ARTOY: DEVELOPMENT OF AR BASED TOY FOR CHILDREN USING PAPERVISION3D AND FLARTOOLKIT

K. Jancy[1], L. Keerthana[2], E. Mahalakshmi[3], M. Anitha[4]

Department of Computer Science and Engineering

Students[1, 2, 3], Assistant Professor[4]

Kingston Engineering College, Vellore, India

Abstract

The technology called AR that jumps out of an impersonal computer or device and into the real world. It is essentially "coming alive." Augmented reality (AR) is something out of a fantasy or science fiction. Augmented Reality (AR) is a growing area in virtual reality study. An augmented reality develops a composite view for the user. It is combined with a real scene viewed by the user. A virtual view generated by the computer that augments the real scene. This is one of the biggest applications of augmented reality in the toys. It is little wonder application than Virtual Reality. These toys can capture the imagination of kids in a powerful way .But these toys will also provide a subtle hint for what is needed. AR becomes a more common way of interacting with technology, in the real world, rather than trapping on a device. With this technology we can make the children to see the complete virtual world and make them more enjoy. Augmented reality helps children's to develop their knowledge. This project completely focuses on developing augmented reality based virtual toy for children's, and make them live in virtual world along with the real world. This is going to achieve with the help of one of the powerful flartoolkit which is based on flash. The FLARToolkit and papervision3d makes the virtual world alive.

Keywords: ARToy, Papervision3D, FLARToolKit, Augmented reality.

1. INTRODUCTION

Toys can be a great way to start our child's play and support our child's development. But our child may not need as many toys as we think. The best toys for children are AR Toy. These are the toys that our children use in lot of different ways. AR toys will help our child to use their imagination, creativity and problem solving skills. Some toys cannot be purchased as many as we need. Now the new technology called Augmented Reality gives the wonderful solution for this. The term Augmented Reality is a live direct or indirect view of a physical and real world environment. It is augmented by a computer generated sensory input like sound, video, graphics, or GPS data. AR is related to a general concept called mediated reality, in which a view of reality is modified by a computer. Augmented reality is the advanced technology of Virtual Reality. In VR childrens need head mounded devices. To overcome this problem we are going to develop an ARToy. AR generates a composite view for the user. It is a combination of real scene viewed by the user. Then virtual scenes are generated by the system. ARToy is developed by using Papervision3D and FLARToolKit. The Webcam is connected with a Laptop to detect the Pattern. FLARToolKit is used to recognize this image from the Webcam. Then the 3D object is created using blender software.

2. EXISTING SYSTEM

The existing system focused on research over development of virtual reality based education and simulation system for children. The VR gives more immersive experience for the user and make them feel virtual world as real world. The problem has been identified that there is a special hardware required to enjoy with virtual reality and moreover our study cleared us that a user cannot be use VR devices for long time, which causes severe eye related health issues.

DISADVANTAGES OF EXISTING SYSTEM:

- Proper Head - Mounted Display is required.
- Gives more eye strain if VR device have been used more than a hour.
- Cannot be advisable for children
- Video Quality is an issue in VR.
- Most Virtual Reality in stereo format.
- Children's may be Addictive to VR environment.
- Current VR platform require some download to begin.
- File size are over 1 GB requisitely.
- Equipments are used in VR is very expensive.

3. LITERATURE SURVEY

This chapter discuss about various research and related activities that are related to Augmented Reality. A wide range of subjects related to this project are discussed here along with their usage, advantages and disadvantages and a comparative study of those techniques with the proposed system are also discussed here.

[1]The paper "Researches and development of interactive educational toys for children summarizes about game based learning. This paper carried out an in-depth research on the interactive mode of children's educational toys. In the research process, it attempted to build a new immersed educational-game scenario for children by using the new interactive technology so as to inspire the children's interest in learning and exploration. The research object in this paper was an interactive educational toy funny tap English learning machine for children. After integrating the design concept of this product from an industrial design perspective, we selected specific interactive technology and completed the project work. Moreover, we have conducted tests of work principles and effect of usage based on the sample machine. The final result indicated that there is a promising and huge market potential to apply the new interactive technology to development of educational toys.

[2]The paper "ARGame Developing an Augmented Reality 3D game proposes development AR games using FLARToolKit. Augmented Reality (AR) is a growing area in virtual reality study. An augmented reality scheme develops a composite view for the user. It is a combination of the real scene viewed by the user. A virtual view generated by the computer that augments the scene with added data. AR Gaming is the elongation of desktop game and investigating how to alter a desktop

game into an augmented reality game. The player enjoyment is centered to computer game. There are many heuristics in game natural environment founded on component such as game interface, mechanics and game play. Although there is a need to integrate these heuristics into the validated form that can be utilized to conceive, evaluate and understand pleasure in games .The AR game gives more truth to the contestant while playing the game.

[3]The work "A new interaction method for augmented reality based on ARToolKit" summarizes implementation of a new interaction method for the application of augmented reality using ARToolKit and Open CV SDK. First, on the basis of the exiting marker-based tracking system, this paper achieved the multi-marker tracking that solved the tracking failure problem when the single marker is partially occluded, which greatly improves the robustness of the registration algorithm. In addition, Codebook-based foreground detection model is used to detect the hand region under an unexpected background environment. Moreover, we could recognize the hand gesture by convex hull on the basis of the hand contour. Therefore, a gesture recognition algorithm is presented based on codebook model algorithm and convex hull algorithm for the interaction. In the end, we use several different experiments to show the performance, which can be seen the good interactivity and realistic.

4. PROPOSED SYSTEM

As from our study we proposed this system which focuses on augmented reality which is advanced technology than Virtual reality (VR). With the help of this powerful tool we are going to develop an interactive virtual toy for children and make them to feel the computer generated virtual world as real. We just use webcam to see the augmented reality world and joystick to control the object over virtual (real) world. To achieve this we uses FLAR Toolkit and papervision3D to create the augmented reality world and the powerful modeling software Blender to model the AR objects .The AR generated virtual world not only for playing, at the same time enhances the creativity of the children and can be useful for powerful learning tool.

ADVANTAGES OF PROPOSED SYSTEM:

- Improved quality of Trainings and Educations
- No need to wear the head-mounted display devices.
- Augmented reality is used for the 3D object visualization.
- Viewing experience is memorable to the audience.
- Augmented Reality helps for children's playing using toy.
- Used in military and emergency service.
- Used in Medical, Navigation, Entertainment.
- Augmented reality is advanced technology of Virtual reality.
- Used to create AR environment.
- Used to develop the childrens education and knowledge.
- ARToy are less expensive than Virtual reality toys.
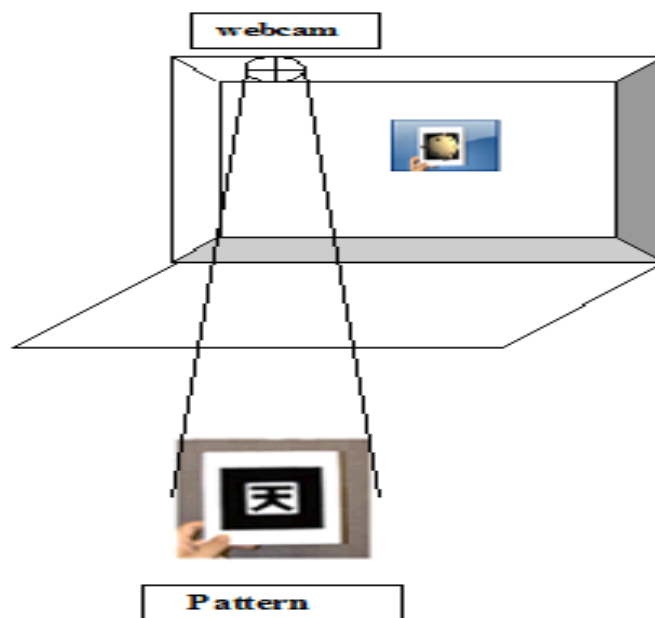
5. ARCHITECTURE

Figure.1. Architecture of augmented reality toy

5.1 SYSTEM DESCRIPTION:

The System preparation methods are called for each of the following, the webcam, the marker detection, and Papervision3D.

Webcam setup: Flash features are the great webcam support. As the Application runs the camera is detected, Flash Player will automatically execute the code and prompt the user to enable the code executes. The video object is in the window. On screen where the video will be shown, The Camera object records and feeds its live footage to that Video object.

FLAR setup: A corner stone of our project is marker detection. The marker graphics detected via webcam. FLAR will capture the image from the webcam. The Pattern object position, rotation, and scale is detected from the user's physical space. This calculation is used in the next step. FLAR will capture the image from the webcam. It will search for the each frame of the Pattern Object. FLAR is used to calculate the transform matrix for the object. The detection technique uses an Actionscript Bitmap Data object. It contains only the latest still-frame of video at any given time.

Papervision3Dsetup: For most of the project, the 3D setup is typical of any Papervision3D project. A Basic
Render Engine will handle the bulk of the vector math. It will convert the 3D geometry to 2D graphics for display on the screen. The Car toy 3D model is loaded on the screen. This 3D object is inserted into the 3D scene. The object is viewed into that screen (View Port Object).

5.2 MODULES

- Modeling the virtual toy.
- AR Marker generation with FLAR.
- Developing and integrating AR environment with Actionscript and Papervision3D.

MODULE 1-Modeling the Virtual toy:

The 3D computer graphics is used to create the 3D model for the object. It is a process of developing a mathematical representation of three-dimensional surface of an object. The object is either inanimate or living. This product is called as 3D model. The object can be displayed as two-dimensional image through 3D rendering process. This 3D model is created by using the modeling software called blender. It's a free and open source software. The software is used to design a animated flims, visual effects, interactive 3D application or video games. This features include UV unwrapping, 3D modeling, texturing rigging and skinning , animating, match moving, fluid and smoke simulation, camera tracking, rendering, video editing and compositing. Blender also has a feature of built-in game engine. Blender is used in AR environment for designing 3D model.
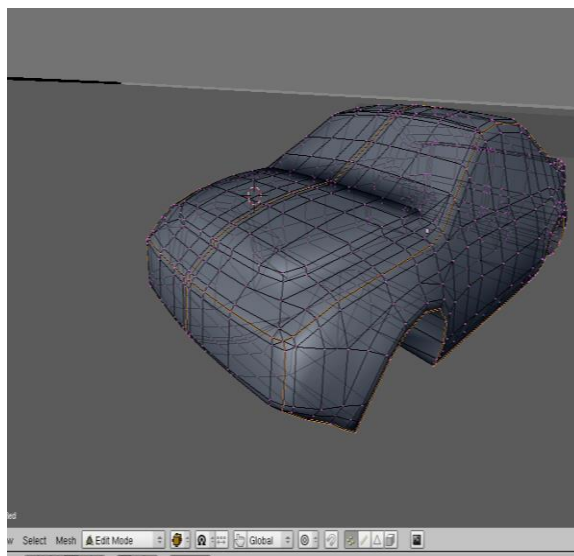

Figure.2. Modeling a Virtual Toy

MODULE 2-AR Marker generation:

There are two types of Augmented Reality has been used in the technological world. They are marker based and non-marker based. Here we focus on Marker based augmented reality. It uses markers to generate the virtual world in the real world. Those markers are to be generated and recorded. It is used in the program for AR environment. This has to be done in this module. There are several toolkits has been available for AR, here we uses Flash based Augmented Reality toolkit to generate our customized AR marker.
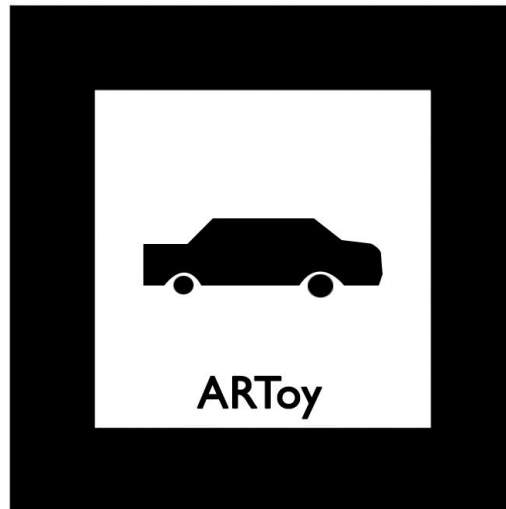
Figure.3. Pattern diagram of ARToy

MODULE3-Developing and integrating AR environment with Actionscript, Papervision3D, FLAR:

To develop a 3D model that is designed in the first module. The Papervision3D libraries are used to create the 3D object models. Papervision3D is used to render the flash content from the object; it will help the user, so the end-users can easily use it without requiring downloading or installing an additional plugin. It has an outstanding reputation within the Flash community. It's easy to use an impressed and experienced 3D environment.
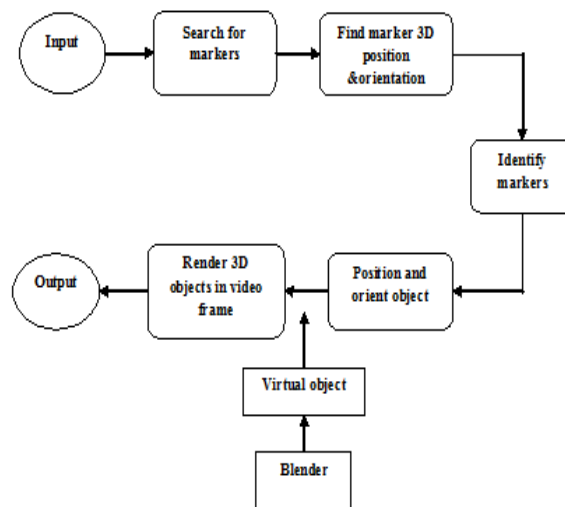
5.3 IMPLEMENTATION

Figure.4. Implementation of ARToy generation

The system implementation phase of the software deals with the translation of the design specifications into the source code. The ultimate goal of the implementation is to write the source code. Also to write the internal documentation, so that it can be use to verified easily. The code and documentation should be written in a manner that ease of debugging, testing and modification.
System uses flowcharts, sample run on packages, sample output etc.

An effort was made to satisfy the following goals in order specified:
▪ Minimization of Response Time.
▪ Clarity and Simplicity of the Code.
▪ Minimization of Hard-Coding.
▪ Minimization of the Amount of Memory Used.

Various types of bugs were discovered while debugging the modules. These ranged from logical errors to failure on account of various processing cases.

Augmented Reality is one of many new technologies that may offer benefits to technology lovers. It is of particular interest as it provides a means to merge traditional real world environments with the digital world. To create such Augmented Reality environment FLARToolkit is used along with Flash that supports Actionscript programming. The pattern design of an object must be in a square shape. Then the 50% of the square center only focused for the detection of the image. To import a 3D object in the screen we are using the modeling software called blender. The webcam is used to capture the image from the pattern. FLARToolKit is used to capture the image from the webcam. The object is created from the image. Each part of the frame is compared with registered pattern. If it's matched with that image then the 3D object is rendered in the screen. The Papervision3D is used to create the 3D object.

Print out the realistic marker. Demonstrate the marker to the running application by means of the webcam. The black line is for outline reason to indicate fruitful introductory marker recognition.
Much like Arnold Schwarzegger's Eliminator character, the task would now be able to peruse in the encompassing condition, outwardly check and identify significant protests, and make figuring's in light of that data. It works best to have a basic background of a strong divider in the application since complex scene may confound the discovery plot. Next, seeing the marker through the webcam, the application forces a vivified 3D display onto the client's physical space. The model now pivots and scales reasonably as the client moves the marker.

6. ALGORITHMS

● Image detection algorithm.
● Homography transform.
● Calculate transform matrix.
● Thresholding algorithm.
● Render 3D object using Papervision3D.
● Creating 3D model using blender software.

7. CONCLUSION

With this, we would like to conclude our work, that the toy which is one and only entertainment tool for children. The usage and type of toy get varies day by day. We only focused on development of AR toy for children which enhances creativity and gives more entertainment. The powerful technological tool that is Augmented Reality helps us to achieve this. Several toolkits like Papervision3D, FLARToolKit and 3D modeling software blender has been used to create virtual world and AR world.

8. FUTURE ENHANCEMENT

Presently we had created work area based AR application. We additionally are going to center around creating instruction based AR device that to be keep running on various stages. Presently versatile goes about as essential fundamental device for a few applications. So we will be create portable based AR condition and will seek after our exploration work respect this. In future we are going to develop a Augmented reality based toy on the mobile phones. Currently all the applications are in the mobile, so it's easy to use in the mobile.

9. ACKNOWLEGEMENT

10. REFERENCES

1. R. T. Azuma, "A survey of augmented reality", vol. 6, no. 4, pp. 355-385, 1997.

2. Buechley, L., Elumeze, N., Dodson, C. and Eisenberg, M., Quilt Snaps: "A Fabric Based Computational Construction Kit", (WMTE) 2005.

3. Elumeze, N. and Eisenberg, M. SmartTiles: "Designing Interactive Room-Sized Artifacts for Educational Computing Children, Youth and Environments", pp. 54-66, 2005.

4. Zhang Zhcnzhong, Li Yanjun, "Classification Research of Educational Toys, Textiles and Design", Vol. 12, 2008.

5. L. Gutnick, L. Bernstein, and M. H. Levine, Always connected: "The new digital media habits of young children." *2011*.

6. D. Holloway, L. Green, S. Livingstone, "Zero to eight. Young children and their internet use", 2013.

7. Rita Brito, Altina Ramos, "Digital technology in family environment: A case of children from 0 to 6", pp. 1-4, 2017.