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3D Marker Based Augmented Reality: Modern Teaching Learning

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Abstract: *The main objective of this paper is to provide clarity of concepts to the students in a real like environment through 3d visual aids that may be used to clarify or enhance understanding of a concept or process. As a student said, "Tell me and I forget. Show me and I remember, Involve me and I understand" This paper focuses on involving the children in understanding of the concepts in 3D environment. The traditional method includes concept deliverance not based on visual aids. Now the modern teaching methodology includes visual aids such as projector, transparent slides, and models in 2d environment. If visual aids are converted from 2D to 3D environment, the student will have a live environment to understand the concepts. Visual aids tools are available to teachers to add reality, clarity, and variety to the drill which is necessary for students at the earlier stages of language learning. Augment Reality Development Lab is such a nice direction to go in incorporating technology in the classroom, because it makes [learning] more interactive," Sloan said. "The kids love it because they are active.*

Keywords: *Teaching – Learning, 3D Environment, Augmented Reality, 3D Visualization.*

I. INTRODUCTION

The classroom lessons are engaging experiences with augmented reality (AR), a technology that overlays digital information on top of real-world surroundings as viewed through a smart phone or other handheld, GPS-enabled device." It's not just about throwing technology in these classrooms, it's about empowering the teachers to understand the technology," Jochim said. "Grasping the capability behind it gives teachers tools that are easy to use." "This ... is clearly going to revolutionize education,"

Augmented reality (AR) is the registration of projected computer-generated images over a user's view of the physical world. With this extra information presented to the user, the physical world can be enhanced or augmented beyond the user's normal experience. The addition of information that is spatially located relative to the user can help to improve their understanding of it. In 1965, Sutherland described his vision for the Ultimate Display [SUTH65], with the goal of developing systems that can generate artificial stimulus and give a human the impression that the experience is actually real. Sutherland designed and built the first optical head mounted display (HMD) that was used to project computer-generated imagery over the physical world. This was the first example of an augmented reality display[SUTH68]. Virtual reality (VR) was developed later using opaque display technology to immerse the user into a fully synthetic environment. One of the first integrated environments was by Fisher et al., combining tracking of the head for VR with the use of tracked gloves as an input device.

Augmented reality and virtual reality share common features

1.1. Hardware / Software requirements Specification:

The main hardware components for augmented reality are:

Processor or CPU: The computer analyzes the sensed visual and other data to synthesize and position augmentations

Display/Output: To display the output, the programmer can use any of these following type screens, devices like:

Projection displays

CAVE-type	IDesk /Iscreen	Head mounts	Fishbowl VR
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- To do stereo, you must get a different image to each eye trivial for head mounts
- shutter glasses, left & right images temporally interleaved
- polarized glasses or red/blue glass
- need several loudspeakers, carefully phased
- might need model of listener's head shape

Sensors: Sense users attention and emotions:

• gesture	• posture	• voice	• eye gaze
• breathing	• pulse & blood pressure	• electrical activity of muscles	• skin conductance

Input devices Techniques include the pinch glove, a wand with a button and a smart phone that signals its position and orientation from camera images.

▪ joystick, trackball	▪ pressure-sensitive stylus	▪ Wand
▪ a simple way of grasping virtual objects	▪ Data glove	▪ tracker with buttons attache

Artificial information about the environment and its objects can be overlaid on the real world. Augmented reality provides the students with:

- Dynamic content
- Engage technology-driven learners
- Leverage handheld technology
- Digitally archive of Instruction

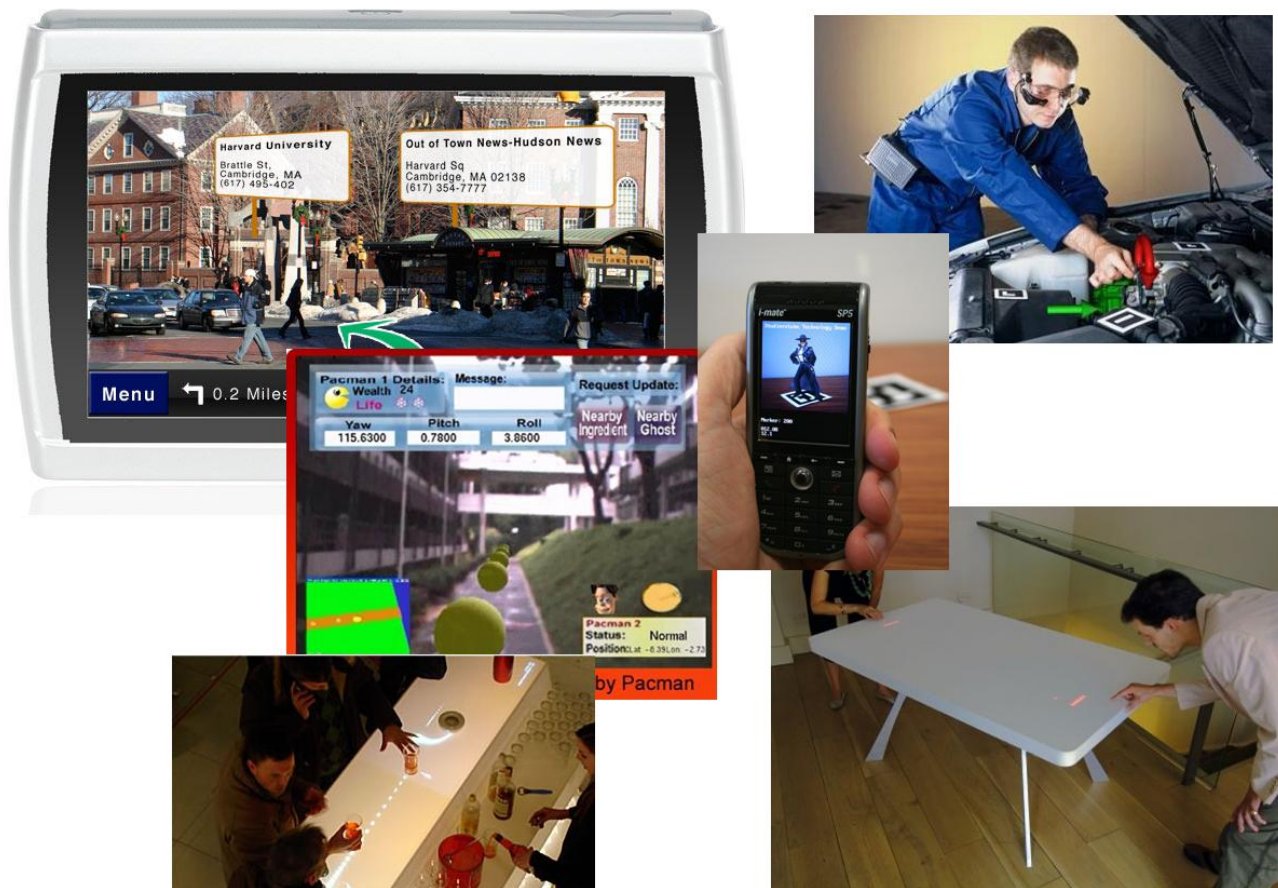
Unlike Virtual Reality (VR) that aims at replacing the perception of the world with an artificial one, Augmented Reality (AR) has the goal of enhancing a person's perception of the surrounding world. Being partly virtual and real, the new interface technology of AR which is able to display relevant information at the appropriate time and location, offers many potential applications; these include aiding in education, training, repair or maintenance, manufacturing, medicine, battlefield, games and entertainment.

II. REVIEW LITERATURE

An ICT-supported setting may offer interesting possibilities for the learning of mathematics because it can, and often does, provide students with several representations with which they can work (Parnafes & diSessa, 2004). Further variation of representations may be offered by allowing for students to make use of real objects in the virtual setting, thereby providing opportunity for students to interact physically with the virtual objects and also providing tangible Feedback(Scarlatos, 2006).The present paper is part of an ongoing project regarding design of ICT-supported learning activities, which are developed in collaboration between researchers in mathematics education, researchers/developers in media technology and high school teachers. A central aspect in this work is to investigate the use of augmented reality(AR), a technology that allows for mixing real-world images with computer generated images (Milgram & Kishino, 1994). Although Sutherland already in the 1960's (1965) developed the first AR interface, it is only recently that researchers have explored its potential uses for formal education (Zhou et al., 2008). Instead of the user wearing or carrying the display such as with head-mounted displays or

handheld devices, Spatial Augmented Reality (SAR) makes use of digital projectors to display graphical information onto physical objects. The key difference in SAR is that the display is separated from the users of the system. Because the displays are not associated with each user, SAR scales naturally up to groups of users, thus allowing for collocated collaboration between users. SAR has several advantages over traditional head-mounted displays and handheld devices. The user is not required to carry equipment or wear the display over their eyes. This makes spatial AR a good candidate for collaborative work, as the users can see each other's faces. Augmentations cannot simply hang in the air as they do with handheld and HMD-based AR. The tangible nature of SAR, though, makes this an ideal technology to support design, as SAR supports both a graphical visualization and passive sensation for the end users. People are able to touch physical objects, and it is this process that provides the passive haptic sensation

III. APPLICATIONS



IV. THE COMPUTING VIEW

Augmented Reality Marker based experiment development is possible now, it has mainly two vision (view).

3.1. Source view

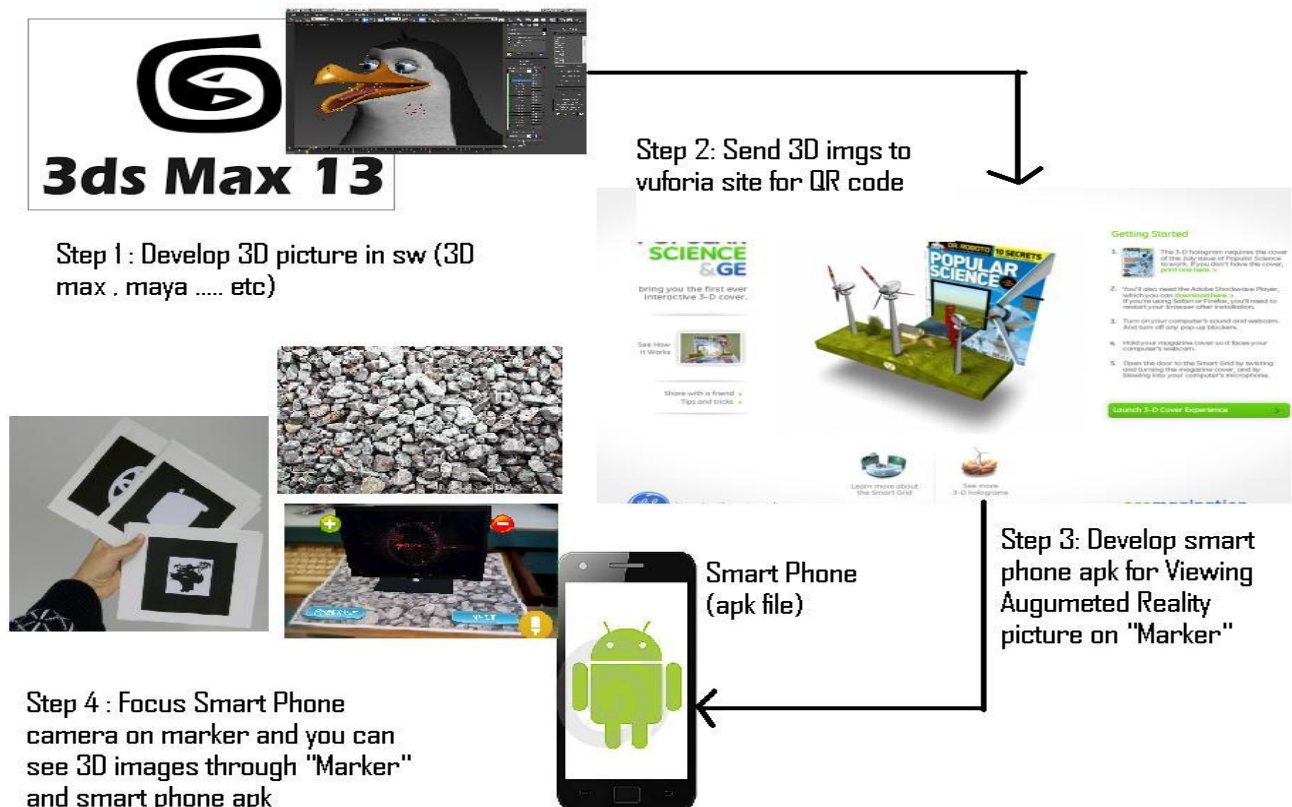
From the user's perspective, an interaction technique is a way to develop some 3D object in various software like 3D MAX and other software and make it image view and send some of the images to uforia for creating image QR code for ready for Augmented Reality. Uforia send some of the image with ready of augmented reality.

3.2. User's view

From the user interface User's view by smart phone camera it is compulsory to develop QR code detect apk file by which when smart phone camera we mount we can clearly see that 3D image by our smart phone. By learner's perspective if we set

this augmented reality and convert some theory topic to practical base and explain some laboratory base concept in theory class only by subject teacher.

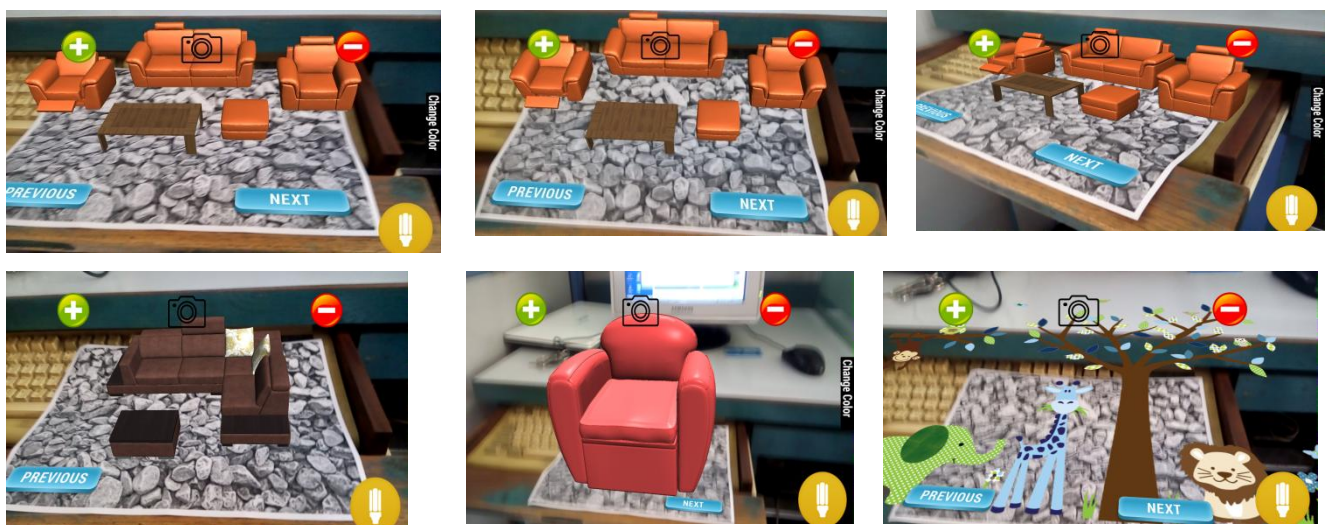
3.3 Development Framework



Process Architecture(Framework) for Developing 3D-"Marker"

3.4 Implementation of "3D Marker Based Augmented Reality"

Some original implemented Example of "3D Marker Based Augmented Reality"



V. TESTING AND RESULTS

Null Hypothesis: H0: No significance difference between evaluations scores before and after utilizing Marker based Augmented Reality (AR).

Alt. Hypothesis: H1: Significance difference between evaluations scores before and after utilizing Marker based Augmented Reality (AR).

N	before(x1)	(x1 ²)	after (x2)	(x2 ²)	diff	diff ²
1	76	5776	86	7396	-10	100
2	73	5329	76	5776	-3	9
3	64	4096	84	7056	-20	400
4	56	3136	67	4489	-11	121
5	56	3136	60	3600	-4	16
6	71	5041	87	7569	-16	256
7	81	6561	89	7921	-8	64
8	54	2916	66	4356	-12	144
9	89	7921	90	8100	-1	1
10	60	3600	78	6084	-18	324
11	52	2704	69	4761	-17	289
12	44	1936	65	4225	-21	441
13	57	3249	77	5929	-20	400
14	74	5476	93	8649	-19	361
15	55	3025	59	3481	-4	16
16	85	7225	79	6241	6	36
17	90	8100	87	7569	3	9
18	76	5776	86	7396	-10	100
19	52	2704	78	6084	-26	676
20	44	1936	73	5329	-29	841
21	57	3249	86	7396	-29	841
22	63	3969	63	3969	0	0
23	56	3136	60	3600	-4	16
24	58	3364	86	7396	-28	784
25	84	7056	90	8100	-6	36
	1627	110417	1934	152472	-307	6281
Average	65.08		77.36			
St. Dev.	13.464		10.692			

Comp. T	-3.50		calculated at %5		
Crit. T	2.06		T from table value from d.f. of 24 for 5% significance		

Critical T = 2.06 at 5% level of significance with d.o.f. (degrees of freedom) : 24

Computed T = -3.50

Computed T falls in rejection region therefore H0 is rejected and hence H1 is accepted.

Impact: This justifies the higher performance of learners after utilizing Marker based Augmented Reality (AR).

VI. CONCLUSION

Augmented Reality is such a technology through which augmented objects can be overlaid into the real world. This is a hot and trendy technology. In the educational field it can be used for demonstration of various practicals. Even theoretical concepts can be made very fascinating to learn. As per the survey conducted education done under Augmented reality showed very positive result as compared with the traditional educational system. In future augmented reality will replace the traditional learning system. Augmented reality will be used E-Commerce, Digital Marketing, Educational Resources, Industrial, Military and Medical fields. The future of Augmented Reality is very admirable.

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