A Survey on Use of Augmented Reality in Education

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***Abstract* - Virtual Reality immerses the user only in an artificial environment; Augmented Reality (AR) allows the user to overlay reality with a artificial world. The possibilities for educational value in these overlays are very useful. Education is a subject field with many problems and very abstract concepts, which are hard for students to grasp.AR applications can be developed to make education more engaging and relevant for students. This survey will give an overview of augmented reality, especially focusing on its potential in the education. A few education AR applications currently in use will be briefly described. Lastly, we will discuss future directions of augmented reality in the improvement of education field.**

***Index Terms* - Augmented reality, picture puzzle Detection, Education with augmented reality, BOT.**

I. INTRODUCTION

Due to the recent development of advanced technology, virtual reality and augmented reality are being utilized in various fields. Especially, education in connection of augmented reality with diverse fields has been actively provided as a part of improvement for creativity of infants in their education. Augmented reality is a sub-field of virtual reality and also a computer graphic technique for making objects seem to exist in the original environment by synthesizing virtual objects or information in the real environment. Unlike the virtual reality that assumes a total virtual world; augmented reality is to increase a sense of reality by combining virtual objects with real world and hence is called as mixed reality. Augmented reality is in a limelight as the next generation display technology in 'Internet of Things' (IoT) technology or others that are appropriate in ubiquitous environment [1]

AR can stimulate several senses at the same time, leading to improved learning skills (with practice – brain can be rewired to optimize performance) and memorization. With improved AR interfaces additional senses (five senses – sight, sound, taste, smell and touch)could improve cognition of information, and therefore learning process.[2]

Augmented reality (AR) combines the real world with virtual information to improve the observation, which cannot observe by naked eye. The advantages of AR include integrating reality with virtual, real-time interactive, accurately locating 3D objects, AR supported system allows students interact with context instead of paper on the traditional course, even more, immerse students in a knowledge from learning activity and enhance the communication between group members . Scholars have reveled through AR learning systems in a field trip, adequate guiding students focus on the learning objects, helping them operate science tools, quick response to understand learning condition. More important, since AR apply to aware students' location in order to implement "context-awareness" which sensing students' current location and provides relative learning materials.[3]

Augmented reality is a new technology, which can enhance view that we see in the real world. Moreover, augmented reality combines virtual world, which are object, generated by computer and also represent them in the real world simultaneously. For instance, you can hold your phone camera over the images, posters, or street to see extra information, which related to that object. Not only advertising augmented reality can use in education too. In the part of education, it will offer people to study by using other channels for understanding the lesson easier, faster and portable by moving the camera on their smart phone.[4]

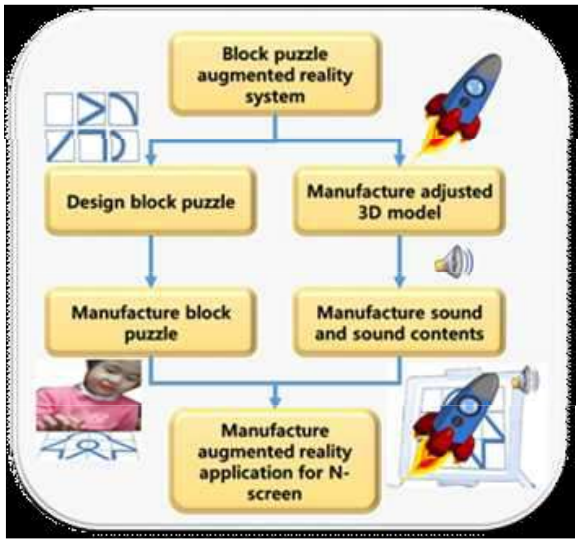

Fig. 1.1 Picture Puzzle Detection System Using Augmented Reality [1]

II. AUGMENTED REALITY

Augmented Reality (AR) is a general term for a collection of technologies used to blend computer-generated information with the viewer's natural senses. A simple example of AR is using a spatial display (digital projector) to augment a real world object (a wall) for a presentation. As you can see, it's not a new idea, but a real revolution has come with advances in mobile personal computing such as tablets and smart phones. Since mobile 'smart' devices have become ubiquitous, 'Augmented Reality Browsers' have been developed to run on them. AR browsers utilize the device's sensors (camera input, GPS, compass, *et al*) and superimpose useful information in a layer on top of the image from the camera which, in turn, is viewed on the device's screen. [11]

While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects super-imposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it.AR is related to a more general concept called mediated reality, in which a computer modifies a view of reality. As a result, the technology enhances one's current perception of reality. Virtual reality replaces the real world with a simulated one. Augmentation of visual information is presented in semantic context, coherently with environmental elements and in real-time, similarly to synchronized sports scores on TV during a match. [2]

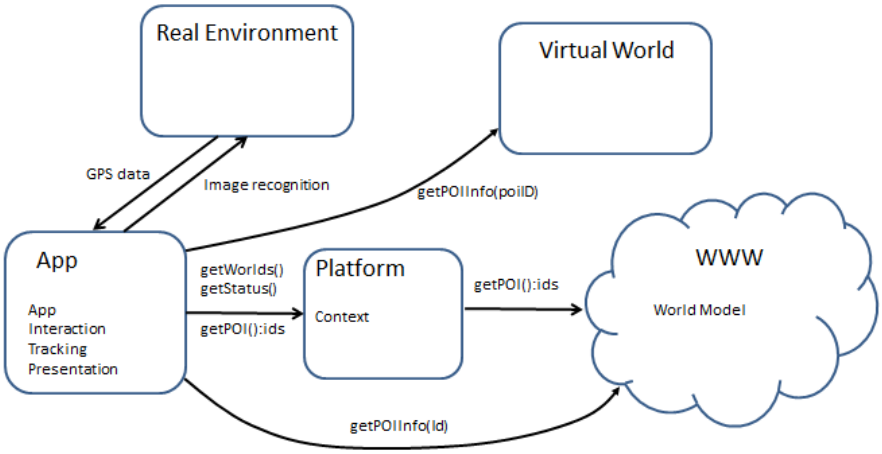

Fig. 2.1 Architecture of Augmented Reality [13]

III. PICTURE PUZZLE IN AUGMENTED REALITY

Line block puzzle is a diverse combination that is comprised of direct line, diagonal line, and curve and makes it feasible to express animals and objects. Infants or children are able to build creativity and fine art sense while connecting lines and creating beautiful patterns. This system supports to accomplish a high level of achievement on the completion of puzzle by visualizing 3D model on the creative work made by block puzzles that children play with and generating special effects. In addition, language education is also available after becoming familiar with objects while displaying 3D objects when children adjust the puzzle. [1]

Creativity of children is built by various ways of thinking. Especially, education for providing a sense of achievement by fine motor skill and adjustment is a good means for activating brain. This system uses basically provided line blocks making it feasible to provide puzzle education. This block makes it feasible to expand the number and scope depending on the age. In addition, children are able to draw an image and print 3Dmodels for creativity.[1]

Generation of sound for 3D model and contents

The 3D Max Studio tool makes 3D models. 20 types of objects that are the most preferred by infants or children are

Provided. Sound and video clip are produced by media equipment. Produced 3D objects and sound establish the adjustment location with blocks by using 3D Unity and display them on the N-screen. In addition, user-participant figure 3D model for infants or children makes relevant objects in the image produced by an individual order. [1]

Generation of augmented reality web for N-screen

When children adjust the block puzzle and implement augmented program to provide an input on block puzzle, the relevant puzzles are matched and express the model. This serves as a role of providing vivid education as well as a sense of achievement and deriving interest from children. [1]

IV. BOT

It is a technology of Artificial Intelligent field. BOT works on previously archived results. It makes algorithm depends on previous results, which helps to give more specific results. Suppose, a student get results of plane and take only images, deletes the videos and other stuff. Now, second time if student search on plane, BOT gives more results in picture format. [10]

BOT help to overcome the static database or library limitation. If system cannot able to find matches in local database then it goes to the web and find results. BOT helps to give more specific and needy results depends on previous searches.

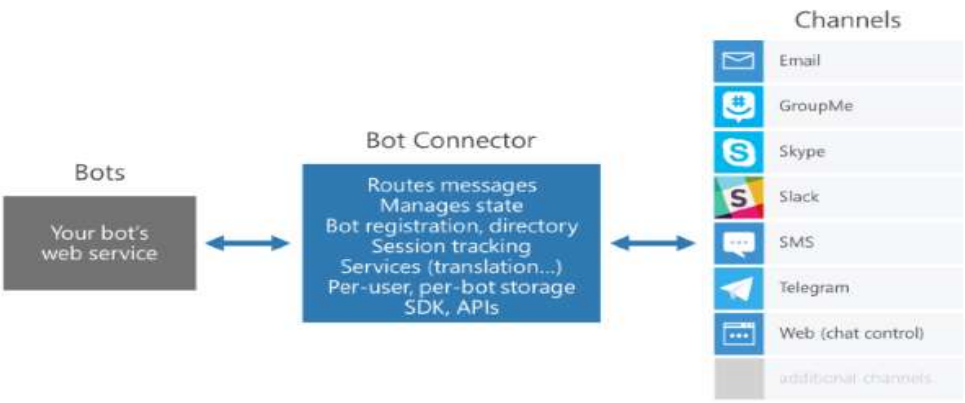

Fig. 4.1 Architecture of BOT [12]

V. Previous Work

5.1 An Augmented and Virtual Reality System for Training Autistic Children [5]

In this paper, The AR system was demonstrated to the psychologists and teachers for their feedback. They found that system will help students and teachers too and will help them learn new things .From teachers point of view, the proposed system will help the child in different aspects, such as identification, learning, recognition and understanding of things, colors, shapes, names etc. psychologists found that this system will increase the brain power and creativity of students.

5.2 Real-time Recognition and Augmented reality for Education [4]

In this paper, EduAR application is learned. EduAR application applies image detection and augmentation techniques to make a new style of leaving, which attract learners to continuously, study by themselves. The proposed application is separated into two components, which are mobile application developed by using OpenCV library with MySQL management to handle the information and web application in PHP language, which allows the instructors to conduct contents of their lesson**.**

5.3 Improving education experience with Augmented Reality (AR)[2]

In this paper, education experience is improvised with use of augmented reality. With use of AR, users can remove the boundary between real world and virtual world. Digital data is used in real world, which make great user experience. AR systems also provide analysis of user behavior and user interactions. Data is stored in cloud for further process. AR can enhance the experience of students in education with new technologies. Interactions of students are increased with use of augmented reality systems and also increase the learning ability of students.

5.4 wARna - Mobile-based Augmented Reality Coloring Book [6]

In this paper, wARna is a mobile-based interactive Augmented Reality coloring book that identifies texture from the coloring book to be mapped onto the corresponding 3D content and employs marker-based detection in the form of frame marker for the augmentation part. To make up the system, three core use cases are generated.

5.5 Co-Design of Augmented Reality Book for Collaborative Learning Experience in Primary Education [7]

AR Books should be developed focusing on a specific aspect of education or specific educational subjects. An example of AR Book for children education is an interactive coloring book. Another one for an educational subject is Live Solar System (LSS) which was developed to help children learn Astronomy. Thirsty Crow is also an AR playbook for learning numbers. Despite the few numbers of studies that focus on specific areas of education, AR Books should be developed for all kinds of subjects, and explored in different educational aspects in order to fully understand the potential of AR in education. The AR Book of this study will be designed based on an English schoolbook for foreign speakers.

5.6 AI*R*-EDUTECH*:* Augmented Immersive Reality (AIR*)* Technology for High School Chemistry Education [8]

This paper has depicted one of the potential applications of AIR in education and how it can achieve the syllabus's learning objectives. The application presents Chemistry related topics through an interactive and engaging user experience. Such experience was reinforced with several features, such as cards to represent different chemical elements, playing audio files to pronounce the names of the chemical elements upon detection, augmenting 3D scenes on top of the physical card, applying concept of collision to trigger the chemical reaction between elements, and giving direction while using the application.

5.7Impact of Smart Immersive Mobile Learning in Language Literacy Education [9]

This paper demonstrates how language literacy education, for younger learners, can be improved and enhanced with augmented immersive reality technology. Despite cultural differences in the way of learning, particularly between the Western and Eastern context, it concurred some of the relevant research work conducted in the field and shows the same result findings, for Arabic literacy education, in the Middle- East region. As a proof of concept, an Arabic children storybook was supplemented with an augmented immersive reality application, which includes automatic audio narration with animated 3D graphics that play autonomously when the relevant page of the book is in view of the camera.

5.8 Picture Puzzle Augmented Reality System for Infants Creativity [1]

The system in this paper is the block puzzle education system based on augmented reality for infants or children. Infants or children are able to enjoy play and learn at the same time. It visualizes 3D model on the creative work made by block puzzle and creates special effects. This will make infants or children feel a sense of achievement and interest. In addition, it generates words and sound on the relevant 3D model to make children naturally learn words. This is the augmented reality based block puzzle education that infants or children are able to build creativity, fine motor skills, perception of objects, and language education at the same time.

VI. Future work

There are some limitations in AR, such as, security, time and power constraints, results timing, availability and reliability. For that purpose AR systems will be made more versatile to overcome these limitations. In picture puzzle detection, number of results is archived from local database and local server too. If given picture is not matched with data of local database, it will not give results. For that purpose results are archived from directly Internet. But another problem arrives that number of results are huge so it may affect the power constrains of mobile device. For getting small but more specific results, BOT is used, which gives required results in proper format and numbers. That we can see in figure 6.1.

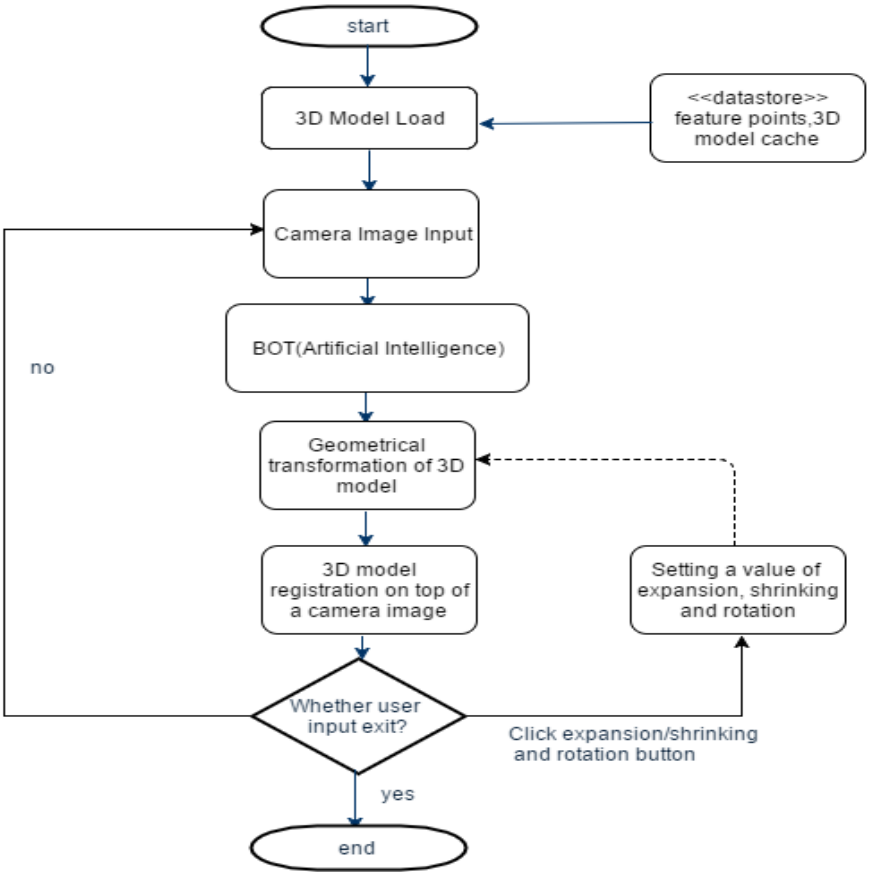

Fig. 6.1 picture puzzle detection using BOT

VII. COMPARATIVE STUDY

NO	Technique Used	Strong Points	Weak points
1	Applied Behavior Analysis, Ad boost-Learning Algorithm	Assists In Teaching Children About New Pictures Or Objects	Library is static
2	OpenCV, MySQL	Provide real-time commuter vision	Smaller kernel size.
3	Augmented Reality	Decrease the distance between real world and virtual world.	GPS is only accurate to within 30 feet (9 meters) and doesn't work as well in indoors
4	User-Manipulated Three-Dimensional (3D)	Use 3D Environment For Input	Costly
5	Augmented Reality, AR	Decrease the distance between real	Output Device is needed,

	Book	world and virtual world.	Costly

VIII. Conclusion

Augmented reality is widely used in education in different prospects. AR applications increase the ability of students to learning and also increase creativity. A student becomes more interactive to study. Response of students in education is increased. From teacher point of view, it becomes easy to make students understand a hard topic in easy ways. Learning becomes more interesting with use of AR and it makes education easy to understand. AR may also increase learning capability and grasping power of mind.

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