

# Superimposition of 3D Objects for Education using Augmented Reality

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**Abstract:** - Different levels of Learning Disability (LD) has affected millions of people in India and on an average each class has five students with Learning Disability symptoms. However, children have great imaginative power and it is the age when the brain starts developing. Therefore, it is necessary to develop a stable system where it will assist student and help their imagination and learning. This report presents the implementation of an ARBook with a marker less application which will help students with Learning Disabilities. This implementation includes different ways to help children learn by themselves and understand. This makes a study and play model.

**Keywords:** ARPlaybook; Augmented Reality

## 1. Introduction

Education is an important part of every human being life, especially providing proper ways of education to children can make a successful career. A child wants to learn by its own way and means, pressuring a child cannot provide good results all the time. With the help of augmented reality, this paper is going to demonstrate how a child can self-learn and make his/her study lot meaningful and enjoyable. This paper explores two types of augmented reality applications, one is Marker Based AR and other one is markerless AR application. An ARPlay book will be used for demonstrating marker based augmented reality. These applications will help all the children including learning disabled one [4].

### A. Existing system

The current educational system in our country is Physical model education system. There are not many educational based Augmented reality applications. However, the current system has video projection and the pattern in which learning disabled student should hook up with the topic is slow. The Applications in India for children in school are not yet developed using augmented reality. The work under Augmented reality has started and will play an important role. Applying Experience Based Learning (EBL) to real world problems to motivate students to identify, communicate, collaborate, apply their knowledge effectively. This EBL is currently applied in most

of the schools across India with reference to physical model usage and audio- visual implementation [10].

### Demerits:

- Focus is on Text book Knowledge, where they could be fun applied to learn.
- Amount of work provided is more and lead stress
- Most knowledge is memorized
- Examinations are focused on results rather than continuous learning

### B. Proposed system

The proposed system uses Augmented reality technology for developing application for kids to enhance their learning experience. This paper covers basic aspects for kids between the age group of two to seven. It allows them to have hands on experience with the device and can learn by themselves with the help of the application. This proposed system also makes a child more comfortable due to enabled play and study mode. The system has implementations of both marker based as well as markerless augmented reality applications. This paper ensures the use of Experience Based Learning (EBL) in a new way with the help of Augmented Reality. The implementation show the superimposition of 3D object on a tracker which will give the real object view to the user with the related audio output so that a child can easily understand and learn.

### Merits:

- Better imagination
- Enjoyment along with study
- Models displayed looks real, which attracts attention.
- Students can self-learn
- When there is some image imposed it will be easy to understand.

## 2. Related work

A. Classification of data using semi-supervised learning (a learning disability case study)

In this paper [1], the authors have observed that about 10% of children enrolled in school have a learning disability. It is

difficult to detect learning disability early ages; however, this paper makes a classification of the data using a process. The authors of this paper used a java implementation to categorize the Learning deficiency. They took out a case study to know weaknesses of students. The result of case study was that normally 14 percent students in a class are affected with learning disabilities.

*B. Exploring the Use of Augmented Reality to Support Science Education in Secondary Schools*

This paper [2] estimates the details on Previous research efforts in the field and show that AR can provide some benefits for education. The adoption of Construct 3D tool for exploring and learning about geometry. It makes use of computer-aided-design (CAD) and combines it with AR technology to build a learning tool allowing its users to communicate with each other in a natural way. Construct3D was used in an experiments and requires some one doing maintenance and technical support to run. One key discovery was that in order for the AR application to be used for learning, it needed to be seamless and transparent; allowing the user to focus on the actual task instead of application itself. This paper exhibits some of the potentials and benefits of using AR, but simultaneously it turned out to be too complicated and hard to implement in everyday school practices schools.

*C. An Immersive Augmented Reality System for Education*

This paper [3] describes how an Immersive Augmented Reality application works with a book. It acts as a new way of learning where book is scanned to get the results. A survey was conducted on students and educators who have tested the application. The purpose of the analysis is to study the effectiveness of the application in improving the user’s learning methodology and help to devise plans to improve the system. The main AR system hardware comprises of an input sensor (camera), a processing unit and an output display which are all available in modern smartphones and tablets. The software is collectively made up of various image and target recognition components in the Unity3D engine. The system integrates Image Targets, Virtual Buttons and Cloud Recognition from Vuforia through the Unity3D extension. A survey was conducted and researcher normally quoted it as positive. This model roughly gives the same idea of the implemented project in this report.

Augmented Reality has become a notable marketing technique used by many toy companies to sell more of their products [3]. This following information enabled the marketing routes and how this product should be presented in current scene.

Block puzzle education system that infants or children naturally learn words for objects and English as well as creative thinking skills [5]. This product information provided a platform for 3D object superimposition. The biggest feature of AR is virtual reality combination and real-time interaction. Augmented reality technology can generate vivid virtual visual

information synchronously based on real-time scenes. Augmented Reality makes the real world and the virtual world truly seamless docking, and more importantly, users can find a balance between the real world and the virtual world [7].

AR-System concentrates on the display and the tracking since the type of display and tracking system have the largest influence on AR system architecture. The display is one of the critical components where the level of immersion is concerned [6].

**3. Implementation**

This session covers the implementation of marker based and markerless augmented reality application

*A. Implementation of AR bases ARPlay book*

The ARPlay Book introduces a learning approach for children using an augmented reality book and an application. This application has following innovative characteristics:

1. It makes use of visualization technology (AR) that has potential to improve learner’s optical view with related information and even allows learners to interact with the exhibits displayed
2. It is easy to operate
3. Uses mobile AR environment

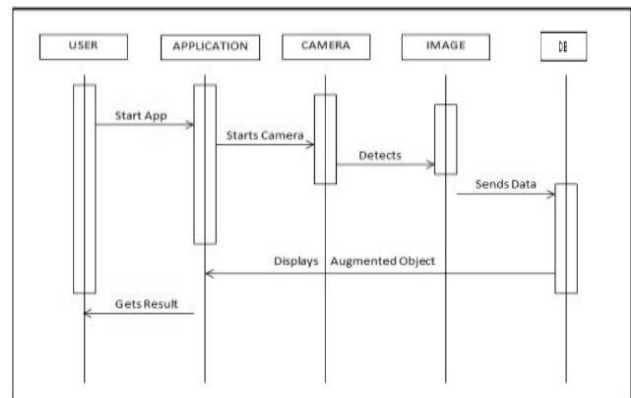


Fig. 1. Sequence diagram for processing marker based AR application

The fig. 1 shows the sequence of the tracking and matching is performed using marker based augmented reality.

*B. Steps to start ARPlay Application*

- Open the Application from one of the Smartphone
- Choose desired options from Menu
- Select play option
- Open the ARBook
- Start scanning the Images from the book
- Find the resulting output in mobile screen
- The result includes the model display with an audio output
- Select Quit to close the application

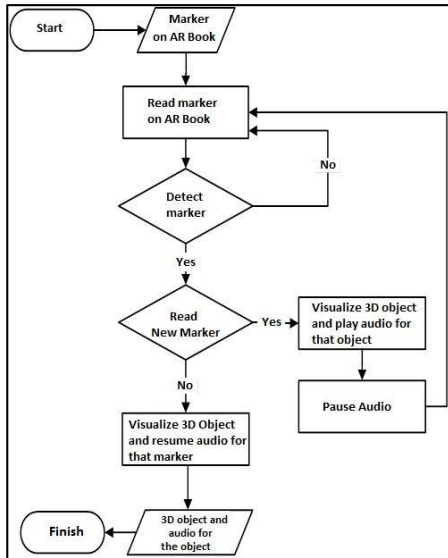


Fig. 2. Control flow diagram for AR application

### C. Implementation of Markerless ARPlay Application

This Application requires a high-end or supported smartphone which can recognise the ground plane surface feature provided by Vuforia.

Steps to start Markerless AR application procedure

- Open Markerless AR application from any of the Supported Smartphone.
- Choose desired option from Menu
- Click on button
- Align the camera to a ground surface and tap
- Find the resulting output
- Click on back button to go to main menu.
- Select quit to close the application

## 4. Experimental results

### A. Marker based ARPlay book Results

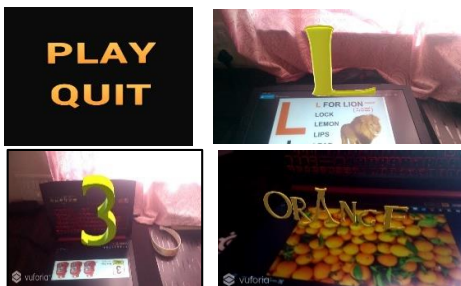


Fig. 3. Screenshots taken while Marker Based application execution

### B. Markerless Application results



Fig. 4. screenshots taken while Markerless AR application execution

## 5. Conclusion

This AR Application focuses on children oriented application Which will help the children with learning Disability to focus, learn and enjoy simultaneously. This multi-tasking activity will allow a child to be more interactive and involved. This application has been imposed with 3D models, related sound and movements which can be a medium for self-learning. This application will be implemented in schools in near future depending on the requirements. The Augmented reality application provide a better understanding and learning experience to children in schools as well as at home. The fundamental goal of this paper is to see an improvement in learning Disabled Children. The improvement in child's imagination and a new experience to learn will make children actively participate. Highly anticipating the user experience to be beautiful with the ARPlay application.

## 6. Future work

With AR improving day after day, there is lot of scopes for

- AR in Health Education
- AR in School Education
- AR Games
- AR based IoT Sensors application
- AR based Navigation System

- AR Based in home Experiences
- AR Based business menu

### References

- [1] Pooja Manghirmalani Mishra, Sushil Kulkarni, "Classification of data using semi-supervised learning (a learning disability case study)", IJCET, Volume 4, Issue 4, pp. 432-440, July-August 2013.
- [2] Mattias Davidsson, David Johansson, Katrin Lindwall, "Exploring the Use of Augmented Reality to Support Science Education in Secondary Schools", Seventh IEEE-WMUTE, Takamatsu, March 2013.
- [3] Mhd Wael Bazzaza, Buti Al Delail, M. Jamal Zemerly. "iARBook: Immersive Augmented Reality System for Education", International Conference -TALE, Wellington, March 2014.
- [4] K.P. Vinumol, Ashsish Chowdhary, Radhika Kambam, V. Muralidharan, "Augmented Reality based Interactive Text Book", XV Symposium on Virtual and Augmented Reality, Cuiaba, November 2013.
- [5] Yeon-Jae Oh, Young-Sang Suh, Eung-Kon Kim, "Picture Puzzle Augmented Reality System for Infants Creativity", ICUFN, Vienna, July 2016.
- [6] Waleed Fayiz Maqableh, Manjit Singh Sidhu, "From Boards to Augmented Reality Learning", CAMP, Selangor, March 2010.
- [7] Wu Cai, Qingtao Chen, "An Experimental Research of Augmented Reality Technology from the Perspective of Mobile Learning", TALE, New South Wales, December 2018.
- [8] Heen Chen, Kaiping Feng, Chunliu Mo, Siyuan Cheng, Zhongning Guo, Yizhu Huang, "Applications of Augmented Reality in Engineering Graphics Education", IEEE International Symposium on ITME, Cuangzhou, December 2011.
- [9] Che Samihah, Che Dalim, "TeachAR: An Interactive Augmented Reality Tool for Teaching Basic English to Non-Native Children", IEEE-ISMAR, Merida, September 2016.
- [10] Jayashree Roy, Debbie Richards, Yusuf Pisan, "Helping Teachers Implement Experience based Learning", IEEE-ICCE, Auckland, December 2002.