A Beacon Enabled Smart Library Management System

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ABSTRACT

Nowadays, Global Positioning Systems (GPS) receivers are used for outdoor navigation, which are the part of recent smartphones and tablet devices. However, GPS is not suitable for indoor navigations due to its signal limitations which are blocked by ceiling and walls. Indoor navigation can be achieved through a mobile phone using a recent technology that utilizes Bluetooth, namely beacons. Beacons are small transmitters, run on Bluetooth Low Energy (BLE) technology, used as a point of reference for mobile devices and they can detect a Bluetooth enabled device once it enters its transmission range. In this paper, we present Library a beacon assisted indoor navigation technique for smart libraries. The proposed indoor navigation technique can also be used for other applications such as offices, retails, airports, hospitality, and education. For experimentation, beacons are placed in a library and a Bluetooth enabled smart-phone is used to install a digital library application (App) which communicates with the beacons. The result shows that when the smartphone comes in the range of a beacon, it shows the information related to the book on the smart-phone screen.

KEYWORDS: *Bluetooth Low Energy, Beacons, Proximity Sensor, Indoor Navigation, Global Positioning System*

I. INTRODUCTION

Recently, Bluetooth Low Energy (BLE) is gaining quality as a convenient method of wireless communication thanks to its low power demand and cheap characteristic compared with classic Bluetooth [1] [2]. Also, it doesn't limit the amount of devices to be connected for info sharing. Whereas Classic Bluetooth is employed for short-range (personal space network) communication, BLE provides quick and economical handling of multitudinous devices for similar applications [3]. Beacons are little transmitters, run on BLE technology, used as some extent of reference for mobile devices and that they will find a Bluetooth enabled device once it enters into its transmission vary [4]. In this work, for experimentation purpose, a beacon is coupled with a book within the library that provides the essential info of the book to a reader/library user while not even studying the book. The necessity is that the reader ought to have the digital library App downloaded and put in within the smartphone or pill. A user United Nations agency includes a Bluetooth turned on within the smartphone can receive the book info from the beacon if he/she is within the vary of the beacon a sensible App is developed to supply easy accessibility to library users with a Bluetooth enabled smartphone or pill. A user is ready to check the essential info of the book on the mobile screen. This helps a library user to induce easy accessibility to the books while not studying individual books and it doesn't need a web affiliation. As compared to GPS that is employed for outside navigation [5] the projected work is employed for indoor navigation within the library.

Mostly, beacons are utilized in promoting purpose for promotional offers. This paper explores another application of beacon as in indoor navigation. This work objective additionally includes the event of associate automaton mobile App exploitation Java. The Estimote Bluetooth beacons and automaton phones are used for the experimentations. Figure one shows a typical Estimote Bluetooth beacon obtainable within the market.

II. RELATED WORK

Bluetooth beacons area unit proximity sensors with little button cell batteries they give the impression of being like hockey pucks and area unit typically coated with a plastic case. The beacons area unit wont to broadcast advertising services and data for subject matter and promotional message or events [6].Beacons have transmitters that work on BLE technology and might be programmed employing a message. in an exceedingly library, a user can receive the knowledge a few book issued to him/her, come back dates, fines etc. within the smartphone App. BLE is extensively utilized in health care applications wherever health sensors communicate biological readings and standing to smartphones alternative tending applications designed on BLE area unit observation systems of Electro Cardio Gram (ECG) [7] [8],blood pressure and pressure level [9]. Few of the commercially obtainable tending merchandise area unit [10] [11] .BLE could be a key enabler technology for the web of Things thanks to low power consumption and straightforward hardware implementation [12].

Figure 1 A typical Estimote Bluetooth beacon

BLE is additionally utilized in hotels to tell the shoppers concerning the menu, costs and even the order may be placed exploitation mobile App with the assistance of BLE and in this means, the client doesn't got to await the waiter to return and take the or-der. This helps in cut for costly business. This additionally saves crucial time, for instance, the waiter can take the orders and inform the cook and convey the food, by that point exploitation the technology, and a client will place the order and receive the ordered dishes. BLE may be used for jobs requiring accuracy like turning ON and OFF the lights and show on the various screen [13] .Magnetic beacons and receiver with magnetic sensors are engaging for a good vary of indoor events and applications, like pedestrian and mechanism navigation [14] .Mobile beacons in wireless detector network (WSN) give info of first applications like fire detection and animal pursuit [15] .NFC is another contactless technology used for simple payment and paperless ticketing purpose [16] .NFC-enabled smartphone has helped to make a replacement application like mobile payment (m-payment) and mobile ticketing (m-ticketing). Authors in [17] have studied the contactless transport service exploitation the SIM card as security part and NFC-enabled smartphone a similar application supported RFID is employed in metropolis, New Zealand for bus, train and ferry ticketing that charges the users mechanically once they reach their destination.

III. PROPOSED SYSTEM

The aim of this work is to produce the indoor navigation to users in libraries like port University of Technology technique for the good library, Beacon Library. A digital library App is formed that displays the quilt of the book, title, authors and a short in-formation regarding the book. Estimote development kit is employed for experimental purpose. The kit contains 3 Estimote beacons in numerous colours; lemon tart, candy floss and sweet beetroot. The beacons are enabled to broadcast not solely Apple iBeacon packets however conjointly Eddystone, associate degree open beacon format from Google. The Estimote cloud will be wont to manage the beacons. It permits the remote access to the settings of the beacons and placement saved with Indoor Location SDK. there's data of the colour, name, Identifier, and placement of every of the beacon. it'll show the data of the sticker beacon that's referred to as because the "Nearables". It conjointly provides the data of the applications that may be created victimization the "Apps" possibility. It conjointly provides the data of the digital library App created .It provides the knowledge of the situation and analytics just like the variety of tourists especially time of the day and also the location. The third floor of the urban center University of

Technology Library is chosen to check the Beacon Library because it may be a Brobdingnagian space jam-packed with books wherever Indoor navigation is troublesome it's conjointly chosen to check the operating of sensible Library in jammed areas because the signals of beacons get interfered and absorbed [10].the diagram of university library. The beacons area unit placed ten to twenty meters apart within the library exploitation Beacon Library, the scholars and workers members area unit able to realize the books simply. The projected answer is sometimes tested by the scholars of urban center University of Technology 3 beacons area unit placed close to the books as shown in table one once a user reaches within the vary of a selected beacon the knowledge associated with the book can seem on the smartphone.
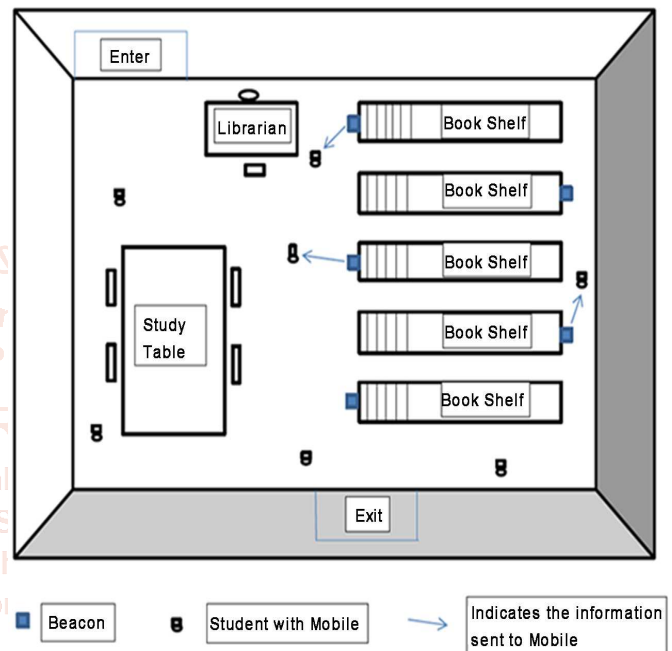

Figure 2 System structure block diagram of university library

The flow sheet of the sensible Library App is shown in Figure two. First, the user must install the digital library application. Then the beacons check whether or not the Bluetooth is on or off. If the Bluetooth is on then the scholar can receive the data of the book betting on wherever the scholar is. If the scholar is close to Lemon colour beacon then the smartphone can show Introduction to complicated Numbers and if the scholar is close to the Candy colour beacon then it'll show the fundamental info of the Automation and AI book. If the scholar is close to the Beetroot colour beacon then it'll show the fundamental info of Introduction to Electronic Engineering. If the scholar isn't close to any of the beacons then it'll show the image not out there. Table two lists the options of Estimote beacons. After that, if the user walks to a different beacon then it'll show the data of the book associated with that beacon or it'll simply show no image out there. If the user decides to depart the library or doesn't need to any extent further info of the book then he/she will cut the Bluetooth. during this manner, the user will search the books while not mistreatment the web.

Beacon	Title of Book
Lemon	Introduction To Complex Numbers[12]
Candy	Automation to robotics[13]
Beetroot	Introduction to Electronic Engineering[14]

**Table 1 Beacon and related book information.**

Properties	Specification
Battery Life	5 years
Range	200 Meters
Thickness	24 mm
Built in Sensors	Motion, Temperature

Table 2 Features of Estimote beacons [13].

IV. DISCUSSION

Once the Estimote beacons are connected to the Estimote account they will be programmed as per the specified objective. associate humanoid phone is needed to run the good App and site of the beacons may be chosen as per the need of the project. To run the humanoid App during a notebook computer, Microsoft Windows or later version, mackintosh OS X ten.5.8 or later version with the Intel chip or Linux as well as antelope C Library a pair of.7 or later [24] is needed. The humanoid Programming needs tools that ar downloaded with none charges. The software package needed ar Java JDK5 or later version, humanoid SDK, Java Runtime atmosphere (JRE) half-dozen, humanoid Studio, Eclipse IDE for Java Developers and humanoid Development Tools (ADT) Eclipse Plug-in. every Estimote beacon has separate ID that may be modified, it's iBeacon format having 3 values that ar UUID associate Major ID and Minor ID as shown on top of (Figure 6) the beacon we've utilized in the project have the subsequent. These IDs ar known by the mobile application and it makes them behave the approach they show the output. The UUID is mounted and that we will modification the values of Major ID and Minor ID as per the need of the project. The committal to writing is employed to convey info concerning the Beacons and therefore the ID. within the committal to writing, the variables like title, author and a quick introduction of the book ar declared victimisation String Text and it uses variable name as "title", "author" and "intro". The image of the book is additionally keep and therefore the background color is keep. additional variables may be introduced as per the need of the project.
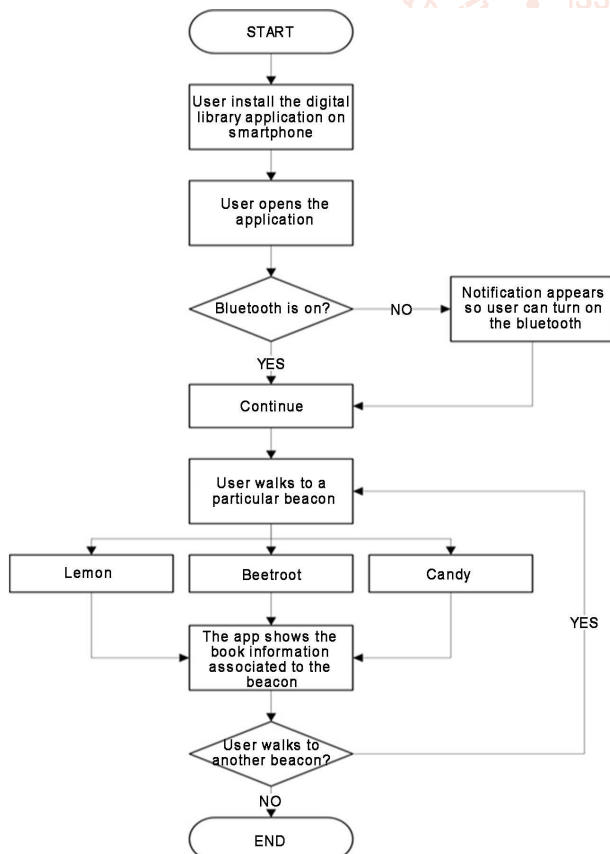
Figure 3 Flowchart of the digital library application.

V. ADVANTAGES AND DISADVANTAGES OF BEACON

Advantages

[14]Beacon technology is additionally reasonable and comparatively simple to put in and setup, that makes it low risk and high doable come back on investment. Beacon promoting will increase the employment of a business' mobile app likewise as stimulate in-location sales. Beacon triggered notifications supported proximity enable apps to be a lot of participating searching tools and additionally drives traffic with a promotion to the closest physical location if, as an example, you're within the mall and beacon technology directs you to a particular store.

Disadvantages

Beacon selling is proscribed to BLE (Bluetooth) signal; so, if a client doesn't have Bluetooth enabled, beacon technology won't be able to notice them. This additionally limits the information the corporate has as usually the demographic that has Bluetooth enabled solely permits the marketers to succeed in a particular target market because the Bluetooth could also be enabled for Bluetooth pairing of devices, which usually represents a younger demographic for a few brands, beacons believe put in whole apps so as for the beacon technology to speak with the customer's device. as an example, if I enter a spot store and don't have the gap appenabled, i could not be able to receive beacon communication with customized offers.

VI. CONCLUSION

This paper conferred good Library: A Beacon Enabled good Library Management System it's shown that Indoor navigation may be achieved through a portable employing a recent technology that utilizes Bluetooth, specifically beacons. The projected indoor navigation technique is for a wise library. Beacon Library utilizes the Bluetooth Low Energy (BLE) technology. The projected indoor navigation technique can even be employed in alternative applications like offices, retails, airports, cordial reception, and universities. For experimentation, beacons were placed during a library and a Bluetooth enabled smartphone is employed to put in a digital library App that communicates with the beacons. The result shows that once the smartphone comes within the vary of a beacon, it shows the knowledge associated with the book on the smartphone screen.

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