



Beacon Based Bus Monitoring System

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Abstract: Beacons are small devices that broadcast a Bluetooth smart radio signal to trigger alerts on consumer's phones. The next version of gps. Instead of using satellites to triangulate your position as gps does, beacons transmit a low energy signal to provide location. The ibeacon based on communication technology is Bluetooth low energy (BLE). BLE is a wireless personal area network technology used for transmitting the data over short distances. The standard BLE has broadcast range of up to 100metres. Sensor is used for bus arrival identification The HC-06 Bluetooth module is connected to arduino UNO through serial communication. The details of bus i.e., bus number, route and timings can see in the smart phone through app(Bluetooth terminal). Additionally the APR module is used in this paper, which stores the voice message about bus notification then it connects to the speaker. Whenever the visually impaired people wants to know the current details of the bus, they don't need to depend on anybody. They get the information through speaker by pressing the button, which is placed in the lane.

Keywords: Beacon, Bluetooth module, Sensors.

I. INTRODUCTION

IBeacon provide various location-based facilities after settling the position mechanically without extra user's exploit such as NFC (Near Field Communication) or QR (Quick Response) RFID. For these reasons, I Beacon receives a lot of thoughtfulness. Not only Apple but all enterprise so many company harvest such as Qualcomm, Eddy stone, PayPal, and SKT carry forward related business by affiliating with a variety of company I beacon. Particularly deployment in the range focused offline distribution endeavor is extended to digital content, smart car and smart home. So thoughtfulness of industry for I Beacon is increasing further work and also can be used for education purpose. Especially indoor localization is of actual interest where satellite based standing methods cannot be used, since receivers usually fail if line of picture visibility to the satellites are lost.

Bluetooth is a wireless network technology standard for exchanging and broadcasting Data over short distances with low consumption. It uses the frequency band between (2400 MHz and 2480 MHz). Bluetooth 4.0 is a widely used Standard for personnel wireless area networks and is a network technology among mobile devices and other devices. It is mainly used for low power and short

range connections, low cost which is necessary for mobile and embedded devices. In recent years with the growth of mobile phone and tablet market, it became the preferred method for short range connections. Many PC accessories such as mice, keyboards, and headsets also include the Bluetooth standard for wireless connection network for communication to smart device.

Beacon is attached in owner vehicle such as car, bus anything we can connect beacon device in the vehicle to find out the location and speed of the vehicle is crossing on the road all those evidence will be store all those in base station on the road side through beacon it transmitting the in oration will access through UUID and major, minor accessing the data. Which the beacon access the devices through smart phone we can check the car is located the current position. This method is used for visit the parking location

In the vehicle we can attached the beacon in the vehicle for monitoring the vehicle were is located. What time the vehicle is crossed the road we can use the beacon through app in the smart phone access through Wi-Fi or Bluetooth. All those data will be store in the base station as an ibeacon will transmitting the data as a message to base station and send data information as message notification to smart phone.

I. SYSTEM DESIGN

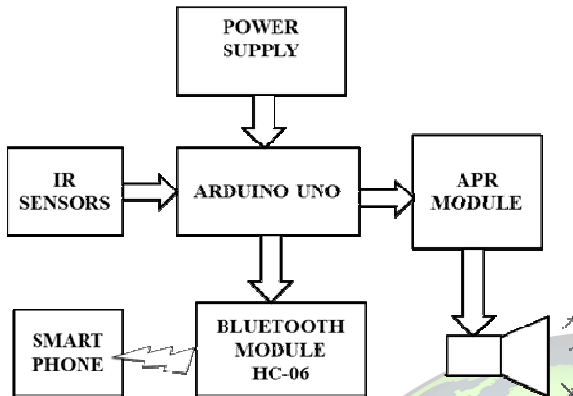


Fig 1. Over view of system design.

A. Bluetooth low energy

Bluetooth Low Energy BLE operates spectrum band (2402-2480 MHz), divided in 40x2MHz physical channels and uses GFSK variation, attaining a data rate up to 1 Mbps. A major advantage of BLE over the traditional Bluetooth is that it has been designed to support both connectionless and connection-oriented applications. Depending on the required method of the ibeacon, a BLE device may task in changed methods, i.e. publicizing when it has to notify its incidence, scanning when detecting of smart devices in its area has to be accomplished, connected as a master or a slave when data transmission is needed. When a connection is essential, a Bluetooth Low Energy master device may connect to unlimited slave devices such as star topology picoted, thus overtaking the classical Bluetooth, which only supports seven energetic slaves in a twisted. The radar nodes can be a change of smart devices and a Smartphone can be used as the interconnect message to over the 100 meter to run on Internet connectivity.

The Bluetooth Low Energy defines numerous profiles for low energy devices specification for how a device works in a specific application. While manufacturers are expected to implement the fitting conditions for their device in order to ensure compatibility, they are also allowed to define their own protocols for custom applications.

Generally, these applications take into account that the RSSI value cannot deliver correct distance approximation due to many motives. For instance, the 2.4-GHz band, in which BLE operates, is the most dominant one in wireless communications, used also by the global 802.11/Wi-Fi and other personal area network technologies, like Zig Bee. To reduce interfering by other technologies

working in the same band, Furthermore, the radio signals quality depend on the working appearances of the transceivers, such as the antenna gains and the receiver feeling on the smart phone and physical obstacles, like walls, moving persons, etc. Reflection, scattering, bending as well as the estimate perfections produce significantly different route sufferers for equal distances. All the above means that the RSSI value from a BLE-enabled device benevolences major variations in time and space. Reliable GPS signals. Furthermore, GPS is not suitable for reliably liable distances within 15 to 20 meters. For that reason, some mobile applications also use triangulation of signals from cellular towers or Wi-Fi hotspots to obtain the device's geo-location, but the results are quite approximate regarding both stability and precision.

B. Ibeacons hardware

Ibeacon spreaders come in the form of hardware that runs on Bluetooth Low Energy (BLE). The BLE specification is used to create BLE devices, which are then embedded or communicated into the devices. These devices are also known as transmitters, or broadcasters can come in the form of any type of hardware such as USB dongles, computers, small coin-cell powered gadgets, etc. All iPhone 4S and newer and iPad 3 and newer devices that run on iOS7 can also be I beacon transmitters. These transmitters regularly in a distance from a few up to 70 or 100 meters to all Bluetooth devices that are joining for the ibeacon indication. If your device is receiving a signal from the ibeacon and it knows A. Hardware considerations are 1) Battery: ibeacon receivers are required to communicate at a frequency with Apple specifications, and should be tested at several battery-powered Ibeacon at Apple's frequencies, we've discovered that battery life of coin-cell Ibeacon models can be as little as 2 or 3 months. Beacons have the option of being powered by batteries or a fixed power source, used in such devices like as a USB port on a POS terminal. To less maintenance costs, I beacon running on a fixed power source is most ideal. 2) Beacons encasing: beacon offer the versatility of being placed anywhere - indoors or outdoors position. The test comes when beacons are deployed in environments that are disposed to weather conditions such as rain or humidity. Ibeacon should be resilient to such conditions, especially when it is connected to outdoor positions 3) Beacon management: Rather than physically going out to each beacon to update its UUID, their needs a system to remotely manage a network of beacons. This is particularly important for large scale ibeacon arrangements in areas such as shopping malls, arenas, or airports and many places ibeacon can be used. IN



such case the Ibeacon network is backed up to cloud storage.

interactive objects that can sense and control objects in the physical world. Arduino board designed to use different types of microprocessors and microcontrollers.

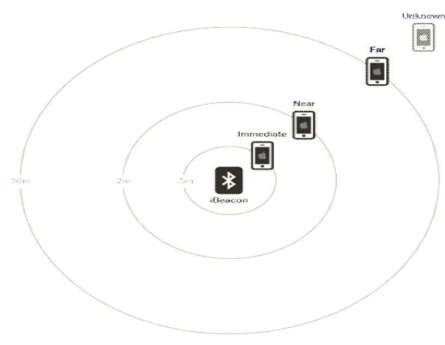


Fig.2.iBeacon

C. IR SENSOR

An infrared sensor is an electronic device; it emits and senses the IR radiations. An IR sensor measures the heat of an object. These types of sensors measures only infrared radiation, that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to human eyes that can be detected by an IR sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistance value and the output voltages, changes when IR light is received.

If an analog sensor is used, then we will get an analog output in terms of voltage which can hold any value between **0 volts**. If the intensity of the radiation is high then the output voltage falls on the photo diode will also be high.

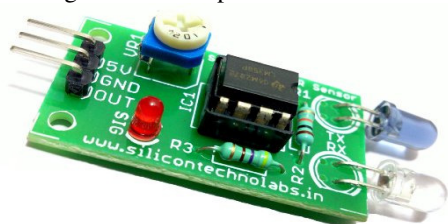


Fig.3.IR Sensor

D. Arduino controller

Arduino is an open source computer. It's containing both hardware and software. The user can designs single board micro controllers for building digital devices and

TABLE 1
Hardware specifications for controller

Arduino	Specifications
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6 DC
DC Current for 3.3V Pin	50 mA
Flash Memory boot loader	32 KB of which 0.5 KB used
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

The boards contain sets of digital and analog input/output pins that interfaced to various boards and other circuits. The board has serial communication interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from computers. The microcontrollers are programmed by using a dialect of features from the programming languages C and C++. By using traditional compiler tool chains, the Arduino provides an integrated development environment (IDE) based on the Processing language project.



Fig.4.Arduino UNO

II. CIRCUIT DIAGRAM

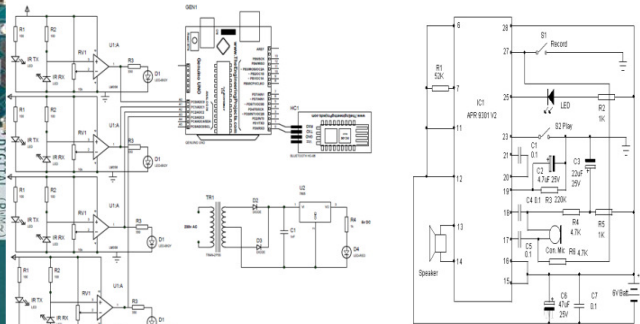


Fig.6.Circuit diagram which consists of power supply, IR sensors, controller, and APR module.

E. APR MODULE

APR module refers to **Acoustic Paramagnetic Resonance** in which resonant absorption effect is used. It occurs when the energy of the sound wave of the quantum will be equal to the splitting of the energy level of the particles, the splitting included by the magnetic field. APR is a variation of the electron paramagnetic resonance (APR).



Fig.5.APR module

APR is generally measured using the pulsed echo technique at high sound frequencies of 100 MHz – 100 GHz. Two opposite sides of a crystal are mirror polished and it's made parallel to each other, and a piezoelectric crystal is attached to one side, which generates an ultrasound wave.

The four IR sensors are connected to A0, A1, A2 and A3 pins of arduino controller which is shown in the figure.6. In this controller, pin '0' is used as a receiver and pin '1' is used as a transmitter which are connected to the TX, Rx pin of HC-06 Bluetooth module. The center tapped transformer is designed for providing power to the whole unit. Then the APR module which is used for the speech output, specially designed for blind people is connected to the arduino in the pins of 2,3,4,5.

A. Software description

Embedded systems programming is somewhat different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, are as follows: Embedded devices have resource constraints Components used in embedded system and PCs are different. Embedded systems uses smaller, less power consuming components. Embedded systems are more tied to the hardware. Goal of embedded system programming is to get maximum features in minimum space and minimum time. Embedded systems are programmed using different type of languages:

- Machine Code
- Low level language, i.e., assembly
- High level language like C, C++, Java, etc.
- Application level language like Visual Basic, scripts, Access, etc.
- Assembly language maps mnemonics word with the binary machine codes that the processor can be used to



code the instructions. Assembly language seems to be an obvious choice for programming embedded devices.

III. RESULTS AND DISCUSSIONS

The simulation output is shown in the figure.7. embedded c program is coded in the arduino programming tool. The program is compiled so that hex file is generated. Then the hex code is copied from the tool and then dumped in the arduino controller by using protius software. Then if the sensor is double clicked, the output is displayed in the virtual terminal.

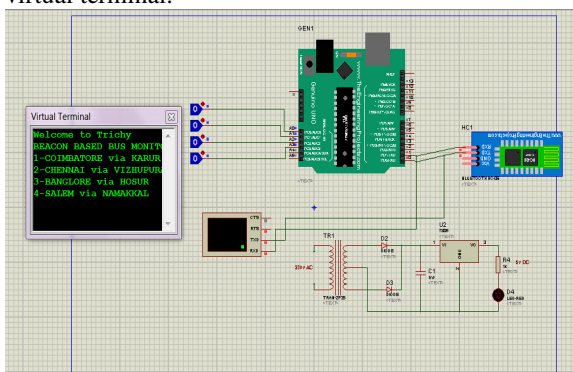


Fig.7.Simulation output.

IV. CONCLUSION

In this concept, the bus which is entering as well as standing on the lane will be updated to the controller through the sensors. The information stored as the time of the bus which is on the lane and details such as (bus route, time) will be stored in the controller. Then we can access through Smartphone or tablet itself through the apps or webpage and also by using Bluetooth which are connected by the servers. Without authentication, stored information will not accessed by the user. Ibeacon is used for short range information will be passed and store the details about the bus into the database or it will show the information on beacon based notification on the Smartphone. With beacon can communicated through Bluetooth with low energy consumption transmitting to the Smartphone. APR module is connected to the controller in which the voice messages are stored. The visually impaired people can get the current details of the bus information through the speaker which is connected to APR module.

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