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Augmented Reality in Academia-Changing Landscape of Education

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Abstract: Augmented reality uses technology to take the real world and superimposes digital image and sound into it. By using the technology of Augmented Reality (AR), we can make the real world we see more digitally interactive with help of computer vision and object recognition. It allows us to add digital content to almost anything such as printed material, geographic locations and objects. We can use the available AR technology in innumerable ways to improve our classrooms and refine the learning process. Academia is one field that should definitely benefit from all these technological advances. Hence such ideas that allow us to harness and apply this state of the art technology for the improvement of the crux of our education system should be encouraged.

Key words: Augmented reality, virtual reality, education, chat-bot, classroom-integeration

INTRODUCTION

Augmented reality uses technology to take the real world and superimposes digital image and sound into it. By using the technology of Augmented Reality (AR) we can make the real world we see more digitally interactive with help of computer vision and object recognition. We have been playing computer games since almost three decades, graphics now a days are much more advanced and sophisticated which are enabling the researchers and engineers to actually integrate the graphics into the real world thereby blurring the line between what is real and what is computer generated. This technology is called augmented reality which enhances what we see, feel, smell and hear (Bonsor, 2001). Merging computer-generated content with real-world visual data is one of the main challenges in fields like augmented reality or visual effects and is increasingly important in broadcasting, gaming, medical, automotive, maintenance and learning applications (Eisert *et al*., 2017). AR is a technology that superimposes computer generated enhancements on the real world to make it more interactive and meaningful. It allows us to add digital content to almost anything such as printed material, geographic locations and objects. We can then use any smart device to view the digital content by scanning the objects. One of the biggest confusion which could happen is between what augmented reality is and what Virtual Reality (VR) is. People usually tend to mix up both even though they are different. As we have discussed, AR adds reality to the real world which user see on the other hand, virtual eality is all about creating a artificial world which users can interact with and the virtual reality is usually experienced by wearing instruments similar to goggles (McKalin, 2014).

As we can see, both AR and VR are similar in nature and both have a goal of enriching users experience though in different ways. By using AR, the users will still be in touch with the real world while more digital data would be added there by making the real world more interactive. In case of VR, the user would virtually move to a different world there by being isolated from the real world. Table 1 (Charara, 2015) gives detailed difference between augmented and virtual reality.

Augmented reality in academia: Augmented reality uses technology to take the real world and superimposes digital image and sound into it. By using the technology of Augmented Reality (AR) we can make the real world we see more digitally interactive with help of computer vision and object recognition. The two main categorizations of AR implementation are: marker-based and location-based.

Marker-based: This technology works on the basis of recognizing or scanning specific bar-codes or QR codes using a camera device which finally overlays the augmented visual data on the real world entity as viewed from the device's screen.

Location-based: Location based applications involve using geographical or latitude-longitude data to give information that is relevant to that location. Some specific

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Table 1: Sophie Charara (2015)

Virtual reality	Augmented reality
How it work	
Immerses the wearer in a 36°, 3D-environment; spatial sound and metion-tracking optional	Overelays 3D graphics on to the wearer's view of the real-world environment
The gear to wathc out for	
Oculus rifts, samsung gear VR, Google Cardboard, HTC Vive, Sony project morpheus	Google Glass 2, Microsoft Hololens, Sony Smart Eyeglass, Recon Jet, Magic leap Vuzix M 100,ODG R-7
Main benefits	
Transports the wearer to another environment; low-cost mobile VR with innovative accessories	Wearer remains engaged in the real world and keeps hand free; glasses rather than headest
Main hurdles	
Simulation sickness and input; needs apps experiences and games ready for launch	Small field of view, expensive hardware,fashionformfactorrequired and needs apps/games
Biggest deals	
Facebook paid $2 billion (£1.3 billion) for Oculus VR in 2014	Magic leap raised $542 million (£346 million) from Goolge, qualcomm and other in 2014

ideas following this category are applications that store information regarding a city according to its geolocation and use them for finding your way around for example the application like layar. Pokemon-Go is also a popular example of location based AR application.

Specific applications in academia: We can use the available AR technology in innumerable ways to improve our classrooms and refine the learning process. Some such unique applications are jotted down below:

Location based: Augmented reality can be best used in the classroom for creating interactive assignments that includes moving through the campus as well as nearby place. Assignments can be made in such a way that augmented reality helps us in abridging the gap between the classroom learning and interactive learning process. One particular scenario for botany can be that the teacher can store the total number of plant species observable in the campus with available AR based information portrayal about them. Students can be told to find them around campus in a scavenger hunt kind of a scenario and jot down all the information including what additional things they observed about them. We are able to harness an existing technology and use it to make our learning process more interactive and interesting. Such additions to the curriculum can work wonders in improving how students understand things and boost their practical knowledge.

Marker based: Marker based AR can have humongous applications. Some of them have been listed down here.

Interactive and interesting assignments: The first thing that needs to improve in the curriculum is how homework assignments work. As students we ourselves feel that at times we get stuck at problems and it lowers down our interest in the subject unless there is someone to assist us there and then. Teachers with their extensive knowledge and lots of experience in the domain, know by intuition where a pupil might go wrong or may face difficulty. Hence, AR tags can be made available at check points in the homework which provide extra information or give hints about how to approach a particular problem. This will make the home work assignments much more engaging and learning process much more fun. Even the classroom teaching can include intricate visual models to be realized using AR so that the students are able to learn by visualizing things better.

Interactive faculty information: In this concept we can have faculty information embedded in one stop "Faculty-Wall" which can contain marker tags that trigger a camera device to give the information. It happens quite often that we want to inquire about some particular faculty and get more information about their previous research work or their specific domain. Such an implementation of QR tags at a single place can give freshers a thorough idea about the teachers in their department. Such augmented reality based information tags may include animated projections or a video of the teacher giving his/her brief introduction (POI, 2017).

Deaf students: A special scenario where visual learning process can come into picture is in case of people with hearing disability. Different vocabulary words can be portrayed as flashcards with access to how they can be expressed as signs. This will make things much more easier for such pupils.

MATERIALS AND METHODS

Proposed idea: No matter how advanced we have become and how technology is reshaping everything but we all know there is no replacement for books. To gain detailed insights about any domain, there is always a set of books that are 'go-to' guides for better understanding of the discipline. With that in mind we can improve the whole learning process using AR. Different pictorial diagrams can be visualized in a much better way if they support AR tags and they are interactive in nature. One big issue that is faced always be it a novel or be it a reference book is choosing which book will suit you the best. A very good solution to this is letting the research tell you about the book. A lot many times it isn't really feasible to read the whole introduction to all the books that you have to choose from.

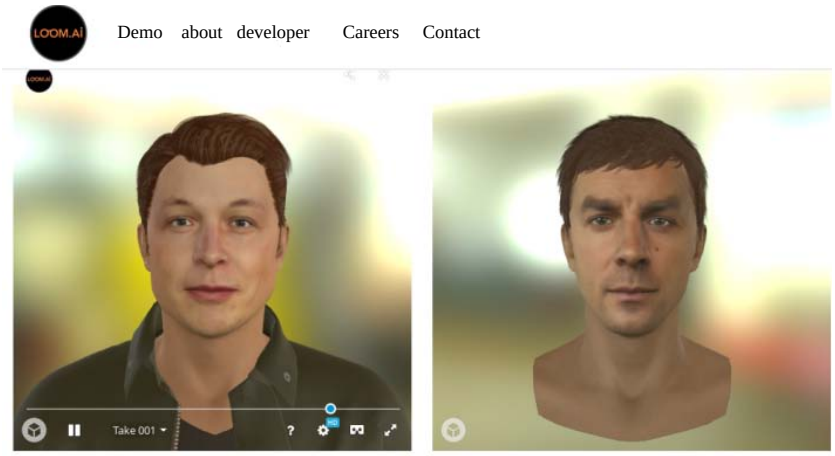

Fig. 1: 3D model of researcher

What is proposed is an AR based animated model of the author which gives you a brief introduction about the book. The notion here is that nobody else can describe the book as well as the author himself can and also the readers find it legitimate if the information is coming from the creator himself. With the ease of making chat-bots and easily available text to speech APIs and vice-versa we can easily make our animated AR models interactive up to a level. The researcher can propose all the possible questions that a prospective reader might ask and the answers to that can be modeled into a conversational bot. This technology can reshape how students and readers in general choose books. The implementation of the proposed idea can be realized using the following methods.

D-models: We can build an application which uses marker based AR technology to realize the proposed idea. We have existing technologies with high tech computer vision frameworks and machine learning algorithm that understand how a human face can be easily made into a 3D model which can have conversational face movements. One such computer vision based 3D model creator company provides an easy interface to do so (Anonymous, 1970). Hence, easily creating life like 3D models of authors can be realized as shown in Fig. 1 (Anonymous, 1970).

RESULTS AND DISCUSSION

Conversational chat-bots: Now the next challenge is making the model conversational. We can use services from AI-aas providers like Pandorabot (Build a chatbot) and IBM Watson (Walchuk, 2016). Or we can also use a recursive neural network to build one. Any text to speech API can be used like ones provided by IBM

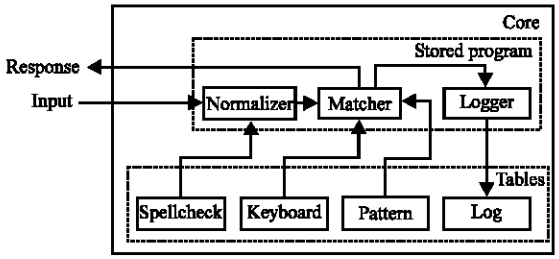

Fig. 2: Chat bot architecture

Watson and Amazon Polly. To have a full conversational model we would also require speech to text and then feed the text data to the chat-bot. Hence similar speech to text APIs can be used for the same.

Setiaji and Wibowo (2016) in their study have explained how chat bots are made and how they make use of knowledge databases and also how scores are given to different inputs to match them to possible outputs that need to be given by the chat-bot. Figure 2 (Setiaji and Wibowo, 2016) shows cor architecture of a chat bot and how various constituent parts work together to give a response. The process involves normalizing/spell-checking, matching to find similarity to stored responses and also logging responses for particular conversational use.

Here, the important thing is that the intents and possible scenarios for training our model will be provided by the researcher himself with all the possible expected answers. The intents and conversation flows for deceased researchers can be provided by some close associate or someone who has the same level of understanding as the author himself. Such an immersive AR experience is bound to impeccably improve how students choose the books they want to read. The use case as mentioned

before can be extended to for all kinds of readers and all kinds of books. Books can have unique QR codes which when scanned can show up the augmented 3D figure on the users device. The hardware from the device can be used for any kind of input and output. There can be a repository of all this data with tags being made available for books.

Using Qr code as a marker for AR has been realized earlier. Kong Ruan and Hong Jeong have proposed overlaying AR on scanning a QR code via an android device. A similar model can be undertaken (Ruan and Jeong, 2012).

CONCLUSION

Augmented reality is an example of one of those technologies which have the capability of transforming and redefining how we interact with our environment. It can find application in innumerable scenarios. Academia is one field that should definitely benefit from all these technological advances. Hence such ideas that allow us to harness and apply this state of the art technology for the improvement of the crux of our education system, should be encouraged. This research is based on a similar ideology to achieve this sensational yet achievable goal.

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