



‘Kid-O-Pedia’ an AR-based Mobile Application to Learn Rhymes for Primary Kids in India

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Abstract- Education plays an important role in growth of the country, society, and development of an individual. Traditional methods being used in Indian education system have not proven interactive for kids. However, the introduction and use of new technology for interactive fun learning were important factor to make teaching-learning process more effective. Visual learning is one of the effective types of learning styles for kids. Unlike traditional education methods it focuses on learning through watching and listening rather than reading. To address this problem, we propose a new interactive learning opportunity for primary kids. This paper proposes an augmented reality-based android application to learn rhymes for primary kids in Indian education system. This application is built with a purpose of improving classroom learning through increased engagement and interactivity by using features of augmented reality. Augmented Reality is a technology that superimposes a computer-generated image on a user's view of the real world and provides a composite view. The original scope of application is to augment rhymes from the NCERT English book for first standard students. We enhance the use of this technology in education rather than entertainment by targeting the particular book being used in most of the schools in India.

Keywords – augmented reality in education, mobile application, rhymes.

1. Introduction

India is a developing country and according to the 2020 macro trends report the rural population is 64.61% and a literacy rate 74.37% [13]. The schools in rural India have been taking many initiatives to improve learning outcomes like increasing student-teacher ratio, providing training to teachers and additional infrastructure. Therefore, with advancement in technology many schools in India are adopting additional infrastructure by incorporating different information and communication technology like mobile phones, tablets, desktop computers, smartboards etc. Nowadays the use of mobile phones is increasing for education purpose. We can introduce an interesting technology like augmented reality in Indian education that can be used simply through smartphones.

Augmented reality has always been an interesting domain in education but is underdeveloped in India. In this project, we will be looking forward to implementing an android application that augments the characters present in the rhyme on a student's book. This is a very unique way to teach and increase student engagement in classroom activity. This application encourages fun learning in primary education. Augmented reality generally starts with any camera-equipped device such as a tablet, a smartphone, or smart glasses. These devices contain software that supports augmented reality. When a user points his/her device to some object, the software marks the surface on which characters will be augmented. Then it recognizes the video stream and downloads information of objects present in the video from the database, in much the similar way that a web browser loads a web page using a URL. A major difference is that the augmented reality information is presented in three-dimensional animated objects rather than in a two-dimensional web page on a browser. Then users can experience augmented objects as partially real and partially digital [12].

Augmented reality is being used on large scale in India for education purposes. It is also being used in the education stream but in a different format where you have to buy books in which some codes are embedded. Students can scan these codes by using their device and then it will try to match the image with mapped images in the database. The software recognizes the image by using computer vision technologies and then augments the objects by downloading related resources.

Virtual Reality and Augmented Reality are the technologies being used to transform the education world and learning experience. Though, India is not far behind in using such modernized technology and obtaining its advantages. Augmented reality applications are being used by different universities in India. In the present times, educational institutions are trying to replace traditional classrooms with modern classrooms using this technology. Even though online learning offers convenience and flexibility in the learning process, it also comes with its fair share of challenges, especially in India. One of the major issues with remote learning is the amount of distraction faced by the students due to the other content available in abundance on the devices they are using to study is more fun than studying. The shift in studying from books to digital devices has also led to a reduction in the attention span and engagement levels of the learners. Furthermore, physical classes offered entertainment and engagement in students and teachers that has been always helped in concentration and attention. This is the major drawback of online learning as teachers cannot capture the activities of the students at the time of teaching.

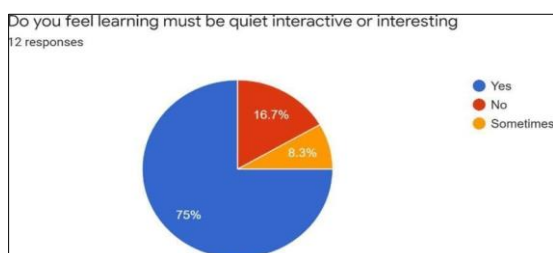
Along with higher education, primary education is also welcoming this breath-taking technology for kids fulfil development. As the age of primary school students is the age where they start gaining knowledge of the world and learn new concepts. This is the time where students enter in the education system and this is the time when we can grow interest among them for exploring different things. To enhance their learning in a fun way will be a lot more effective rather than pressuring or burdening them with syllabus and exercises. The main challenge of using this technology for such small age student is based on the usability of the applications present in the current time. It is now a challenge to develop ways to use this technology for primary student which will include features to enhance the understanding capability of student, handy tools with attractive look and feel, things to avoid distraction and the most important not anything that can affect their mental or physical health.

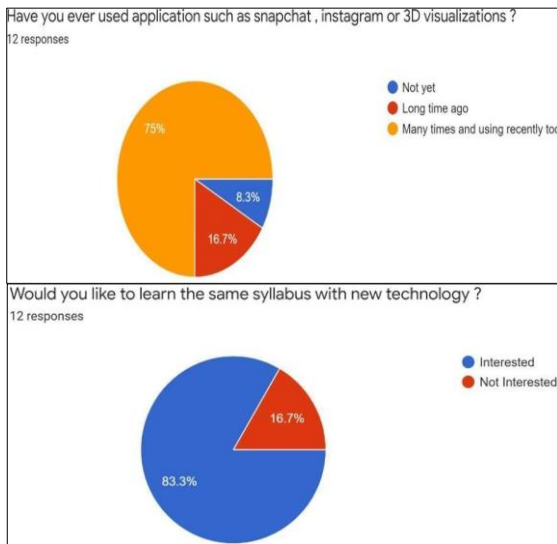
2. Literature Survey

Literature survey is divided in two parts. First part is user study. In this part we prepared a questionnaire and asked some primary students to answer the questions in it with the help of their parents to study our targeted user group. We also study some already present application on some platforms to study existing features of this technology. Second part is to study research papers. In this part we have studied around eleven research papers published by some of the most prominent universities around the globe. Below is the summarization of few of the papers which influenced our approach.

2.1 User Study

This step includes a questionnaire to study the targeted group of our project. For which we created one questionnaire with few questions in it. Questions were based on the comparative study between offline and online education. It includes some questions to know the interest and understanding of students in online classes going on due to the pandemic situation. The last thing we wanted to be sure about the usability of our application, for which we checked the usability of application 'Snapchat' as it is based on augmented reality and popular in India among young age group.





User Study survey was done using google forms, which were filled by parents with child's discussion.

By studying this user study thoroughly, it is concluded that during the time of pandemic, online education was a bit challenge for primary students. Also, on online platforms teachers cannot observe or control all the activities of users. It was a less interactive way of teaching as compared to physical mode of teaching. Students were having trouble in understanding the concepts, focus in studies and perform different exercises. Another important question here was regarding to usability of application for such small age kids. As snapchat is an application currently being used on large scale in all over the world by almost all age groups which is using the features of augmented reality technology. As kids nowadays are using this application, they will be able to manage to learn and use such kind of application for study.

2.2 Study of Research Papers

Safar et.al.,2017 [1] have discussed This experimental research take a look at scrutinized the effectiveness of the usage of augmented reality (AR) programs as a coaching and studying tool while coaching kindergarten children in the English alphabet. Sun et.al., 2019 [2] have discussed Human-computer interaction (HCI) has been developed swiftly in these latest few years, and increasingly more researchers are inclined to use HCI strategies into schooling. Nanda et.al., 2019 [3] have mentioned This paper the Augmented reality area to enhance schooling facility for kids. Parhizkar et.al., 2019[4] have discussed in this advanced generation international, children observed that reading in traditional manner is just too uninteresting and tough, while there are so many entertainments out there that is a great deal more exciting than analysing in line. Dunser et.al., 2018 [5] have discussed in this paper, they have got discovered kids studying an augmented book geared toward early literacy training. Andy S.Y.Lai et.al.,2018 [6] have discussed Augmented truth is an rising era and the programs of era are still not absolutely recognized. Hossain et.al.,2019 [7] have stated children from Bangladesh in recent times ought to analyse two or extra specific languages, most generally Bengali and English. Faima Abbasi et.al.,2019[8] The intention of this work is to improve student's understanding of sensible phenomenon of nature or increase their hobby and decorate their competencies closer to studying. Chris Y.k Wong et.al., 2015[9] This paper explores a brand-new software of augmented fact for a new route in e book publishing, which aims to convey interactive and effective studying experience to existence. Poonsri Vate- U-Lan et.al., 2012[10] This paper reports on an AR curriculum substances studies and improvement project which employs storytelling as a coaching approach in a digital mastering environment. S.Zagoranski et.al.,2003 [11] The primary idea of augmented truth is masking virtual objects on an actual international thus "augmenting" the real global image right into a virtual global.

By studying some research papers, we conclude that there are very few projects that are implemented to enhance the education in India by using the technology of augmented reality. Some developed countries are using technologies like augmented reality for interactive learning. As kids of age 5-7 years are not able to read books and study by themselves. Also considering the rural population of India it is difficult for parents to adopt advance technologies for their kids' growth in education. Hence there is need to promote new technologies like augmented reality to make Indian education system more technology driven and interactive.

Going through a long survey of effects of pandemic situation on Education and considering all above aspects we came to a decision. There should be a system which should increase the student's interest and interactivity. This suggests to build an AR book which will convert boring textbook into an extremely fun learning application. Various applications are published which are using AR for entertainment and games for children, by using same strategy solving exercises will be a lot easy. This application will take children to a different world and bring characters from book in front of them and then there will be no need to mug up what they are being taught. In these book world students are now willing for something new. Hence AR book will introduce different aspects of world, not in the pages of book but around them.

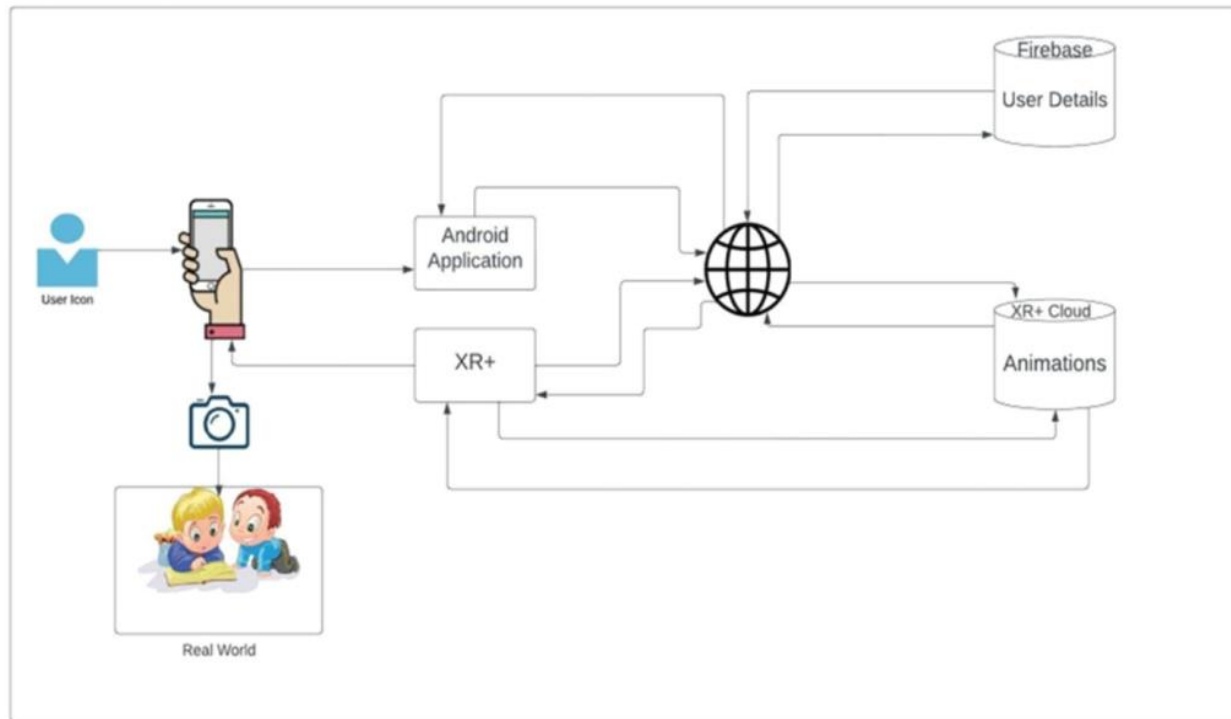
After this long literature survey, there will be system design which will help to develop the application. This system design will give the overview of the system and its working.

3. Methodology

To overcome the gaps identified by going through a large literature survey we propose an augmented reality-based application that is discussed in this section. As a part of methodology, we have recognized target users of 5 to 7 years for AR-based application. Then a questionnaire was prepared on google forms platform and shared among selected number of kids studying in first standard for knowing the interest in traditional education and identifying the familiarity with the AR-based applications which are present in the market like snapchat. Procedure was followed for software development of 'Kid-O-Pedia' where we studied user requirements. Study of user requirement includes study of syllabus and different ways of teaching for our target age group. Prepared questionnaire and asked students to answer different questions in it. Then interviewed children as well as parents to identify problems they are facing in online education. To build this application we Took a NCERT book of first standard and English subject. We Designed characters and different scenes present in the rhymes followed by animation of characters. Audio files were attached to respective animated scenes. After building the application we carried out user testing by providing our application to selected users and teachers from a primary school for beta testing. We collected feedback from teachers regarding usability of application.

3.1 Model Architecture

'Kid-O-Pedia' an AR rhyme book application based on augmented reality with a simple architecture as targeted user group belongs to small age where it is possibility that they will not be able to understand complex architecture. Most of the systems presented in research papers we studied and some of the existing application requires scanning the code or some images by pointing a camera equipped device at it. To remove this complexity from the application we proposed a simple method that seems like finding a page number of a poem in book's index. Further this architecture involves cloud-based platform that will reduce the request time as fetching video data takes quite long time. This cloud integration majorly parts in saving the storage space of device in which user is installing this application. Another major component in the architecture is to point a device at some plain surface on which augmented characters will land. This application follows marker-based technique where augmented reality software first scans the plain surface and marks it. The characters land on this marked area only and remains bounded to it throughout the entire session. This architecture really helps characters to remain steady on a surface. User can move device as per the direction of characters moving on a surface.



Add Name to figure

Add description of Architecture

The system architecture majorly divides system in four parts.

1. User registration.
2. Data fetching from XR+ cloud
3. Mark plain surface
4. Load augmented objects on the surface

3.2 Process of building application:

The application building steps are given below,

Step 1: Create and animate objects in blender here we will create our model in blender and animate all required models one by one.

Step 2: Erect user interface in android studio using material design here we will create and design our android application in android studio by use of material design.

Step 3: Connect database to UI (user interface) here we will create our database in firebase and then connect to our android application UI.

Step 4: import 3D models in XR+ here we have to import our animated models which we have created in blender and make sure all our models satisfy the XR+ import requirements.

Step 5: Augment 3D models into real world using XR+ now once we imported the model now, we have to augment all our 3D model by going to AR section.

Step 6: Bridge XR+ with android studio here in this step we will connect our XR+ augmented models with our android application.

Step 7: Build & install application so this is our final step here we will install and test our final product.

4. Screen-shots of Kidopedia

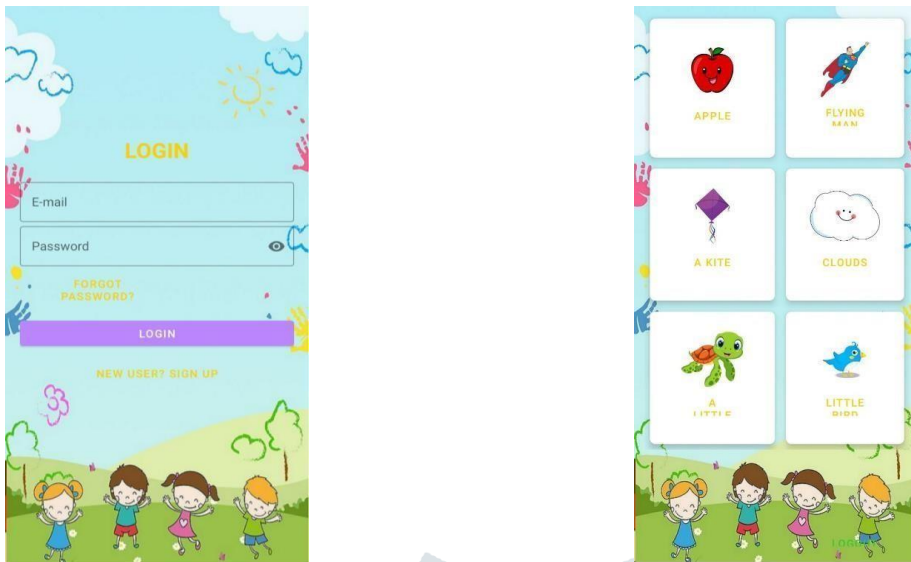


Fig. 5.1 Screenshot of a) 'sign up' and b) 'login page' a), b) sdfdsfdsfdf c) sdfdsfsd d)

Figure 1(a) depicts the screen-shot of sign-up page of Kidopedia app. This will be very first page for the user when they start their session. Here user have to create their account if they don't have any, if they already have an account, they can directly go to log in page so while creating account they have to first give their email id which is already existing next they have to create any random password but validation is present so password should consist of 1 special symbol, 1 capital letter, at least 1 alphabet, at least 1 number & 8 characters.

Login Page

Once user is done with sign-up procedure user have to come to this page here, they have to enter their login id/email id as well as password which they have created in sign-up page so the details will be checked from data base(firebase) if the details are matched the access will be given if the details doesn't match then user have to re-enter the details and if they have forgotten their password, they are reset their password from forgot password.



Fig. 5.2 Screenshot of dashboard & sample superman poem

Dashboard

Once the User is authenticated by login page they will be redirected to Dashboard/home page dashboard consist of menu as well as it will also display the poem which are available for the students, students/users can view by clicking the name of the rhymes user will be redirected to browser where the rhymes will be displayed, clicking on pictures won't work. In menu you can select any class/grade which you wish to view, you can also attempt activities which are present in main menu after performing activates we can also view our progress and download the report.

Augmented Poem

So, this is final step once user selected any particular poem by clicking on it from dashboard, we are redirected to default browser here the camera will scan the surface & look for plain surface if the plain surface is not found then it

won't display the objects once the system detects plain surface it will display all object and the animation as well as the audio of the poem will start and all this will be visible on your mobile screen. User can also move/rotate their mobile to view poem from different angles as the objects have tracked the surface it won't move from give platform so the sure can enjoy Augmented Poem from different views & they can view objects in real world. For creating AR rhymes, we have Create and animate objects our model in blender and animate all required models one by one later we imported our animated models which we have created in blender and make sure all our models satisfy the XR+ import requirements Augment 3D models into real world using XR+ now once we imported the model now, we have to augment all our 3D model by going to AR section.

5. Discussion

As a part of testing this application, a school was chosen from a list of schools under Unnat Bharat Abhiyan. Installed 'kid-o-pedia' on the smartphones provided by school. Logged in with different account on those devices. Then these devices are handed over to children for getting their feedback. Around twenty to thirty students used this application and they found it quite interesting to learn rhymes in this way. Different reactions were identified by teachers and our team. Most important thing is students could easily learn to use the application. They were able to select any poem they wanted to learn and hold their phones stable on ground or table. Students found the application very interesting as they saw characters from the poem in front of them. As a result of this observation, we can conclude that the application is user friendly. it can be used by kids for self-learning as well as by teachers and parents for teaching. Its simple user interface and only few steps make it easy for kids to adopt in rural areas also. Integration with cloud-based platform makes it highly available. Maximum population in India especially in rural areas uses android phone that makes this application accessible to large target group. 3-dimensional objects and animations are stored on cloud, it does not overheads device's storage space. With these kinds of advantages, cloud integration also results in disadvantage that it cannot be used without internet. Looking towards interactive and fun-learning provided by this application we can scale up by uploading content for different subjects like history, maths, geography etc.

Conclusion

We are building this application to introduce a latest technology of Augmented Reality in Indian education system and also to continue the interactive learning and activity like teacher for children of age 5-7 in these pandemic times which will help them to boost Their knowledge. In these bookish world students are willing for something new. Hence AR book will introduce different aspects of world, not in the pages of book but around them. the faculties must be endorsed to introduce conceptual mastering a good way to avoids students to mug up what they may be being taught. interest and instructiveness of the students closer to their domain has been totally misplaced. Self-getting to know the ideas the usage of the traditional methods wastes numerous times of students. coaching community is also lacking somewhere to explain the ideas due to this on-line mode. Three-six year old kids generally need quite a few motions and exploration, and these are matters that you couldn't sincerely do remotely, in particular by way of simply sitting and stare at a display screen. although there have been many negative impacts from the COVID-19 outbreak on the field of schooling, there was additionally a high-quality impact if you want to take the education gadget and its techniques a step higher. The pandemic has given chances to innovative methods of transmission of know-how across the globe. era will help to create an active environment wherein students cannot simply solve problems, but also discover their very own troubles. This technique to getting to know could be very special from the everyday college lecture rooms, in which college students spend maximum in their time mastering by lecture or and doing the issues on the stop of the lessons. future work, For Usability observe (HCI) we are going to perform user checking out for it we are going to visit a primary school where we are able to ask college teachers and college students to our application (kid-O-PEDIA) and take their precious feedback and carry out the changes and try to meet their requirements given in shape of feedbacks & reviews

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