AUGMENTED REALITY APPLICATIONS IN MODERN DAY LIBRARY: A STUDY

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The twenty-first century library is akin to a laboratory of experimentation and prototyping. Augmented Reality (AR) breaks new ground in the library field. It has gained wide public appeal in recent years and carved a niche in mainstream society with the global Pokémon GO craze of 2016.Although AR has been around for more than sixty years the term was not officially coined until 1990. It has come a long way from a science-fiction concept catapulting to a science-based reality. It is a cutting-edge technology that allows the smart device users for a digitally enhanced view of the real world. Augmented Reality works in sync with headsets and/or digital devices such as tablets, smart phones and even PCs. The devices themselves contain software, sensors and digital projectors that trigger digital displays onto physical objects. AR's ability to enhance what already exists is what makes it a perfect fit for libraries. Keeping in view of the modern-day expectations of users from a library, the library professionals should dedicate de novo in dealing with Augmented Reality applications more effectively and efficiently under the rubric of library – AR binary.

Keywords: Definition of Augmented Reality; Difference between Virtual Reality and Augmented Reality; Various types of Augmented Reality applications used in the Library; Role of Librarians; Augmented Reality in Indian scenario.

INTRODUCTION

Augmented Reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer generated perceptual information, ideally across multiple sensory modalities including visual, auditory, haptic, somatosensory and olfactory. The primary value of Augmented Reality is that it brings components of the digital world into a person's perception of the real world and does so not as a simple display of data but through the integration of immersive sensations that are perceived as natural parts of an environment [1]. A key measure of AR systems is how realistically they integrate augmentations with the real world. AR can be created and consumed in multiple forms. For instance, Google Glass displays 2D images onto see-through glasses whilst Microsoft's HoloLens embeds 3D images into the world around you. App such as Blippar, Zappar and Aurasma allow affordable AR content creation for small business, education etc.

At this time, most Augmented Reality apps in libraries are in the research and development phase though they represent a profound opportunity for increased access to print and digital library collections. AR applications can yield an engaging and interactive information experience. Applications that overlay graphical data are well suited for in-library engagement as well as off-site real-world interaction with library content. Mobile augmented reality applications offer much for the integration of library resources into users' information environment. Libraries, through further research and development efforts, can continue to expand and extend the library presence in this environment through augmented reality applications.

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OBJECTIVE OF THE STUDY

The salient objectives of this paper are as followed:

- To discuss about how effectively Augmented Reality applications can be adopted in Library.
- To understand about challenges in dealing with AR applications in Library.
- To know about AR initiatives in the World and India.

LIMITATION OF THE STUDY

Augmented Reality concept, in its entirety, is new to the field of Library & Information Science. This study is done by collecting and collating information from websites and some renowned journals. It is observed that sufficient information related to Augmented Reality is not available. Therefore, in this study all comprehensive information pertaining to AR is not provided.

VIRTUAL REALITY vs AUGMENTED REALITY

Virtual Reality (VR) is a computer-generated scenario that simulates a realistic experience. The immersive environment can be similar to the real world in order to create a lifelike experience grounded in reality. A person using virtual reality equipment is able to look around the artificial world, look in every direction- up, down, sideways and behind you, move around in it and interact with virtual features or items as if he is physically there. Some of the popular VR headsets are Oculus Rift, Samsung Gear VR, HTC Vive and Google Daydream.

Caudell & Mizell [2] stated that Augmented Reality (AR) is tantamount to a technology that merges computer generated simulations with real-world environment, placing them on top of real-world objects. It allows the digital components to blend with the actual environment in such a way that they enhance each other.

Table 1: Key differences between VR and AR

S. No.	Virtual Reality (VR)	Augmented Reality (AR)
1.	VR replaces the real world with the artificial.	AR enhances real life with artificial images and adds graphics, sounds and smell to the natural world as it exists.
2.	Everything around the user is fabricated by the system. This may display inside a blank room, headset or other device that allows the user to feel present in the virtual environment.	User is not cut off from the reality.
3.	It creates immersive, computer generated environment which replaces real world.	It is closer to the real world.
4.	In this case, it is hard to differentiate between what is real and what is not.	It lets people interact with both worlds.
5.	It creates an entire virtual world.	It is a mix of the real world and the virtual world.
6.	This is generally achieved by wearing a helmet or goggle.	This is generally achieved by holding a smart phone in front of you.
7.	More advanced screen processor.	Less advanced screen processor.
8.	Less advanced Indoor Sensors.	More advanced Indoor Sensors.
9.	High quality display device.	Low quality display device.
10.	It is more immersive.	It provides more freedom and more possibilities for the user.

AUGMENTED REALITY APPLICATIONS USED IN LIBRARIES

There are some specific augmented reality applications which can increase the efficiency of library's existing workflows. Libraries will need to be geared up to embrace these innovative AR applications to help users to access their required information timely and also help them to become more interactive. These effective AR applications are as follows:

1. **Aurasma:** This innovative AR app was developed in 2011 by Tech Company Autonomy in Cambridge, UK and recently acquired by Hewlett-Packard. Dunleavy and Chris [3] stated that it allows one to see and interact with the world in a new way. With Aurasma, every image, object and even place can have its own aura. Auras can be as simple as a video and a link to a web page or as complex as a lifelike 3D animation. One will need access to a smartphone or a tablet to use Aurasma as the first step in downloading the Aurasma app. Upon downloading the app, the user creates original contents (called 'auras') or chooses from a library of pre-recorded content, selects a specific static image (called the 'target') and then overlays the aura to the target and when the user points a device at the target and holds it steady the aura appears at Centre Screen. In this way it is presenting a recording selected by the originator to add an AR component to the target image. One can use the Aurasma app to view auras and share the experience. Alternatively, one can use the simple tools within the app to create and share one's own auras. It is easy to use AR platform.

   For instance, Aurasma can bring to life an exhibition in the library's art gallery. A series of posters can be created on a particular theme and auras can then be developed for each poster, bringing a combination of charts, graphs, animations and human centred narrations to each one, thus providing the gallery viewer a uniquely enhanced experience.

2. **Layer:** It stands for world's first augmented reality browser on Android and iphone. It takes the image being captured by the camera and combines it with information from GPS, magnetic compass and tilt sensors. It uses this information to overlay points of interest on top of the picture coming from the camera. Similar to the concept offered by Aurasma, the app used in the library allows creators to add multimedia of all types to bring state images to life and enhance the viewer's experience.

3. **Google Goggles:** It is an image recognition mobile app developed by Google which uses augmented reality application. It can be used in library quite effectively. It is used for searches based on pictures taken by handheld devices. For example, taking a picture of a prominent landmark searches for information about it or taking a picture of a product's barcode would search for information on the product.

4. **libARi:** It is an Augmented Reality Application which is designed to help users to identify where a specific book is located in the library [4]. It requires the students to understand why books are numbered and how to find the numbers on the shelves in order to use the library effectively. In addition to that, it allows anyone to access any specific book just the way they have been naturally habituated to search for anything on the website.

5. **ShelvAR:** It consists of an Android app and a set of coded tags, representing call numbers that are placed on book's spines. When a librarian holds a smartphone or tablet camera up to a shelf, the app reads all the tags at once, thanks to a new algorithm that can decipher multiple patterns even though they are small when viewed at a distance.

OTHER USES OF AR APPLICATIONS IN LIBRARY

1. **Physical Book Stacks Browsing:** Augmented reality application includes the integration of digital library content into the physical stacks browsing experience [5]. Consider a first time user to a library. The new user may consider the physical book stacks to be the only available library resource. He is not aware of the digital items of the collections. With an augmented reality application in the library book stacks the mobile app user can use the software to first identify the stacks that he is in (i.e. identify a subject area of 'dictionaries') and then the software will overlay a range of digital content to this physical presence, once the meaning and subject area of the shelf are identified by the software.

2. **Optical Character Recognition (OCR):** A research and development project underway at the University of Illinois Ursana Campaign is developing a mobile application that allows students to scan the textual documents and learn about relevant library resources to this document from their mobile phone. Users of

the app will have options to scan a course assignment page or syllabus, scan a citation or bibliography, scan the contents of a book page, scan a shelf of books in the library. After scanning, the app will then provide users with suggested resources.

3. **Identify building services and collections:** An augmented reality application can identify buildings by simply holding the phone's camera up to the building. According to Milgram, Takemura and Kishino [6] the user of this augmented reality app can use this to identify the name of the library building and the hours of the library building. It can tell users when it will be closing and overlay information such as current computer availability, technology availability or even seating availability in the library.
4. **Special Collections:** Promoting special collections or university archive materials is of special interest to academic institutions. Many academic libraries struggle with how to share special collection materials and attract students, faculty interest. This is another area where AR can help [7]. If there is an exhibit being showcased on a floor with low foot traffic, pre-existing marketing materials can be enhanced with AR. Adding AR enabled auras to signage about the exhibit allows patrons with the Aurasma app to access additional content about the exhibit, such as a video sneak peek, without having to physically encounter the exhibit. This can increase awareness of the display among individuals who do not frequent the area where it is located.
5. **Technology Programming:** The final area where augmented reality can be utilized is technology programming. AR can interact with existing services such as dedicated tech zone space or sandbox programming which provides hands on demonstrations and training with circulating library technology like virtual reality headsets, Rasberry Pi Computers and iPads. Installing AR applications onto library technology allows patrons to follow along experiment with creating their own AR enhanced content during technology programming [8].

BENEFITS IN A NUTSHELL

- Supports contextual and situational learning.
- Ubiquitous and timely access to information.
- Streamlines workflow.
- Patrons engaged with new technologies.
- Information is provided at the point of need.

CONCERNS

- Privacy of Augmented ID.
- Limited by mobile device technology (GPS, Screen).
- No established standards.
- Lack of interoperability.
- Unavailable to non-smartphone users.
- Could become dependent and miss out on reality.

ISSUES TO CONSIDER FOR IMPLEMENTING AR SYSTEMS IN LIBRARY

- The first and most obvious is that it is important to determine whether your target audience will have access to the device or app that is required to access the augmented reality content.
- Along the same lines, it is important to ensure that your use of AR conforms with your library's existing policies [9].
- Finally, it is important to remember that augmented reality displays will need to be updated as changes occur.

IMPORTANT AUGMENTED REALITY LIBRARY PROJECTS

1. **Librarian-in-Black** is a Layer-based mobile app that allows users to take local history tours with augmented reality capability.
2. **New York Public Library's Find the Future** is another project that unites game based learning and augmented reality. The project is a game designed to empower players to find inspiration for their own extraordinary futures by bringing them face-to-face with the writings and personal objects of people who made an extraordinary difference in the past.

3. **Miami University Augmented Research Group (MUARG)** developed ShelvAR, an augmented reality application that uses the camera of a mobile device to read a bookshelf and flag books that are mis-shelved.
4. **Smart Library** is an AR app developed and tested at the Oula University Library for desktop, laptop, PDA and mobiles at the library. It allows users to locate themselves in the library and find what they are looking for by using landmarks. Landmarks guide users to other libraries on the University campus.
5. **Wolf Walk** is an AR app optimized for the use of mobile devices on the North Carolina State University Campus. It allows users to explore the history of the university with a location aware map and photo viewer for browsing historical photographs.
6. **Expedition Deventer** is a game commissioned by the Public Library Deventer and is a great example of the intersection of game-based learning and augmented reality. Users can learn about the past, present and future of the city of Deventer and the library as the city's information center.

AUGMENTED REALITY IN INDIAN SCENARIO

The rate at which AR is being adopted all over the world is truly phenomenal. In fact, it is not hard to envision a future where not only the library but brands and companies in every sector will engage with their consumers only through AR applications without online and brick-and-mortar channels. India was hitherto slowly becoming a part of this global trend but the recent increase in smart phone penetration and internet services is surely going to provide impetus to Indians' desire for Augmented Reality. Of late, in India Augmented Reality is only used in android based applications, marker-based library applications. "Timescape: Kolkata" is an Indian AR app developed by the University of Liverpool, the Jadavpur University and the British Library which allows mobile-phone users to explore rare archival images and data about heritage sites in Kolkata, as they walk through the city.

CONCLUSION

To sum up, this seems imperative to mention as an addendum that Augmented Reality has revolutionized the way of looking at actuality. The exponential developments in this area have hallmarked visualizations beyond desktop [10]. It has well converged knowledge of computer vision, virtual reality, image-processing, human to computer interaction and more such areas. It is that kind of innovative technology which is rapidly gaining more ground and its uses in libraries and for educational purposes are expanding. Libraries can further engage their users by implementing AR technology into their outreach efforts, marketing and technology programming. By taking advantage of free and low-cost tools that put users in contact with emerging tech trends, the library can generate more interest and garner a reputation with students as being tech-savvy. Perceivably, sky is the only limit for how technology can provide new ways to interact with library patrons. Imaginative librarians can develop their own unique ways to integrate AR technology into their library. So, one should "stay calm" and "Augment on".

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