

# Navigation and Cataloging of books in Libraries using Augmented Reality

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**Abstract**— This project is an application of the concept of augmented reality, and uses day to day equipment such as a Smartphone, tablets or VR devices. The project is divided into 2 parts: Navigation and Cataloging. The navigation feature will include step by step navigation to the given location (section) of the library. A destination tag will be present on the display of the device for easier navigation. The Cataloging feature will display all related information about the books, such as book reviews, book summary, author information, related books present in the library. The advantage of using Augmented Reality will be that seamless transition from one book to another without having to give any additional data or time, will be achieved. To make a database entry of a book, users can participate and scan the books that they have read and use those covers as a marker.

**Keywords**—*Augmented Reality; Indoor Navigation; Cataloging; BLE Beacons*

## I. INTRODUCTION

The main anomaly that we face while we enter a library is to navigate ourselves towards the desired section in order to get the book of the desired genre. So with the help of 'Navigation and Cataloging of books in libraries using Augmented Reality', an effort has been made to eliminate this anomaly of navigation with the help of NFC tags and Bluetooth beacons.

Also, with the help of Augmented Reality, the primary focus has been upon providing the user with rich and interactive AR interface which will be used in Cataloging which is the main feature of the project

The main aim of our project is to solve the problem of searching books in libraries and providing the users with relevant information of the book they are using.

## II. LITERATURE SURVEY

Augmented Reality is an overlay of graphics on the real world which can be used in multiple ways. In this paper [1] we can see it being used for translating input into output in desired languages. This input is mainly in form of pictures which cannot be inherently read by the system and thus uses Optical Character Recognition (OCR) for reading and understanding the given input.

Another method of recognition [2] performs Canny Edge Detection method to read the input image and overlays instructions linked to the images which are given by the manufacturer.

The devices used for experiencing Augmented Reality can also differ from Head Mounted Displays (HMDs) to Smart Phones. It was proposed [3] that HMDs could be used for military operations in urban terrain, giving the user more information and environmental awareness during combat.

Navigation in Augmented Reality is done [4] with the help of static maps placed at particular points in an indoor environment with each map having a "You are here" point which indicates the position of the user in said environment.

Digitizing a static platform with a dynamic model shows improvement in performance [5] by providing newer functionalities to a system through automation, and in turn increasing efficiency.

Use of low energy consuming devices such as beacons in navigation [6] has yielded positive results. Indoor positioning is achieved as a result of Received Signal Strength Indicator (RSSI) of BLE Beacons which constantly identify location on the basis of strength of the signal. This has been proven better than Wi-Fi beacons when tests were performed on the basis of fingerprinting.

Augmented Reality allows users [7] to access abstract information using contextual data such as eye movements, and gaze as input and provide said data on an augmented interface, allowing users to receive information without having to specifically interact with objects.

To enable wireless interaction between devices [7] for applications such as product information retrieval, security authorization, payment transactions NFC tags play an important role as they provide extremely short distance wireless communication between devices and can be provided with unique ID to enable more functionality and overcome limitations of wired media.

## III. METHODOLOGY

The project has two main objectives:

- a) Navigation
- b) Cataloging.

Navigation is achieved by users when they place their Smartphones on the NFC tag on the entrance of the library. The NFC tag will provide the user with the library information and link to the database. In the application interface, the user will search for the desired book. The application will query the database for the beacon number of the searched book. The database will provide the user with respective beacon number. The application will activate the Bluetooth functionality in the device and search for the correct beacon number and will navigate the user towards it.

After the user has navigated to the location the Cataloging feature of the project can be initiated. The user will open the application interface on the Smartphone. The Smartphone camera will be placed on the cover of the book. The camera will scan the cover of the book. The cover will be used as a marker in the application user interface. The UI will query the marker in the catalog database. After identifying the marker, the database will give the respective book information. The AR engine will be started after book information is passed on to it. AR engine will provide an overlay on the book cover itself. When switching book covers, all steps from step 3 will be repeated and the overlay will seamlessly transition to the information of the next book.

#### IV. IMPLEMENTATION

The implementation of both features can be divided into phases. These phases allow the process to be distinguished in their working and better explains the process.

##### A. Login Phase

The first phase that takes place is the login phase where the user logs into the system via their mobile devices. The log in allows the user, access to the system and also lets the library get information about the user such as name, frequency of visits, books checked out, etc.

##### B. Initial Data Fetching Phase

This phase constitutes the user fetching information regarding the library and the sections of the books in the library via. NFC tags. Each library has its unique ID and this ID fetches information the library so that the user does not need to remember the name & location of the library and this information can be fetched directly from the database.

##### C. Navigation Phase

After the information about the library is received the user searches for the desired book and is navigated to the section where the book is kept. This navigation is done with the help of Bluetooth Low Energy Beacons (BLE Beacons). Each section is equipped with a BLE Beacon and each of these beacons has a unique ID. This enables the navigation to the section by a simple search mechanism. The unique feature of the beacons that allows Indoor Positioning is established on the basis of RSSI of these beacons [6].

##### D. Recognition Phase

After the user has navigated to the section and has acquired the desired book, the recognition phase is initiated. The book cover is read as a marker consisting of points which will make all the books with same cover be recognized as one object. The information is then generated in the form of an

augmented reality interface for the users. This phase allows the system to continuously track the information rather than scan it just once, allowing one to hover over the book in real-time and seamlessly fetch data from one book to another without having to specifically interact with the book.

##### E. Cataloging Phase

Once the information about the book is fetched from the database, the user is able to avail information regarding the book which is provided by a community of users who give useful feedback about the book. 3D images of 2D diagrams such as structure of an atom can be rendered in augmented reality which can help better understand concepts, An inbuilt dictionary can help understand meaning of words better. This Cataloging allows a more in depth and time efficient experience to users.

#### V. CONCLUSION

Thus we propose to develop a system to help students and other users to access books in Libraries in an easier manner using the Navigation feature and through an Augmented Reality interface, enable them to get relevant information of the book they are holding like the summary, author information, reviews and related books just from the cover of that book.

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