

Proximity marketing using beacon technology

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Abstract: We present our work on the mobile based indoor positioning shopping application leading to the development of automatic advertisements delivery services based on user's location. . In this research, we use a network of Bluetooth Low Energy (BLE) beacons deployed in a large shopping store thereby constructing the notification environment. The Server component the Smartphone component and the beacons (BLE) constitute the BLE based system. This BLE based Smartphone application detects the location of customers in the store with the help of Bluetooth on the user's Smartphone by using BLE technology, this data of the user's location will be sent to the server component by WIFI, and the server component sends personalized promotions based on the user's location such as mobile advertisements to the customers' smart phones.

INTRODUCTION

Technology innovation's goal is to simplify life of humans and making day to day's work easier and faster. Shopping is one regular activity that human beings spend a large amount of time .[1]

According to a survey conducted by the US Bureau of Labor, an average customer spends his 1.4 hours each day on shopping. According to a study carried out by CISCO Internet Business Solution Group , the best

Reasons for customers to use new technology are to find best price in the market (63%), to save time in the market (47%), to find best assortment in the market (26%) and to get best quality available in the market (25%). [1]

In the 21st century, portable terminals such as smart phones are used extensively.[4]. Due to the increase in the usage of Smartphone devices, advertisers are reaching to their customers in different ways using their smart phones. Smartphone's marketing is appeared to be a widely used advertising tool. Smartphone marketing has different forms, like SMS marketing, social media marketing and software applications that enable location-based marketing. [3]

Knowing the importance of a Smartphone in a user's life, many of the services using positional information of the user's are widely used, and the indoor positioning technology is being focused like never before. One of the technological services provided through smart

phones is location-based application, that can deliver contents such as advertisements or suggesting specific places to the users based on his/her locations. This type of technological applications can be used in several places ,such as ,in malls, streets, airports, shopping stores and bus stations in this paper we specifically report about a network of Bluetooth Low Energy (BLE) beacons, deployed on a shopping store developed using The full deployment of a number of beacons over an area of the shopping store[3].

There are many technologies that can be used to find the location. Like the Global Position System (GPS) technology GPS technology is widely used in many applications to provide us with location-based content. But the main disadvantage of using GPS technology is the high level of battery consumption of mobile phones as a result of being connected to satellites. Google maps are one of the applications using GPS technology. However GPS tracking is considered as a privacy invasion which can be a disadvantage of this technology. To overcome this disadvantage there is a need to find a new and better technology for indoors.[3]

Linking a particular position where the beacon is deployed to a specific notification to be sent to the user makes it easier to set the Position of the notification. Using Received Signal Strength Indicator (RSSI) of the installed beacons, users are able to receive notifications from other close proximity beacons by managing the proximity information got from RSSI. This helps the user not to miss any notification he needs to receive. The criteria we need to remember to do so are : there should be an adequate distance of the user from the beacon to receive notification, and to

construct this environment, a necessary distance between the neighboring beacons is important.[4]

System Architecture

As shown in the figure 1, the System is initialised. A customer with a android based application ,designed particularly for proximity marketing installed in his smartphone identified in the first place, then all the surrounding beacons present around the user is scanned and the UUIDs of beacons is got.

The UUIDs of the beacons are then transmitted to the server through WiFi. Then the location of the customer is identified using RSSI .later by knowing the customer’s position in the store using the knowledge of the nearest beacon, the related data based on his position is obtained from the database.

The Customized Marketing Messages are then generated based on the customer’s Current location and profile.

The generated Messages are delivered to the customer and are displayed on android based Smartphone application.[1]

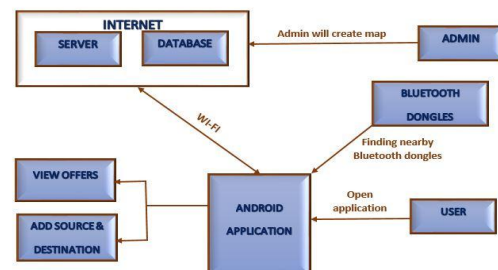


Figure 1: System architecture

I. THE IDEAL WIRELESS TECHNOLOGY FOR OUR SOLUTION

The essential requisites for our report are:

- Low energy consumption: a battery used, tiny coin-cell batteries, can run for months or years. Moreover, it doesn't have the risk of draining out of battery and enables the system.
- Middle range
- High precision, as it takes place in a relatively small navigation areas, superior errors must not occur.
- Safe connection.
- The positions of various devices are read simultaneously.
 - Real-time communication: in just few seconds ,the procedure of getting a connection between two devices, data being transferred and the connection shutting down, must be made.
 - Compatibility: no electromagnetic interference should occur in other sensitive electronics devices, when radio devices coexist to with other radio transceivers
 - There is a necessity for the system to have the ability to communicate with services like Cellular network and the Internet.[1]

II. PROXIMITY MARKETING

Every business works hard for customer retention that is to get new customers, maintain the present customers. This retention can be achieved using different marketing methods which include traditional methods and modern methods. The traditional marketing methods may be putting up advertisements in radio, newspapers, websites, television, magazines and multimedia on cell phones etc. As technological

revolution took place, modern way of marketing rose into fame called location-based mobile advertising (LBA). Proximity marketing is another name for LBA which provides advertisements according to their geographical location of the users. It consists of location-based services in addition to mobile advertising.

These days, location-based advertising is an important and effective marketing tool for both advertisers and customers. As the consumers always carry their smart phones, location-based advertising is time efficient and gives them a better knowledge of specific offers. The reasons of why proximity marketing is effective are

- 1) Personalized: Knowing what the users are interested in and show them something relevant to their interest based on their location.
- 2) Timely: one of the main features of LBA ,the ability to target users at specific moments.
- 3) Targeted: According to an IAB UK study, 46% of people use blocking tools for marketing as it is irrelevant, but when they are targeted, getting blocked is less likely. According to IAB UK study 79% of the respondents said that proximity marketing is an important part of their organization's marketing strategy.[3]

III. The Beacon technology

Beacon is a Bluetooth low energy (BLE) based technology, which helps in indoor positioning system. Beacon is low power consuming and cost effective compared to other systems.

Beacon transmits data packets during regular intervals of time and smart phones can receive this data.

An advertising data packet may consist of four main parts of information as shown in Figure 2:

- The proximity UUID: a 16-byte string identifier used for differentiation between a large set of related beacons present.
- The major number: is used to differentiate a smaller subset of beacons within the larger set.
- The minor number: is used for individual beacons identification. Every beacon has a unique minor number, this helps in knowing customer's position
- TX power: used to determine the proximity of the customer to the beacons.[1]

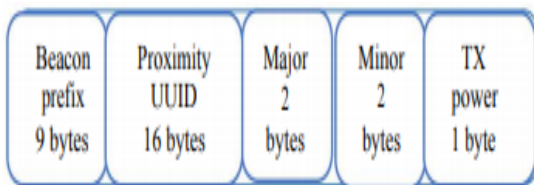


Figure 2 : BLE Packet

IV. RSSI(Received Signal Strength Indicator)

Received Signal Strength Indicator (RSSI) indicates the strength of the beacon's signal in a Smartphone.

The strength of the signal depends on the distance and broadcasting Power value.

Figure3 shows the received RSSI from mobile phone when beacon is 1m away. RSSI varies vigorously from -61dB to -80dB as shown in the figure3.[2]

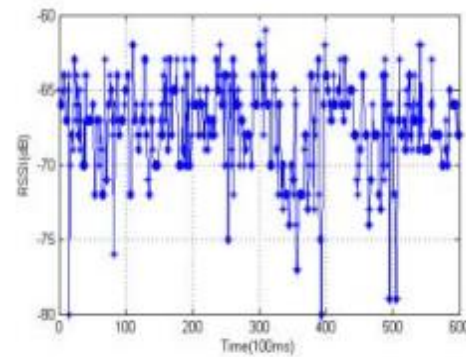


Figure 3 : RSSI values in 1m distance

V. Beacons:

Are small in size, cheap devices that transmit minute amounts of data through Bluetooth Low Energy (BLE) up to 50 meters. Beacons are used for indoor location technology as it transmits their identifier (UUID) to nearby smart phones. Beacon is one-way transmitter to the receiving Smartphone with a specific application installed which interacts with the beacons. The use of this component in the system is that it enables receiving device to perform actions when in shorter distance to a beacon and to track users in the store.[1]

VI. Smartphone Application:

Customers who use the system need to First install Smartphone Android application, then the customer needs to take up a registration stage, which requires them to put up their personal information and their personal preferences and choices. Once the registration is done, the personalized advertising messages and notifications is automatically sent to the customers' smart phones when they are in near proximity to a beacon information's is then

transmitted to the main server using the WIFI or 3G. The data sent is stored in Server database.[1]

VII. Server Application:

To collect, store and analyze trajectories of customers inside the shop ,an application was proposed. The customers' purchase records will be updated to the server via the application. The System records the purchases details about the quantity and value of the product bought by each customer. The interaction of the customer with the service provider and the purchase records are stored in server database. A customer has entered the shop after the registration stage, the information regarding the registration details of the customer is transmitted to the server from the customers' smart phones. Whenever a customer has entered the shop, the Server Application is notified by the customers' smart phone ,then the system will sends customized advertisement messages to that customer's smart phone based on his/her preferences and choices.[1]

Conclusion

Shopping experience can be enhanced, made more pleasurable and efficient for the customers by using proximity marketing. It helps the system admin to enhance their relation with the customers and strengthen their marketing strategy and business planning through promotion plans and personalized services that will satisfy the customer's needs and improves the loyalty of the customers towards the system[1].

As a future enhancement, we are working on implementing a proximity marketing that can work with IOS platform to deliver an advertisement to the customers to help them get the information in the right time and place. In addition, the required experiments and testing will be provided.[3]

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