of augmented reality via mobile devices. Both children teachers will profit from this technology. Additionally, teachers can construct enhanced 3D Models of their subject areas and cleverly explain them to their students. Even pupils can learn the concepts more effectively with the aid of augmented reality 3D models. Another key benefit of android augmented reality apps is that they can be run on even the most basic android-enabled devices with decent cameras. This programme also makes it easier to recognize many targets.

The notion of learning the human body anatomy is more straightforward, fascinating, and simple to use in the produced application. The following are some ideas for future development: Menu selection and interaction can be done without a marker, created using animations for different human anatomical systems; obtained from the scanned item, more precise 3D texture graphics; and used in other fields. In the future, augmented reality and artificial intelligence can be combined to create more advanced apps that are useful.

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