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Augmented Reality in Education

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Abstract: Virtual things are superimposed over the real-world surroundings in Augmented Reality. Educators understand that learning is enhanced not only by reading and hearing but also by creating and participating. Our suggested idea attempts to use Augmented Reality to improve the current educational system. Present working on an app that will display educational information in the form of animations, movies, and 3D models. This initiative has the potential to improve student learning, creativity, and retention. Our application will also encourage pupils' intellectual curiosity, making them smarter. We want to disrupt the traditional educational model and create a new path to a smart classroom.

Keywords: AR (Augmented Reality),Video, 3D Models, Education.

I. INTRODUCTION

New interfaces have been designed to offer natural interaction between humans and computers as the computing environment changes [1]. AR is a technology that allows computer-generated virtual visual information to be layered in real time onto a live direct or indirect real-world environment [2]. For educators and designers, a broad definition of AR would be more productive because it implies that AR may be generated and implemented using a variety of technologies, including desktop computers, mobile devices, head-mounted displays, and so on [3]. In augmented reality, the environment is a live stream that has been supplemented with data and images from the system. AR uses virtual objects or information to overlay physical objects or environments, creating a mixed reality in which virtual objects and real-world environments coexist in a meaningful way to enhance learning [4]. Augmented Reality and Virtual Reality share a number of similarities in terms of technology and features, such as computer-generated virtual scenes, 3D objects, and interactivity. The primary distinction is that virtual reality seeks to replace the real environment, whereas augmented reality seeks to complement it. By combining rendered media with the real world, AR allows the user to become engaged in the produced scene. It may come as a surprise, but according to statistics, roughly 70% of the world's population will own a smartphone by 2020. We feel we should take advantage of these opportunities. For example, we believe that augmented reality presents a tremendous opportunity for schools and universities to engage with students and improve the learning experience. A camera, a screen display, memory, and a CPU are the basic needs for an AR application to produce virtual components. Students can be offered with a variety of instructional options employing AR technology, which will help them become more interested in the subject delivered and improve their learning outcomes [5]. Teachers can use augmented reality to add digital content including a wealth of information as well as physical locations about a place or thing. When you scan any object or location with your tablet or phone, digital information displays on the screen. This digital data comes from 3D models, websites, videos, and other sources. It is now possible to use Augmented Reality (AR) technology for learning as a result of advancements in mobile technology. Attempts to employ augmented reality for training and education have been made. Mobile AR settings can now offer outdoor learning improved by computer simulations and virtual objects, with a focus on real environments, thanks to recent advancements in mobile devices. The goal of the physical and interpersonal connection is to imprint the experience on the visitor's mind. The goal of free education The goal of an educational experience is to pique the visitor's interest, instil a favourable attitude toward the topic, and immerse them in a memorable experience that sparks debate long after they leave. [6] AR is being used in a growing range of applications, including giving point-of-sale information to customers, tourist information on famous locations, computer improvement of traditional printed media, and service information for on-site personnel. The technologies that enable AR are far more powerful and compact than ever before, allowing AR experiences to be delivered to not only corporate but also academic venues via personal computers and mobile devices. As a result, several educational approaches using AR technology are becoming more feasible. [7]. Traditionally, the visuals available to students in books have been two-dimensional images that can be confusing. Traditional learning methods have significant difficulties in maintaining students' interest in the learning process. Due to advancements in computer and information technology, Augmented Reality for Educational Enhancement is thought to be better than ever before, attracting learners from a variety of previously unconsidered angles. AR for Education aids in subject comprehension. It increases students' curiosity and motivation to learn. Students who can envision what they learn have a higher level of attentiveness and memory recall. As a result, individuals are more satisfied with the knowledge they have learned.

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Learning issues that have been discovered in prior studies can be addressed with AR systems. Students, for example, sometimes have trouble envisioning un-observable processes like the world spinning [8]. This shows that augmented reality offers new opportunities and challenges in teaching. AR can be used in a variety of educational settings, from learning the alphabet in primary school to studying various body parts in post-graduate studies. We can see places that aren't accessible in real life using augmented reality. Students find it much easier to learn mathematical formulas after visualizing how they are stated. Special education is required for special youngsters. AR technology can help children with learning impairments, communication disorders, emotional and behavioral disorders, physical limitations, and developmental disabilities. It overcomes the language barrier because a picture can be comprehended by everybody. Deaf pupils are also wellsuited because they lack a distinct sign language with which to communicate with others. They don't appreciate being interpreted over and over. Deaf kids can learn at their own pace thanks to augmented reality. It can be applied to a variety of other disciplines of education in order to benefit everyone. Another study [9] by Vienna University of Technology researchers looks into the advantages of using AR applications in mathematics. According to the study, children traditionally have difficulty visualizing and interacting with threedimensional things when utilizing pen and paper. Students will be able to see three-dimensional items immediately via AR software. In this study, we look at how augmented reality can be used in the classroom..

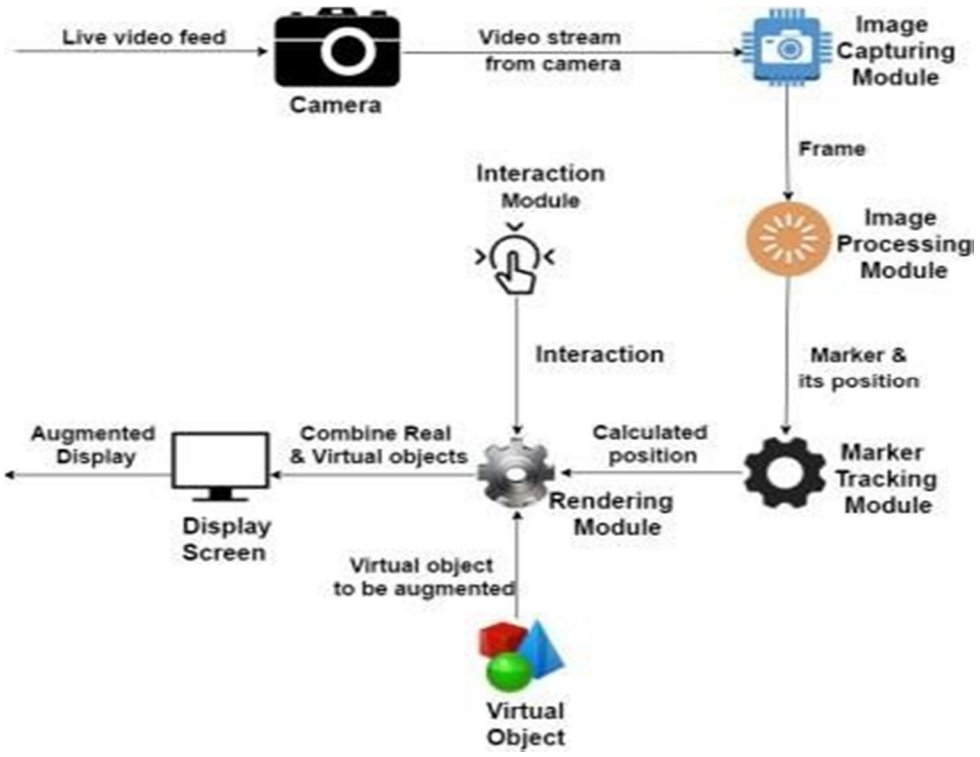
II. RELATED WORK

Several study papers have demonstrated the integration of augmented reality technology with education, as well as the potential benefits that can be garnered from this new technological advancement. All of the research we cited show that augmented reality improves educational quality. The Magic Book, The DehAR Book, The SUN-RA, GeoAR, and The Book of Augmented Chemical Reactions are just a few examples of AR applications. The Magic Book is a regular book that may be read in the typical manner; however, the user can view it behind a display that displays 3D models to considerably enhance its content. [5] Lamees Mahmoud Mohd Said Al Qassem, Hessa Al Hawai, M. Jamal Zemerly, Lamees Mahmoud Mohd Said Al Qassem, Hessa Al Hawai, M. Jamal Zemerly, Lamees Mahmoud Mohd Said Al Qassem, Hessa Al Hawai. The Magic Book was designed to educate 9-year-old pupils how to mix fundamental colours to create new hues, and it proved to be quite successful. The DehAR book was tested on freshmen mechanical engineering students with the goal of improving their spatial skills. This augmented reality application used 3D models to demonstrate the components required to execute spatial-ability tasks. The SUNRA is an augmented reality application that attempts to improve students' knowledge of the solar system. This software displays live videos of the solar system as well as audio recordings associated with various planet motions. Another noteworthy project was the GeoAR, which is an augmented reality application for teaching geometry. Every page of the GeoAR book has a marker as well as an explanation of various geometric forms such as rectangles, circles, and triangles. This application was put to the test in a classroom and found to be successful. Because of the AR-based animations, audios, and 3D representation of the items, the programme was found to be very appealing as well as simulative. [10] Paper Squire & Jan, 2007; Mitchell, 2011 described their SMART (System of augmented reality for teaching) application, which is an educational system based on AR technology. The project use augmented reality (AR) technology to teach low-level concepts such as modes of transportation and animal species. The system superimposes virtual models such as a truck, automobile, or aeroplane on a real-time video feed that is broadcast to the entire class. Visualization of the Brain on the Go Using Augmented and Virtual Reality approaches, they provided a solution for viewing the brain using these techniques in this work. The alignment of the virtual models is not stable in this paper, which is a flaw. A head-mounted display and/or an additional backpack with computer equipment are two examples of AR technologies. The inconvenient and costly design may cause issues such as pain and a lack of depth perception [8]. Kerawalla and colleagues, 2006. Another difficulty is the trade- off between location dependency and in-dependency in technology design (Klopfer & Sheldon, 2010). While location-specific technologies help students contextualize their learning, provide a connection to a specific location, and help students give new meaning to familiar places, locationindependent design benefits from portability and flexibility, as it does not require teachers and students to be present in specific locations and could save money on transportation. AR in the classroom, like many other educational advances in the past, may face restrictions from schools and teacher push back. The nature of typical AR system approaches, on the other hand, is considerably distinct from the traditional teaching methods' teacher-centered, delivery-based focus. [8]

Kerawalla and colleagues (2006) [11] "Augmented Reality in Education," M. Billinghurst, New Horizons for Learning IX, October 2003. AR has not been widely adopted in academic settings due to a lack of government funding and a lack of understanding of the need for AR in academic settings. [12] "Integrating a mobile augmented reality exercise to contextualize student learning of a socioscientific topic," Hsin-Yi Chang, Hsin-Kai Wu, and Ying-Shao Hsu, 2013.

There are numerous experiments underway to increase the compatibility and usefulness of augmented reality in everyday life. However, numerous problems remain about its usage in education and training, according to [13] Kangdon Lee, "Augmented Reality in Education and Training," 2012. These include issues of cost effectiveness, efficiency between AR teaching systems and traditional techniques, and the like. According to the study, the average score of students' perceptions of mobile AR activity is 7.6, which is higher than the 7.3 mean score of student perceptions. "Using the tablet computer to go outside and actually collect data allows me to acquire a sense of the lesson quickly," one student explained. The students' overall impressions of this AR activity were positive. From the pretest to the posttest, the students made remarkable progress on the 15 conceptual questions. This finding suggests that a mobile AR-enhanced SSI unit can help students learn science concepts better. [14] R. Freitas and P. Campos (2008). SMART is an augmented reality system for educating 2nd graders. Human-Computer Interaction: Proceedings of the 22nd British Computer Society Conference (HCI 2008), pp.
27-30. Liverpool John Moores University in Liverpool,
England AR will make classrooms more productive,enjoyable, and participatory than they have ever been. AR may engage a learner in previously unimaginable interactive ways, and provide each individual with their own personalized discovery path filled with incredibly rich content from computer-generated 3D environments and models. Many studies have found that learning through play and instructor guidance can help youngsters overcome their early anxieties of certain subjects and even begin to like them. According to many papers cited, Augmented Reality-based books and applications have been developed for educational purposes, but they are just for self-study and are not employed by institutes. One of the most significant flaws in all papers is that we are unable to provide references.

III. SYSTEM ARCHITECTURE



IV. PROPOSED SYSTEM

Proposing a remedy for the dwindling interest in education. Bringing textbook knowledge to life can have a significant impact on students' interest. We intend to bring previously unthinkable objects within reach of the human touch. Seeing objects interact with motions and seeing them up close might help youngsters remember content for a long time. Young children, in particular, can read books in more dynamic and realistic ways by superimposing 3D produced models onto books using AR technology.

A. Advantages

1) It delivers a fantastic student-friendly environment.
2) It's utilized to locate a specific image in a book.
3) It includes basic instructional videos.
4) It uses AI technology to recognize and infer a certain image.
5) It also highlights the book's most essential keyword.
6) It also includes 3D moving elements to help demonstrate an idea more effectively.
7) Improved video sound quality with faster retrieval

V. METHODOLOGY

All we need is a smartphone. The inbuilt camera captures live video from the environment and delivers it to the image capturing module, which divides the video into frames and sends each frame to the image processing module. The image processing module recognises the marker and communicates its location to the marker tracking module. The marker has now been identified and submitted to the rendering module. A virtual object is matched to the marker in the rendering module, and that virtual item is superimposed on the real video picture. The augmented video is finally displayed on the screen. When the user interacts with the virtual items, the appropriate response is created and displayed on the screen. We'll show you how to interact with virtual things in a variety of ways that will help you grasp the study materials better. Touch-based, gesture-based, and voice-based interactions are examples of different types of interactions. For faster marker detection, we propose to adopt a more modern and faster image processing approach. We'll employ powerful graphics processors and a high-resolution camera to reduce the likelihood of errors and speed up image rendering. We'll create photos with a lot of colour contrast. To eliminate distortions in the augmented feed, we want to construct a highly realistic 3D model or animation.

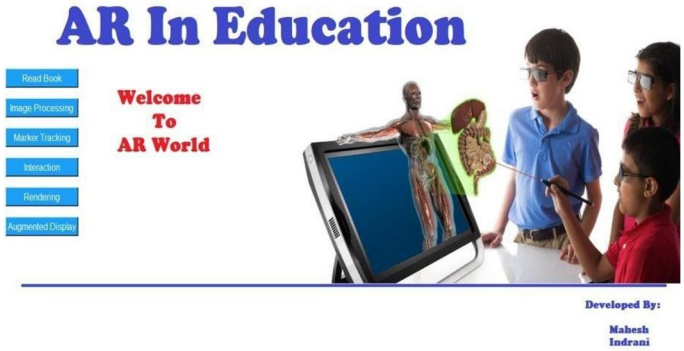


Fig 3: Menu This is the menu page which consists of the menu such as Read Book, Image pre-processing, Marker Tracking, Interaction, Rendering, and Augmented Display

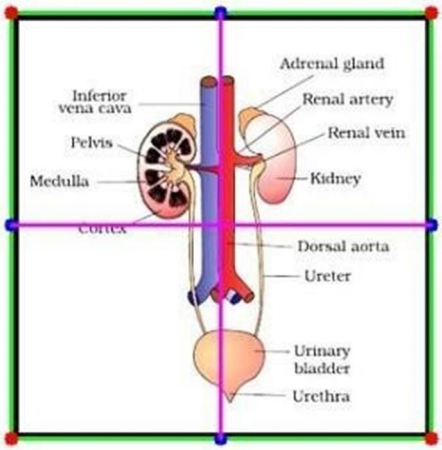


Fig 4: Read Book This module loads all the images from the book

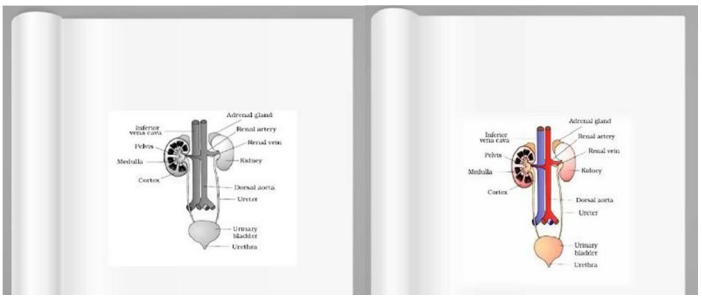


Fig 5: Preprocessing This is used to convert the color image into gray scale image. The actions taken to format images before they are utilized in model training and inference are known as image preprocessing.

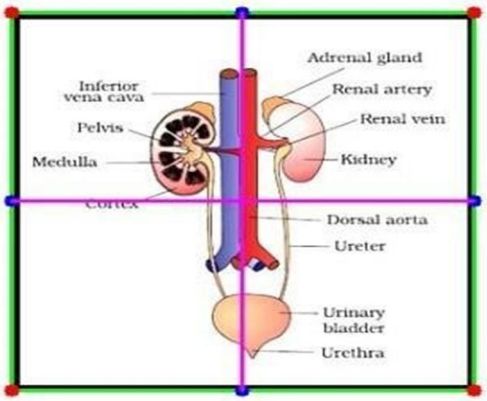


Fig 6: Marker Tracking Maker-based AR works by scanning a marker which triggers an augmented experience (whether an object, text, video or animation) to appear on the device. It usually requires software in the form of an app, which enables users to scan markers from their device using its camera feed.

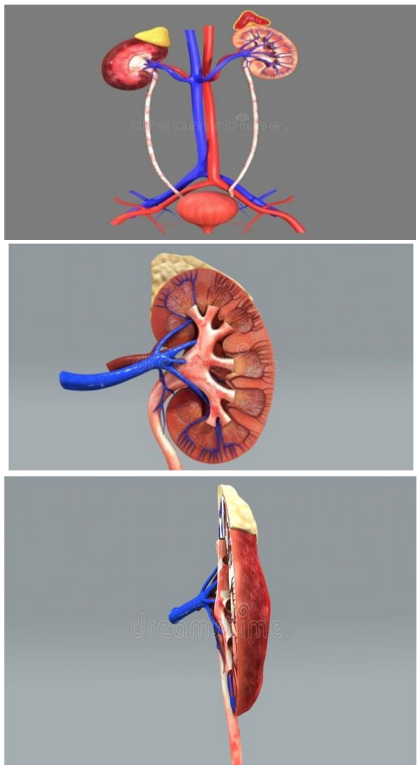


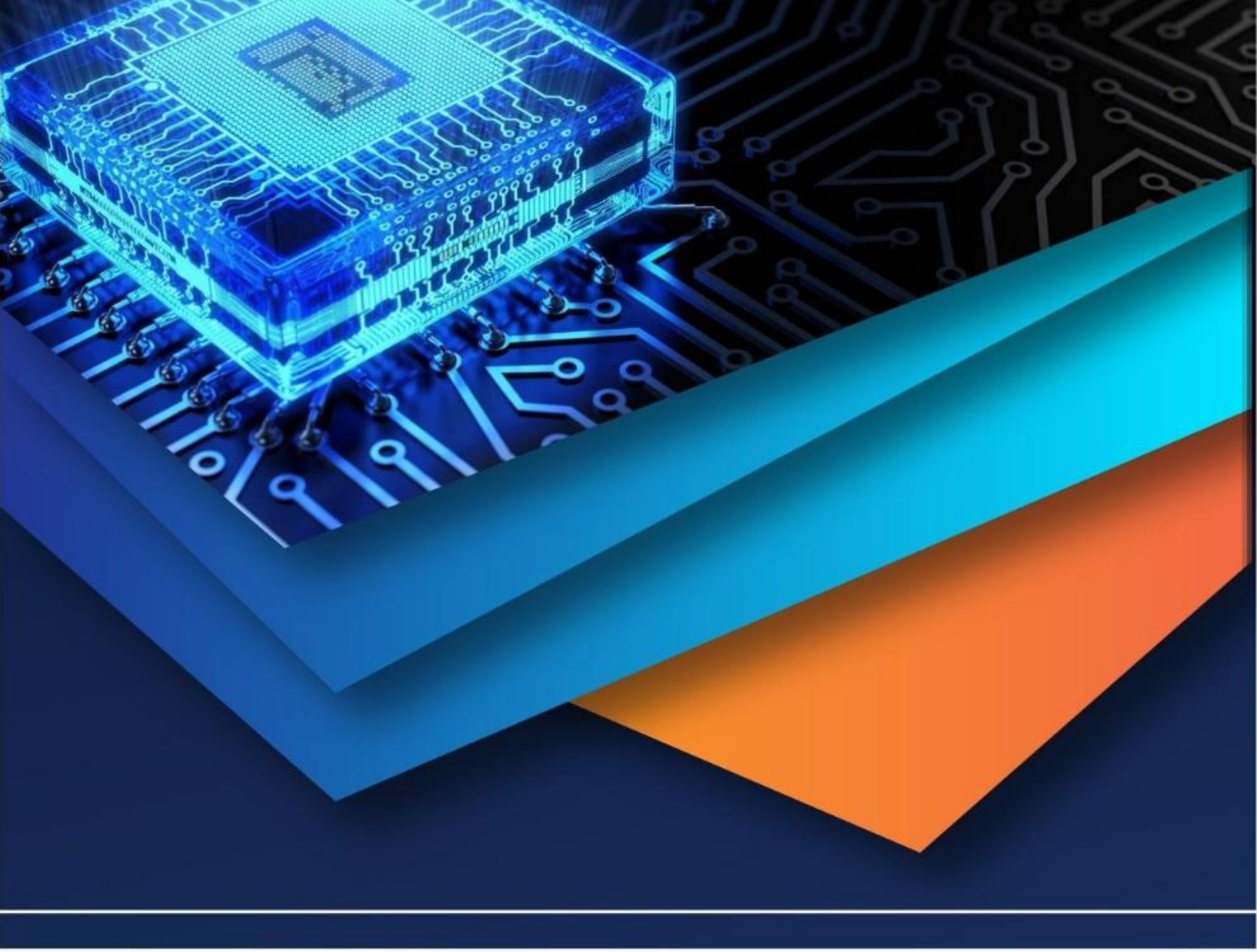
Fig 7: AR

VI. CONCLUSION

Augmented Reality has a promising future since it allows for better interaction between the real and virtual worlds in previously imagined ways. It's a different manner of interacting with the User Interface. Augmented Reality is still in its infancy and offers a plethora of opportunities to investigate. We intend to create educational augmentable content that corresponds to institutes' teaching methods and curricula. Institutes can use our augmentable books in this way to make teaching their curriculum easier. We intend to employ this technology to help youngsters with learning impairments because visualizations are really beneficial to them. We propose that a module be added that allows users to interact with augmented items.

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