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BEACON TECHNOLOGY

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Abstract— A beacon is a small Bluetooth radio transmitter. It's kind of like a lighthouse: it repeatedly transmits a single signal that other devices can see. Instead of emitting visible light, though, it broadcasts a radio signal that is made up of a combination of letters and numbers transmitted on a regular interval of approximately 1/10th of a second. A Bluetooth-equipped device like a smartphone can "see" a beacon once it's in range, much like sailors looking for a lighthouse to know where they are. Beacons are very small, simple devices. If you crack one open, you won't find thirty motherboards and oodles of wires. You'll find a CPU, radio, and batteries. Beacons often use small lithium chip batteries (smaller and more powerful than AA batteries) or run via connected power like USB plugs. They come in different shapes and colors, may include accelerometers, temperature sensors, or unique add-ons but all of them have one thing in common—they transmit a signal. It's not throwing just any old message into the air. It's transmitting a unique ID number that tells a listening device which beacon it's next to.

Keywords— Beacon, Bluetooth Low Energy, GPS, Choke Points, Real-Time Locating Systems.

I. INTRODUCTION

This world is currently bound by technology. People use technology for various needs and requirements, but mainly in order to be a part of each others lives. An extensive and ever increasing number of individuals utilize a cell phone and they all speak with one another. People use web administrations and numerous applications. With the development of technology, people have found new and more efficient ways to make their lives simpler. Additionally, with the new pattern of wearable gadgets they utilize these new devices to follow exercises like running. Be that as it may, there is no correspondence between typical things, for example, sacks or entryways and cell phones.

Beacon Technology can possibly change that. A Beacon is commonly a little Bluetooth Low Energy (BTLE, Bluetooth 4.0) gadget that can be controlled by a coin cell, batteries or through an outer power supply.

These devices are small to the point that you can wear them in your handbag or keep them with your pack of keys. There are a great deal of potential outcomes and this paper clarifies one such circumstance.

Besides, with Beacon you can accomplish more than just track things. A historical center for instance can utilize Beacon to make an intuitive counter. It begins with the inviting at the passageway with a pop-up message. A guest can choose at least one or more displays and the Beacon will explore them to these by means

of the best course. Furthermore, every shop can push intelligent material, for example, recordings, pictures or riddles to the guest.

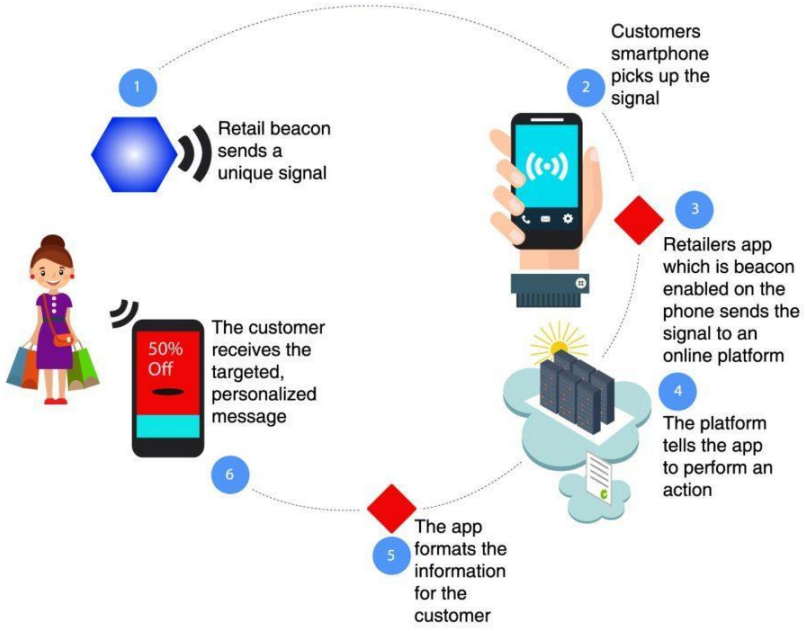

Fig. 1.1 - Beacon Technology in terms of retail

Kids can utilize the Beacon at the shops to play. At the same time, the guardians can follow or track their youngsters, as the application knows at which counter the kids as of now are, so they can't get lost.

II. PROBLEM STATEMENT

Beacon devices are little, a couple of centimeters in size. GPS inside a Beacon must be considerably littler and that makes an issue. GPS isn't just broadly utilized in route estimation, speed estimation, and time estimation, yet additionally its application region is always extending. Be that as it may, the most problematic part of GPS is the signal issue. In territories where there is no receptiveness and where there are numerous impediments, the signal will be debilitated, and even signals may not be found. Since the gathering of GPS signals is commonly better in the open zones, it will most likely be unable to get signals in the event that it is utilized in labs, study halls, production lines, workshops, shopping centers, and so on, to get GPS signal in a roundabout way.

III. OBJECTIVES

This report provides a method of how a Beacon Signal can be improved for indoor usage. As explained in the previous section, the targeted audience for the Beacon Technology use it majorly indoors. The objective is to better the signals for indoor like huge apartments, shopping malls etc. It is to be done using a signal booster which enhances the specific signal frequency being used for the Beacons.

IV. PROPOSED SYSTEM

Our objective is to create a Beacon system that is able to get an accurate location of the user with its enhanced GPS signal. To achieve this, we are using Real-time locating systems (RLTS). RLTS is an efficient tool to automatically observe, identify and track the location of assets or people in real time. RLTS functions efficiently in closed and contained spaces.

Generally, fixed reference points receive RTLS signals from the tag IDs that help determine the location. RTLS tags are small in size and can be placed on any object or can be worn by a human being as well.

Examples of RLTS include tracking automobiles through assembly lines, locating other warehouse equipment, and even finding medical equipment during emergencies or confusion.

The main principle of RTLS is generally a form of radio frequency communication (RF), but some systems use infrared/ optical systems or ultrasound systems. There are many probable combinations as tags and fixed reference points can be transmitters or receivers or both.

RTLS is a form of local positioning system and does not generally refer to GPS or mobile phone tracking. The information doesn't include speed, direction or spatial orientation.

RTLS is generally used indoors and can't be used to provide global coverage like GPS. RTLS tags are generally fixed to mobile objects to be tracked. RTLS tags are placed throughout the building to give desired tag coverage. Higher number of RTLS tags means the accuracy of the location is better until it goes out of range or technology limitations are reached.

V. DESIGN METHODOLOGY

The above mentioned protocol uses various concepts used for implementation of the proposed system. They are listed below.

A. Locating at choke points

Choke points, as the term suggests, are narrow points that help in monitoring and effortlessly controlling the flow of people inside a building. For example, if the store is sensor based operated, the beacon can help determine the entrance of the guest to the store based on his/ her tag ID (passive elements that can be used with an interrogator as a location sensor).

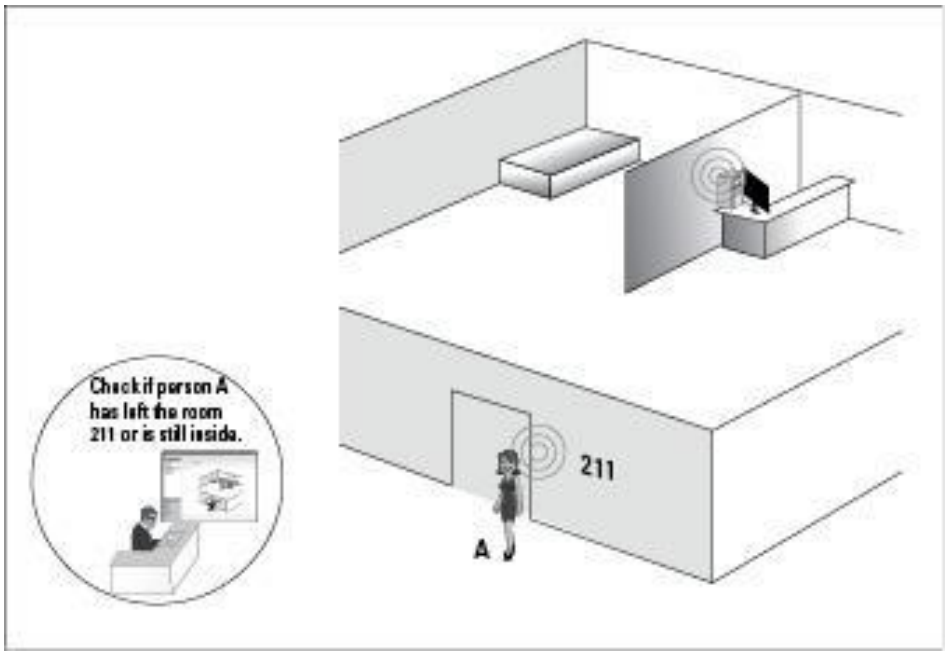

Fig. 5.1 - Example of locating at choke points

The simplest form of choke point locating is where short range ID signals from a moving tag are received by a single fixed reader in a sensory network, thus indicating the location coincidence of reader and tag.

Different types of choke points

- Using interrogators
- Using exciters
- Using receivers

Using interrogators:

Interrogators or readers are short-range devices. They are specifically used to read tags by making the tags to transmit all the relevant information required.

In this model, the devices are placed at various entry/ exit points and if the geometry of the choke point is big, there must be multiple interrogators located at the gate.

The interrogator acts as a doorman. It helps in monitoring the number of people entering and exiting the place by keeping track of their tag ID.

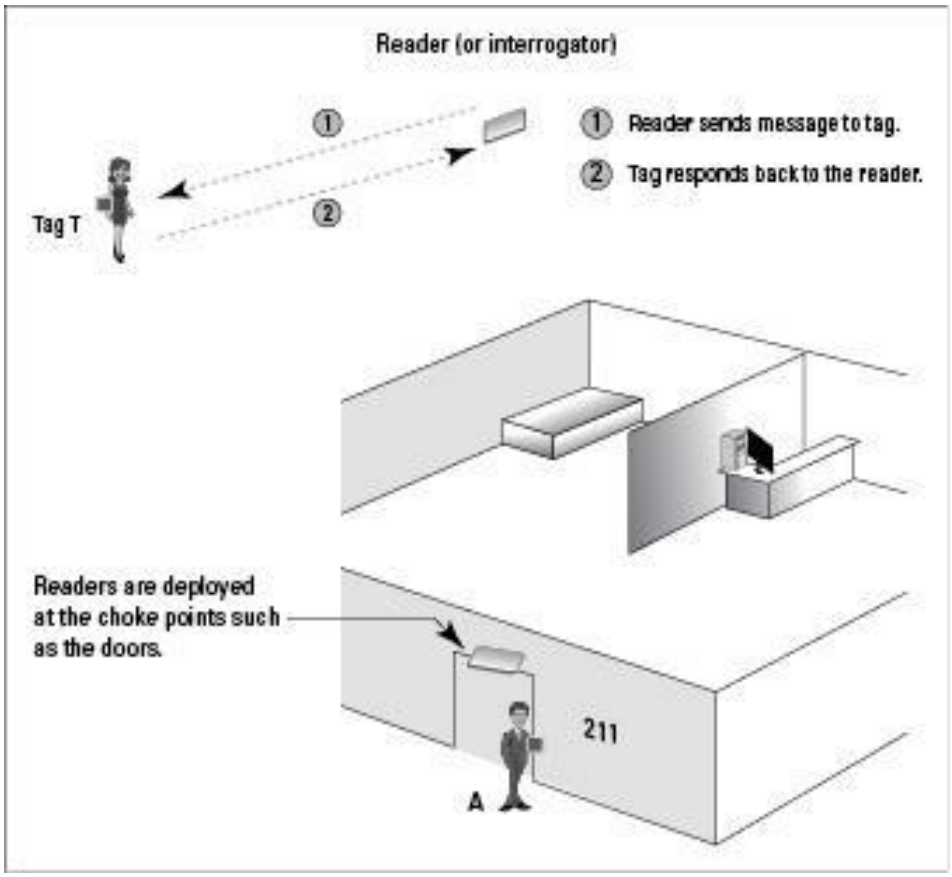

Fig. 5.2 - Using interrogators to locate tags at choke points

Using exciters:

Exciters are short range devices as well. As the name itself suggests, their main job is to excite the tags when it is in range (few centimeters to meters). The exciters are able to include the address in the transmission. When a tag ID is excited and the message is sent to the location engine, the location of the choke point tag ID gets included in the message. Hence, it manages to identify the location of the transmitting tag.

For example, exciters can be compared to signposts. Signposts generally publicize the location, similarly, the exciters transmit messages continuously with the choke point ID. Hence, when the tag is in range the message gets transferred to the location engine and the address is identified.

Using receivers:

A receiver receives the signals, then it converts it into data packets. It is similar to locating choke points using interrogators. Hen a tag ID comes within range of the receiver, the receiver gets the message. The receiver communicates with the location engine constantly and updates the location.

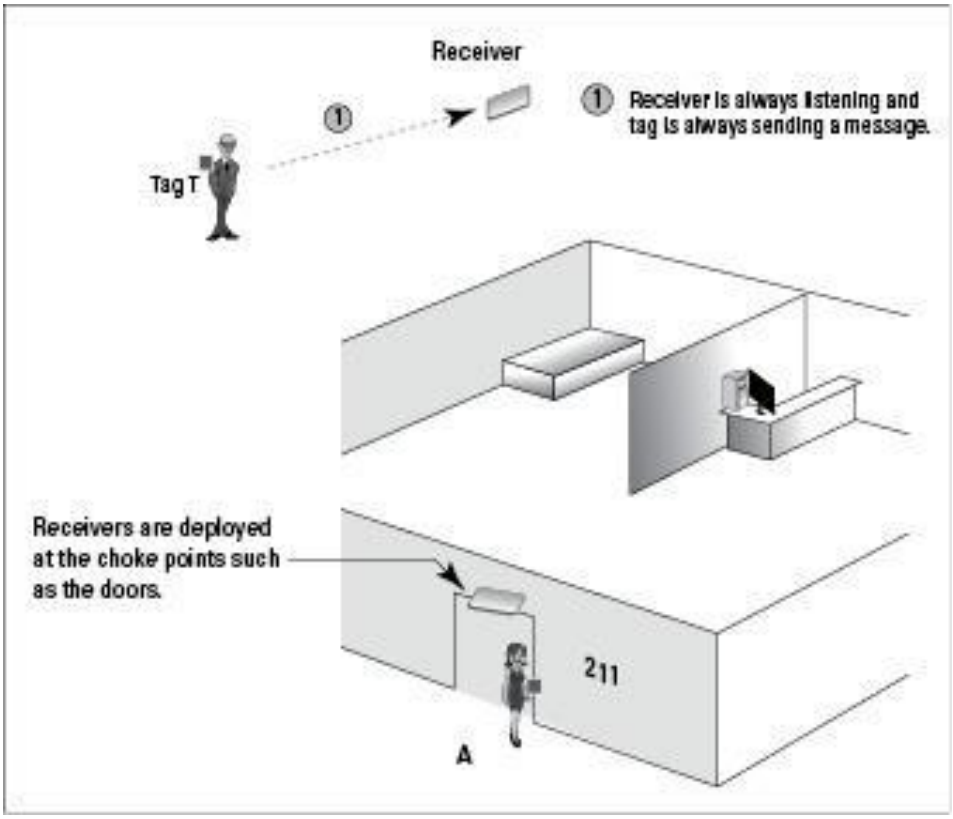

Fig. 5.3 -Using receivers

B. Locating in relative coordinates

ID signals from a tag is received by a multiplicity of readers in a sensory network, and a position is estimated using one or more locating algorithms, such as trilateration, multilateration, or triangulation. Also, ID signals generated by several reference points of RTLS can be received by a tag, and relayed back to a location processor.

Localization with more than one reference points needs the distances one reference points in the sensory network to the other be known in order for precisely getting the location of a tag, and this determination of distances is called ranging. One other way to find the comparable location is when mobile tags talk to each other directly, then convey or transfer the same information to a location processor.

VI. CONCLUSION

In the end it is conceivable to follow a bag, kid or any sort of area using a Beacon. The information for entering and leaving an area function admirably, yet the precision could be improved with better Beacons. Beacons are closeness gadgets and to recognise locales they are working actually well. To get indoor area it requires better innovation to improve their precision. With regards to indoor positions for instance, it is conceivable to better the precision with the expansion of other data, for example, from a movement sensor to follow the made steps.

Future scope would be to make the Beacon even smaller in size, probably just a single chip, which can be embedded in the accessory or device which needs to be tracked in real time. The actual Beacon which the user has to put along the accessory or person will be very small.

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