

Outdoor Navigation and Tracking System Using Low Energy Bluetooth Network

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Abstract: *The advent of the Internet of Things (IoT) has provided boundless opportunities in real - world problems in practical as well as robust approaches. To create a wireless personal area network it is necessary to transmit data at regular intervals of time and it will transmit data packets. In this architecture, we are going to build a Bluetooth area network (BAN) which is a convenient way to communicate with shops for product preference, storefronts, real estate properties, child abduction, women's safety, and it is a cost - effective marketing strategy for the users who are all implementing this system. It transmits fewer data over a smaller range, hence consuming much less power. And these trackers will need every 300m for the statuses of the systems. In addition, it supports a mechanism called privacy feature, which allows a device to use private addresses and frequently change them which builds tight security. This system effectively delivers the real - time status of the school - going child or tracking women's status when they face an unnecessary crisis. And these statuses are monitored by Bluetooth listening units logically placed at points of entry/exit.*

Keywords: Bluetooth low energy, Internet of things, GPS, RFID

1. Introduction

The organization of IoT devices with essential information potential all over the countries rather will increase the things about user secrecy. Moreover major organizations and government sectors instructing the people that they should aware of the transmitting data and using the data [1]. And people will interact with many devices using IoT such as sensors, motors, by using this home automation of various devices [2]. This will enhance the features of IoT applications and also raises their reliability. A survey says that there is an ample amount of users who are anxious about privacy theft which causes various causes that will affect directly or indirectly the third persons [3]. Such kind of secrecy may cause a threatening augmentation to the users [4]. The Beacon Bluetooth is represented as a good option for the users where they can exchange data with their neighbors [5]. Among them, there are expansive dimensions and observe the enormous number of users in a minimum time [6, 7]. The inheritor to the preceding Classic Bluetooth was to provide an effective increase in data speed and consume high power in the devices [8]. Whereas in BLE the low data speed with energy reduction is spaced in this product. This will transforms the architecture to the multiple usages of the system. The beacon is one of the promising technologies and has unified advantageous [9, 10]. It measures the data rate of 2 Mbps and it also faces some challenges regarding the range of the system [11].

In BLE the applications such as child theft, women safety system, retail shops, and real estate for the persons [12]. The retail shops are for the indoor shopping structure and it also associates with automatic attendance in schools for this

formulation many sorts universities are adopting Bluetooth - based automatic attendance systems which will suit extra lecture hours and also gains or enhance the student's knowledge. BLE will act as a master and slave and it will send a bulk of data's in a period. Bluetooth acts as a tight security network [13]. This reveals a wise implementation of a Bluetooth low - energy workplace energy management framework Beacons, smart connectors, & a smartphone app that offers (BLE) beacons, Without users, the destination energy - saving service Intervention. In addition, this paper offers a practical method of calculating real - time energy savings by which more efficient Feedback may be offered to the occupant in a workspace.

In this paper, outdoor navigation and tracking system using Bluetooth low energy for the child theft and women safety more as followed in the upcoming events. This will ensure the records of tracking and formulate the conditions of the persons. For instance, from the beginning of a child plays from certain boundary conditions so that the parents can be aware of their child's location if he/she crossed out of the boundary can be recovered by using another Bluetooth transmitter which we can identify the exact area of the child location.

2. Related Works

Recently the spread of smartphones, services are raises rapidly which is adapted with a global positioning system (GPS) is commonly used for tracking the location of the persons before that Radio Frequency Identification (RFID) used for tracking the objects [14]. This is used in the field of supply chain management, logistics, military defense, and

agricultural management [15]. The major drawback in RFID is the range of acquiring the object is in the range of a few cm to meters which provides a unidirectional antenna. And this system requires the usage of RF readers and tags [16]. The chance of transmitting the data to the required coordinates might be through a ZigBee. Zigbee should have good accuracy in transmitting and receiving the data with a short span of area, which may delve to data loss. And this RFID has a limitation of water attenuation problem where the object cannot be traced to a specified location. In - vehicle tracking system radar detection and GPS data are used for the equipment. And radar is widely used in capturing vehicle and obstacle detection. It consumes large error losses.

The GPS enables the tracking of the outdoor system and can be connected with worldwide infrastructure. This tracking technology does not provide good precision for the persons. Especially for women's safety if they are in a crisis the person should press a key to send concerned latitude and longitude positions [17]. Thus they need to turn ON the gadget initially with proper networks. The GPS consists of ongoing satellite networks which give a surplus of junk files to the system which we should wait for the proper latitude and longitude location of the places [18]. By transmitting weak signals to the GPS from the satellites it is a major challenge for the indoor position of the places. For different GPS modules, the distribution of errors will vary.

This article introduces an innovative approach to energy efficiency for smart homes that incorporates a wireless strategy. Bluetooth Low Energy (BLE) - based network for connectivity between home appliances and home energy management. Scheme for (HEM). The suggested solution deals with the effects of the standby equipment and loads of high - power ratings in peak times to Consumers' electricity usage fees. Outcomes in simulation Display that the suggested strategy is successful in reducing Charges for peak load & energy usage for an Increase in customers' level of convenience [19].

Communication with multiple organizations involved in BluHEMS is based on a WSHAN that uses the Bluetooth Low Energy (BLE) protocol. In this research, the innovation incorporated in both the use of a HEM device that takes into consideration the input of the user &, in particular, the use of BLE in the wireless network. Coordinates the interaction of

home appliances in BluHEMS. Validations affirm the advantages of BluHEMS, while no works are available to the best of the knowledge. In the literature that extends BLE to a wireless network, a HEM approach ensures it [20].

So far problems faced in the existing methods are given below:

- The Existing system for using Bluetooth & WI - FI wireless technology it's uses only data transfer the point to point.
- The growing popularity using location - tracking systems leads to a large amount of positioning technology
- The existing system consumes very high power consumption modules.

3. Proposed Work

These system users encounter a landmark; this scheme can use the information of the landmark to calibrate the location of users. The iBeacon has the characteristics of ease of deployment, low power consumption, and low cost. Figure 1 depicts the system architecture of the proposed system with which the live location of the device emits a sort of data and will be captured by the receiver. It is used as an object occupation in a low - energy Bluetooth module which also governs the data from the users. Because this module is a one - way process for communicating the users or products it gives tight security. Thus it has a consistent level of security. And the pairing is done based on the full - duplex communication.

From the architecture, it consists of many areas which followed by many streets to monitor the persons or children [19]. If a person moved to a certain distance (i. e) for instance area. In this proposed work we construct a list of area1, area 2, and area 3 for the different approaches for user validation. Through various streets, it consists of several Bluetooth receivers. From the area 1 server, it is routed to the centralized server. The centralized server is the major part of the network node. It is a broadcast wave point that will be able to navigate to the main server. The General Packet Radio Service (GPRS) is a cellular communication and it is conceptualized to mobile network or LAN (Local Area Network) which gives good data rates for the data packets communicated to the server.

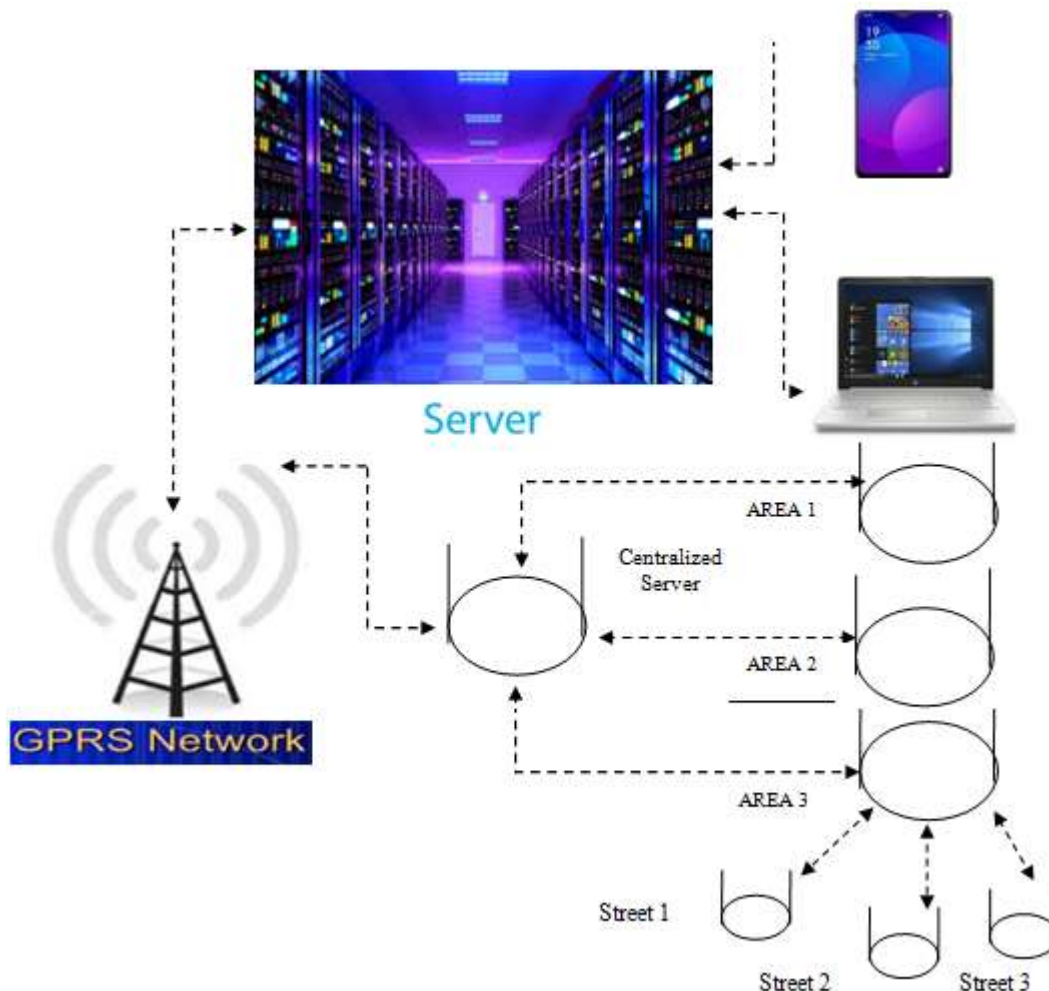


Figure 1: System Architecture of Bluetooth low energy module

The sub - server will transmit the transitional files or information to the main server. The main server will play a vital role and act as a gateway between the centralized server and the client. The main server will run the source database to the destined places. Whenever the user pops into the IP address the main server diverges into the specified area location of the person through a centralized server [20]. And finally, we can get a person alert and inform the users by

Bluetooth low energy system. The amount of energy consumption of this module is relatively low compared to the classic Bluetooth module.

3.1 Block Diagram

3.1.1 Remote Unit

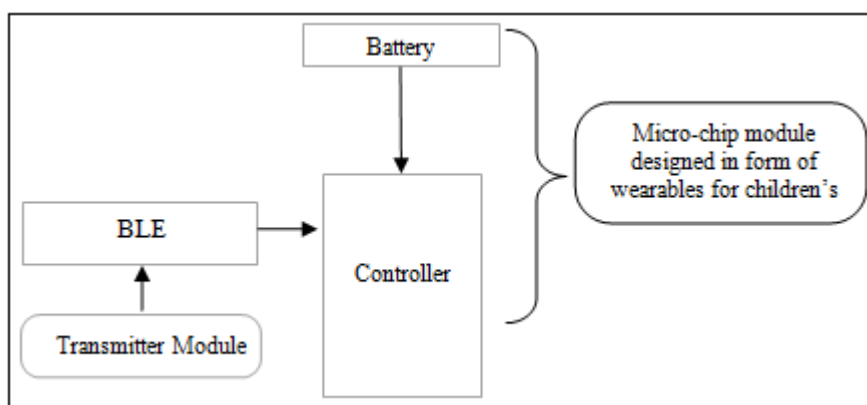


Figure 2: Block diagram of the Remote unit

Above fig.2. shows the block diagram of the remote unit. It constitutes a Microcontroller, Battery module, Bluetooth low energy transmitter module. In these above - mentioned components, BLE transmitter module is designed in a small

scale chip type module in which a child can wear them and carry them easily. This BLE module transmits the data to the BLE receiver module which is found at a minimum nearby distance.

3.1.2 Host Unit

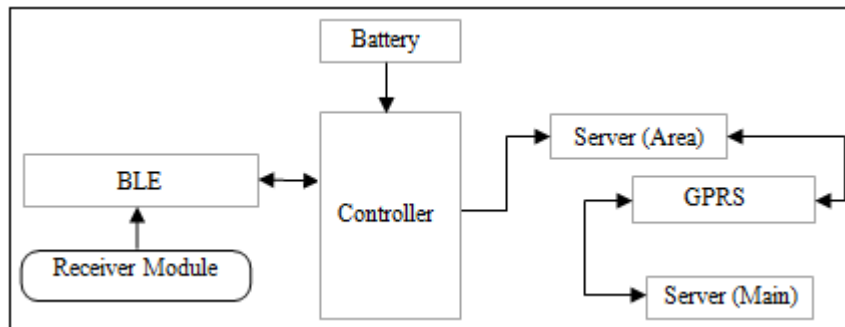


Figure 3: Block diagram of the House unit or Node unit

Above fig.3. shows the block diagram of the host unit. It constitutes a similar component that is available in the transmitter module. Here, a receiver module is installed in every household to receive data transmitted from the Bluetooth transmitter module. So that the reader then converts the radio waves to a more usable form of data. Obtained data is then fed to the common server through a wireless modem or a LAN. So a caregiver or a parent of missing children can search for their children in the main server by entering their transmitter module's ID number. And the server responds with the particular node number where the particular ID's frequency is received.

4. Description of the Hardware Components

4.1 Controller

The compact device with a single metal oxide semiconductor (MOS) chip is a microcontroller (MCU for a microcontroller unit). One or more CPUs (processor nucleus), as well as peripherals with input/output programmable, are present on the microcontroller.

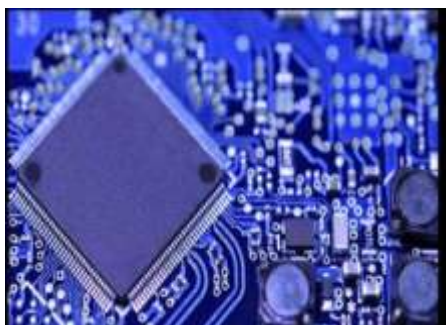


Figure 4: Microcontroller

4.2 Battery

The mixture of materials such as zinc (anode), manganese (cathode), and potassium comprises 60 percent of the battery. There are parts of the Earth. In the processing of fertilizers to render maize, this mixture is 100% recycled and reusable as a micronutrient.



Figure 5: DC battery

4.3 BLE Module

In the same frequency spectrum as in classic ISM Bluetooth technology, Bluetooth Low Energy (the 2, 400–1, 4835 - GHz ISM band) works but uses multiple networks. Bluetooth Low Energy has forty 2 - MHz channels, rather than the classic 79 Bluetooth 1 - MHz channels. Data are transmitted within a channel using Gaussian modulation of frequency changes, equivalent to the classical Bluetooth Simple Rate scheme. The rate is 1 Mbit/s and the overall transmit power is 10 mW (optional for two Mbit/s in Bluetooth 5) (100 mW in Bluetooth 5).



Figure 6: BLE (Bluetooth Low Energy) module

Bluetooth Low Energy uses hopping frequency to fix concerns with narrowband interference. Whereas both FCC and ETSI identify Bluetooth as FHSS technology, Bluetooth's low energy is classified by optical modulation or the direct spectrum series as a device. Classic Bluetooth often uses hopping frequency, although the specifics are different.

5. Result and Discussions

Fig 7 illustrates the server monitoring of outdoor navigation tracking by low energy Bluetooth is used for the location of

the persons. And the location and range are updated into the main server. The main server act as a medium between the client and the centralized server.



Figure 7: Mobile track using Android App.

Below fig 8 illustrates the user with the details of the BLE transmitter module which is found missing, it gives data like ID number of the particular ID, last time of received data, node location, etc. This can be also developed like an APK file in near future, to access it with ease.

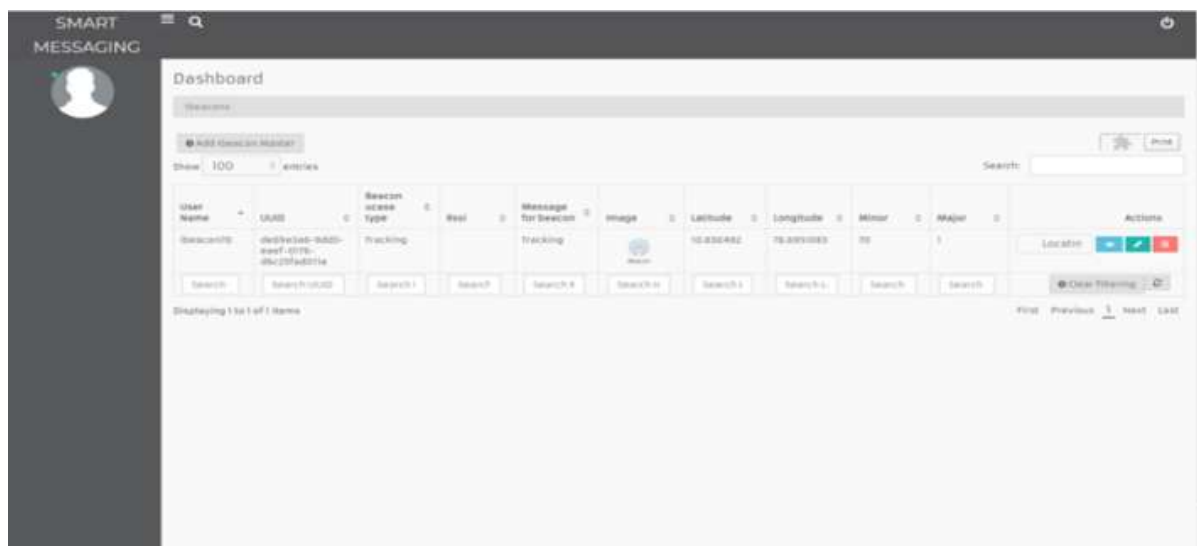


Figure 8: Server monitoring via Bluetooth module

6. Conclusion

In a Society oriented environment, a convenient energy - saving method without user intervention is needed for the effective reduction of energy consumption. So, In this article, we demonstrated the low - energy Bluetooth network for outdoor navigation. In terms of its elegance, BLE allows for a substantial reduction in Time & energy usage to create the link in the multi - node environment between BLE devices. To achieve these requirements, this paper proposed a smart outdoor navigation system that can intelligently track the children in a household without the use of GPS which is mainly achieved based on BLE beacons or transmitters, BLE receivers, and a common mobile application. The outdoor positioning feature is created to be wirelessly composed with smartphones and also we can monitor the server for the lost kin in a family. The closer the Bluetooth are to each other it accumulates the signal noise

over the device. Future research will look at the replacement and accuracy of this architecture. This can be adapted with scaled environments for different applications. We hope to further aim the work and groundwork the elaborate system aims and plan further assessment. Compared with a normal Bluetooth module, BLE has an average power savings ratio of 31% respectively.

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