BLE Beacon Based Museum Knowledge Sharing Platform

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Abstract

In this new age where evolution of technology is so rapid, there is a greater need for our environment to become smarter to interact with people who communicate with the world through a technology called "internet of things" which has become quite popular nowadays. Internet of things affords an approach for functioning with intelligent environment for smart people. As witnessed, People nowadays are very much interested in knowing about ancient history and cultural heritage more than ever. Cultural heritage epitomizes the global, worldwide resource of inestimable value and it earns more and more interest and significance when encapsulated with the digital ecosystem of smart environment. To achieve this, we use BLE beacons which are quite in headlines across the world recently. In our paper we solely focus and propose an IoT aware architecture to improve the cultural experience of the user by involving the services offered by BLE beacons. This enables us to design a smart museum as a knowledge sharing platform. Here an immobile cultural space is becoming smart, all credits to the definition of an innovative model of sensors and services.

Index Terms- Beacons, Bluetooth Low Energy, Indoor Localisation, Received Signal Strength Indicator (**RSSI**), Smart Museum.

1   INTRODUCTION

Every museum with its artifacts is an ocean of knowledge but limited with space to showcase. Majority of the museum either show the information using paper art or by LCD displays. Since majority of the people have an android phone, the information related to the artifact can be portrayed. Thus, we use beacon technology.

Beacons offer museums an opportunity to provide context to visitors like never before. With beacons, an app can sense exactly where in the museum a guest is and provide relevant information. Instead of searching through an audio tour for the right section, the visitor can instantly watch a video highlighting the artist's life on his/her mobile and learning more about a particular painting. Experts in the beacon field maintain that museums will be one of the biggest beneficiaries of iBeacon technology. Museums will have fast customer adoption for beacons because they replace known tools that guests are used to. Instead of audio headsets, they can use their phones. Instead of searching through a brochure for the right exhibit,

beacons can pinpoint their location with accuracy.

Whenever a person is within the vicinity of the strongest signaled beacon, the visitor will get customized multimedia related to the artifact for a world view of information. With the wave of IoT development, Bluetooth Low Energy Beacon devices have become important media of assistive perception. Although current applications of these devices do not make objects "smarter and wiser" as most people imagine, with the help of the sensing characteristics, IoT can have more diversified applications. The so-called Beacon is, in fact, Bluetooth precision positioning technology. Its use is mostly focused on consumer push applications of the retail industry, which can bring business opportunities.

2   LITERATURE SURVEY

The literature provides an illustration about some implemented and tested methods for BLE based applications. One of the key features of this proposal is represented by the indoor localization mechanism, which currently is an important and challenging research topic to be dealt with. Before deciding scope for our project, we have studied many existing BLE application in smart museums like iBeacons and others.

2.1   BeaSmart:

A beacon enabled smarter workplace by Adegboyega et. al. IBM's Watson Internet of Things (IoT) initiative is the next step of IBM's exploration of new ways for systems and humans to learn and interact synergistically. BLE beacons become more popular and widely adopted, interesting use cases have been developed. For example, Location-Based Systems that use BLE beacon technology to help Smartphone users navigate through buildings. BLE beacons become more popular and widely adopted, interesting use cases have been developed. For example, Location-Based Systems that use BLE beacon technology to help Smartphone users navigate through buildings.

2.2   Bluetooth Low Energy (BLE) based geomarketing system by Dalal zaim et. al.

A Geomarketing system based on Bluetooth Low Energy (BLE) is developed. This BLE-based system consists of three key components (i) Server component (ii) Smartphone component, and (iii) beacons (BLE). The Smartphone application detects the location of customers by using BLE technology, this data will be transferred to server component by WIFI, and the server application sends personalized promotions such as mobile advertisements or e-coupons to customers' smart phones.

2.3   Smart shoppe using beacon by Rajat pugaliya et. al.

The goal of this research is to implement mobile based indoor positioning shopping application with the beacon solution based on the Bluetooth Low Energy (BLE) technology. For estimate the locations based on localizations we use RSSI (Received Signal Strength Indicator). A triangulation algorithm is used for calculating the current location of mobile

Proceedings of the 3rd National Conference on Image Processing, Computing, Communication, Networking and Data Analytics (NCICCNDA 2018)

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phone. Beacons provide accuracy in proximity and distance estimation. In our application customer saves their time because customer's gets notifications on mobile phone when they are pass through any malls or stores. When customer like any notification they react on that and they got the way to reach that store.

2.4 A System for Detection and Tracking of Human Movements Using RSSI Signals by Apidet booramawong et. al.

A device-free human detection and tracking system using a received signal strength indicator (RSSI) for an indoor environment is presented in this paper. The proposed system has two major functions: a wireless communication system and a human detection and tracking system. The first function is developed for measuring and collecting RSSI signals affected by human presence and movement, while the second function is developed for detecting and tracking the human using a predefined threshold and a zone selection method.

2.5 Beacon applications in information services by Yuki Shinotsuka et. al.

Beacon is based on Bluetooth technology and precision positioning technology. Beacon in use, mostly   focused on the retail consumer push applications can bring promotional opportunities. Beacon technology addition to applications in the commercial, the paper will explore Beacon on a variety of information services applications, such as traditional library service combined ibeacon tour combining culture and technology to promote digital reading, use of site characterization recommended book list, different field will recommend different books, makes eBook thrust and iBeacon pull interact with each other, develop more users.

3   PROPOSED SYSTEM

Museums are looking for ways to interact with visitors. Majority of the museum either show the information using paper art or by LCD displays which is a costly affair to deal with along with maintenance of the same. Since majority of the people have an android phone either with the guardian or personal, the ocean of information related to the artifact can be portrayed but this tends to make people lazy to use the application since they have to search for a particular artifact and search on it.

Beacons might just be the right answer. Bluetooth beacons offer museums the ability to help people navigate and send out the right messages in the right place. Via beacons and their apps, museums can provide information on exhibits in the form of videos, audio clips, and photographs.

The project consists of 3 stakeholders, Bluetooth Low Energy (BLE) beacons (nRF51828) with each having unique ID, Android Application for streaming content and calculating the RSSI Signals, web server for providing media based on ID and for uploading the data. The android phone continuously scans the BLE signals around and chooses the strongest signal i.e., using RSSI values. As the user progress towards the artefact, if the RSSI value is lesser than the defined threshold, the content is captured from the web server using the ID provided

by BLE. There exists a service running in background in android which continuously manages the BLE scanning and processing the data. The application web server is responsible for giving the content to android app when requested.

4   ARCHITECHTURE

The architechture is divided into 3 modules

4.1   Android

NORDIC SCANNER: The Scanner Compat library solves the problem with scanning for Bluetooth Smart devices on Android. Using this library, you may have all new features even on older phones. If a feature (for example offloaded filtering or batching) is not supported natively, it will be emulated by the compat library.

We then have user logic and user libraries which user has created and developed. We also have system libraries   and API's that are supported and necessary. BLE android: Android 4.3 (API level 18) introduces built-in platform support for Bluetooth Low Energy (BLE) in the *central role* and provides APIs that apps can use to discover devices, query for services, and transmit information. Volley is an HTTP library that makes networking for Android apps easier and most importantly, faster. Volley is available on Github.

4.2   BLE beacon-nRF51828

Bluetooth beacons are hardware transmitters - a class of Bluetooth (LE) devices that broadcast their identifier to nearby portable electronic devices. The technology enables smartphones and other devices to perform actions when in close proximity to a beacon. The nRF51828 *Bluetooth* low energy *Beacon* Kit is a standalone kit for demo, evaluation and simple development of *beacon* projects with *Bluetooth* LE.

4.3   Server

It has end points like get_List which has list of mac addresses and corresponding urls,get_place which is used to retrieve the area name and create_record. The database we are using to store our data here is mongodb, because of its flexible nature. There is html file collection in the server which is retrieved by the app to show content to the user.
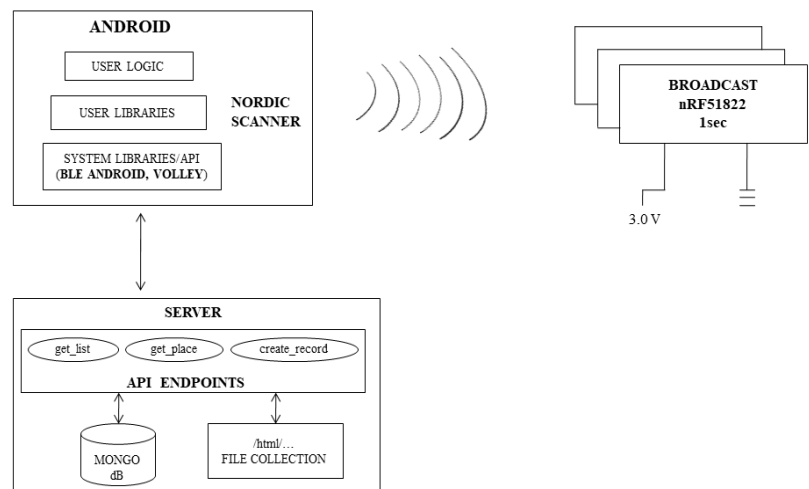
Fig1:System Architecture

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5   CONCLUSION

In this digital age there is a need to make everything smart. When people visit a museum, they should have an unforgettable experience and our paper works in that very direction. This paper defines an architecture to represent and manage the smartness inside museums, adopting the IoT paradigm and supporting this direction with the design of a set of sensor nodes that are able to stream multimedia information on a location basis. We use a beacon technology to fulfill that feature, the usage of beacons as a number of advantages on its own. Any new technology requires a big investment if you are to adopt it for your business. Fortunately in case of using Beacons, you need not have to invest in millions. Beacons are low powered and low-cost hardware. And automation is awesome there are various parameters to push messages through Beacon, which are when user comes into range or within specific time interval or based on after any specific event. Its no secret that usage of mobile devices is increasing exponentially every year. And our paper is all about utilizing BLE technology with your Smartphone. With Beacons visitors will be amazed by Context sensitive engagement, Location based information, interactive knowledge sharing platform.

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