International Journal of Scientific Research & Engineering Trends
Volume 6, Issue 3, May-June-2020, ISSN (Online): 2395-566X

A Non Gps Based Location Tracking of Public Buses using Bluetooth Proximity Beacons

Dean Academics Dr. Anmol Kumar Goyal | **UG Student Yashaswini** | **UG Student K. Swetha** | **UG Student K. Nithin Reddy**

Department of Electronics and Communication Engineering,
Guru Nanak Institute of Technology, Ibrahimpatnam, Telangana, India.

***Abstract* – This paper presents the prototyped design of A non gps based location tracking of public buses using Bluetooth proximity beacons. The system design in this paper include microcontroller connected to Arduino Uno, IOT module, RFID, Bluetooth low energy device and another device like DC motor. These results of this help people to track the buses location and places where it travels without wasting their time by using mobile phone. The RFID will scan the data and scanner will be present in the bus stop and IOT module is used for scanning and receiving the data when bus was somewhere. By using Bluetooth, we can see the bus location and journey of bus.**

***Keywords* – Bluetooth Low Energy (BLE), IOT (internet of things).**

I. INTRODUCTION

Tracking of public bus location requires a GPS device to be installed, and many bus operators in developing countries do not have such a solution in place to provide an accurate estimation of bus arrival time (ETA). Without ETA information, it is very difficult for the general public to plan their journey effectively. This paper proposes an innovative IoT solution to track the location of buses without requiring the deployment of a GPS device. It uses Bluetooth Low Energy (BLE) proximity beacon to track the journey of a bus by deploying an Estimate location beacon on the bus. BLE detection devices are installed at selected bus stops along the bus route to detect the arrival of buses. Once detected, the location of the bus is submitted to a cloud server to compute the bus ETAs. A field trial is currently being conducted in Johor, Malaysia in collaboration with a local bus operator on one single bus route. Our test results showed that the detection of BLE beacons is very accurate and it is feasible to track the location of buses without using a GPS device in a cost-effective way. A mobile app – my Busz has been developed as well to allow for passengers to check the bus ETA in real-time.

Internet of Things is a concept where each device is assigning to an IP address and through that IP address anyone makes that device identifiable on internet. The Internet is an evolving entity. It started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT) [1]. IoT is having the potential to change the lifestyle of peoples. In day today's life, people prefer more of automatic systems rather than any manual systems. The major elements of IoT based home automation system are Arduino uno and the Relay along with their driving circuitry for respective functionality.

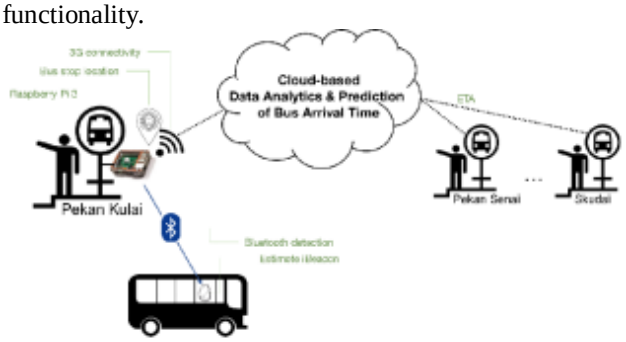

Fig.1.Tracking of Bus Location Using IoT.

II. LITEARTURE SURVEY

This paper provides a simple introduction to the IoT, its application and potential benefits to the society [1]. IoT has received much attention from scientists, industry and government all over the world for its potential in changing modern day living. IoT is envisioned as billions of sensors connected to the internet through wireless and other communication technologies. The sensors would generate large amount of data which needs to be analyzed, interpreted and utilized [2]. Domestics System uses the technology of Internet of Things for monitoring and controlling of the electrical and electronic appliances at home from any remote location by simply using a Smartphone. Implementation of a low cost, flexible home automation system is presented. It enhances the use of wireless communication which provides the user with remote control of various electronic and electrical appliances [4].

III. SYSTEM DESIGN

Arduino/genuino uno is a microcontroller board based on the atmega328p (datasheet). It has 14 digital input/output pins (of which 6 can be used as pwm outputs), 6 analog inputs, a 16 MHz quartz crystal, a usb connection, a power jack, an icsp header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a usb cable or power it with a ac-to-dc adapter or battery to get started. You can tinker with your uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.
"Uno" means one in Italian and was chosen to mark the release of Arduino software (ide) 1.0. The uno board and version 1.0 of Arduino software (ide) were the reference versions of Arduino, now evolved to newer releases. The uno board is the first in a series of usbarduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Fig.2. Arduino UNO.

The programming of the Arduino/genuino uno can be programmed with the (Arduino software (ide)). Select "Arduino/genuino uno from the tools > board menu (according to the microcontroller on your board). For details, see the reference and tutorials.
The atmega328 on the Arduino/genuinouno comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original stk500 protocol (reference, c header files).
You can also bypass the bootloader and program the microcontroller through the icsp (in-circuit serial programming) header using arduinoisp or similar; see these instructions for details.

The atmega16u2 (or 8u2 in the rev1 and rev2 boards) firmware source code is available in the Arduino repository. The atmega16u2/8u2 is loaded with a dfubootloader, which can be activated by:
On rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8u2.
On rev2 or later boards: there is a resistor that pulling the 8u2/16u2 hub line to ground, making it easier to put into dfu mode.
You can then use atmel's flip software (windows) or the dfu programmer (mac os x and linux) to load a new firmware. Or you can use the isp header with an external programmer (overwriting the dfubootloader). See this user-contributed tutorial for more information.

IV. METHODOLOGY

1. Hardware implementation

To make the desired system function we designed a block diagram that functions as per the desired functionality.

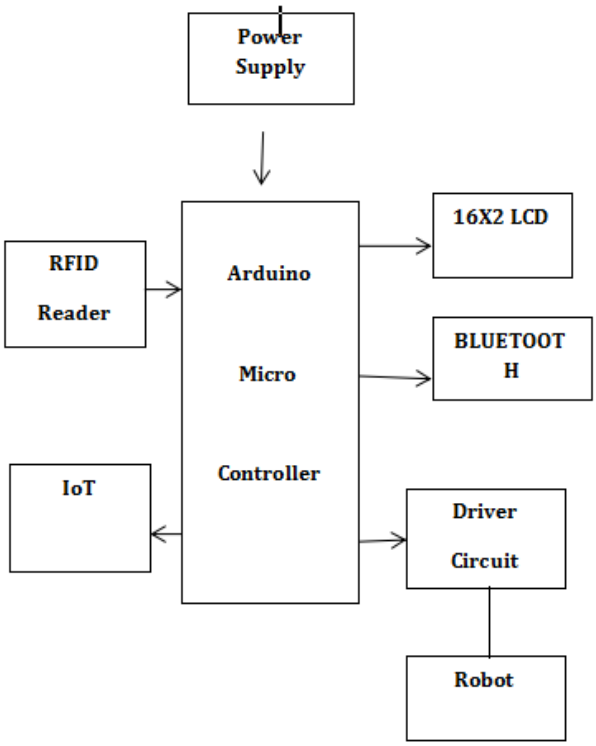

Fig.3. Block diagram of system.

2. Existing System:

In the existing system we used manually to identify the bus details.

Fig.4. RFID Reader.

3. Disadvantages of Existing System

There is no wireless system for data transfer.
More delay are introduced.
There is no privacy security system.

4. Proposed System

In proposed system Arduino and Bluetooth modules used. Android application used to give the details of all buses in the network via Bluetooth.

5. Advantages of Proposed System

It is useful to know the accurate ETA for the passengers.

6. Radio Frequency Identification

RFID, short for Radio Frequency Identification, is a technology that enables identification of a tag (that is normally attached with an entity) by using electromagnetic waves. RFID Reader Module, are also called as interrogators. They convert radio waves returned from the RFID tag into a form that can be passed on to Controllers, which can make use of it. RFID tags and readers have to be tuned to the same frequency in order to communicate. RFID systems use many different frequencies, but the most common and widely used & supported by our Reader is 125 KHz.

7. Features:

- Reading Distance: 6-10 cm
- Dimension: 40mmx20mmx8mm (LxHxW)
- Frequency:125kHz
- Compatible Card
- codes: Manchester 64-bit, modules64
- Current Rating: 35mA (Max)
- Operating Voltage:4.6V - 5.4VDC

8. Rfid Tag

RFID tag is a small device which stores and sends data to RFID reader. They are categorized in two types – active tag and passive tag. Active tags are those which contain an internal battery and do not require power from the reader. Typically, active tags have a longer distance range than passive tags. Passive tags are smaller and lighter in size than the active tags. They do not contain an internal battery and thus depend on RFID reader for operating power and certainly have a low range limited up to few meters.

Fig.5. RFID TAG.

9. Advantages of RFID

- Non-line of sight identification of tags
- Unattended operations are possible, minimizing human errors and high cost.
- Ability to identify moving elements that have tags embedded.
- Larger area of coverage, Up to several feet.
- Can be used in diverse environments, including livestock, military, and scientific areas.

10. Bluetooth

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices and building personal area networks (PANs). In 1994 a group of engineers at Ericsson, a Swedish company, invented a wireless communication technology, later called Bluetooth. In 1998, the original group of Promoter companies—Ericsson, Intel, Nokia, Toshiba and IBM—came together to form the Bluetooth Special Interest Group (SIG).

- Specification of Bluetooth
- Operates in the 2.4 GHZ band which is globally available
- It has 79 channels
- Uses FHSS, GFSK modulation
- 1600 hops per second
- Can support up to 8 devices in a piconet
- Omni-directional, non-line of sight transmission through walls
- 10m to 100m range

11. Liquid Crystal Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in

seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

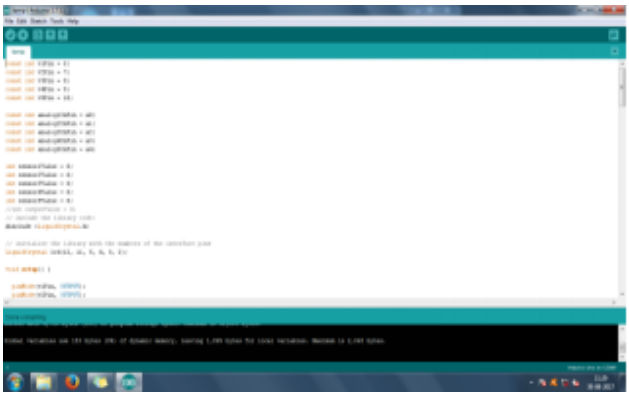

Fig.6. Arduino IDE software.

Programming is done with embedded c language. Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Fig.7.TCP client application.

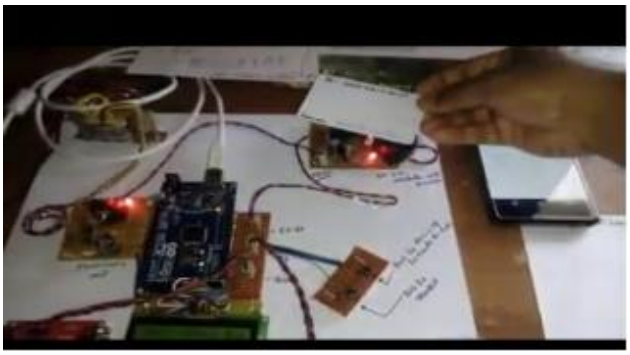

Fig.8. Kit under working conditions.

VI. SCHEMATIC DIAGRAM

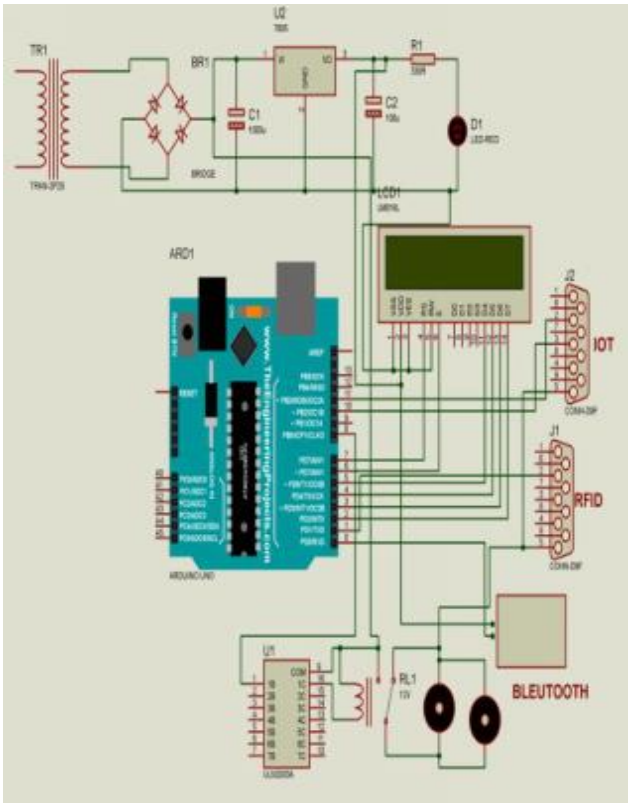

Fig.9. schematic Diagram .

RFID , IOT and Bluetooth modules are connected to Arduino UNO , as soon as the power supply is given to the Arduino microcontroller the RFID tag reads the card which is unique for each bus stop, whenever bus reaches the bus stop using Bluetooth and IOT module it tracks the location from where to where bus is going.

Arduino/genuino uno is a microcontroller board based on the atmega328p (datasheet). It has 14 digital input/output pins (of which 6 can be used as pwm outputs), 6 analog inputs, a 16 MHz quartz crystal, a usb connection, a power jack, an icsp header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a usb cable or power it with a ac-to-dc adapter or battery to get started “Uno" means one in Italian and was chosen to mark the release of

Arduino software (ide) 1.0. The uno board and version 1.0 of Arduino software (ide) were the reference versions of Arduino, now evolved to newer releases. The uno board is the first in a series of usb Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Internet of things (IoT), is another advance technology in IT sector, provides internetworking for numerous of devices such as sensors, actuators, PLCs and other electronic embedded smart devices and controls, and various software's' and provides systems network configuration and connectivity, which enables communication between these numerous devices for information exchanging. Here

LCD is used for displaying the location from where location the destination.

VII. SIMULATION AND RESULT

Display the home activity, enter the code of root and submit in mobile, fetch the selected root from the server, if yes show the current location of the bus in the map, if no display the message, bus doesn't start.

Explanation of output: Using BLE beacons, BLE detectors, whenever bus arrives at the bus section, RFID reader scans RFID tag and the location from where the bus is going is displayed on the TCP client application. Iot is used for the people who are in the bus stops and Bluetooth can be used in the buses for the information, that at what time the bus will arrives will shares the information Iot. Each RFID tag has a unique code and route from where the bus is going. Using this project one may get the information about the bus arrival time and he shouldn't no longer wait for the bus in the bus stop.

VIII. CONCLUSION

We have proposed a new way of tracking the location of public buses using BLE proximity beacon, in order to provide an estimation of bus arrival time. Instead of relying on the bus operators to upgrade its fleet to install a GPS device or share their fleet's GPS traces, we have provided an alternative means to collect, analyze, predict and disseminate transport information. With sufficient location and bus arrival data collected, the proposed system can be integrated with a deep-learning model to predict the bus arrival time. The ultimate aim of this research is to design an accurate bus location tracking and ETA system that does not rely on the availability of real-time GPS data. With such a solution, it can be deployed in many developing countries to improve people's mobility and journey experience.

REFERENCES

[1]. S. J. Barbeau, A. Borning, and K. E. Watkins. Onebusaway multi-region - rapidly expanding mobile transit apps to new cities. Journal of Public Transportation, 17, 2014.

[2]. J. Biagioni, T. Gerlach, T. Merrifield, and J. Eriksson. Easy tracker: Automatic transit tracking, mapping, and arrival time prediction using smartphones. In Proceedings of the 9th ACM Conference on Embedded Networked Sensor Systems, SenSys '11, pages 68–81, New York, NY, USA, 2011. ACM.

[3]. B. Ferris, K. Watkins, and A. Borning. Onebusaway: A transit traveler information system. In Mobile Computing, Applications, and Services. MobiCASE, 2009.

[4]. B. Ferris, K. Watkins, and A. Borning. Onebusaway: Results from providing real-time arrival information for public transit. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '10, pages 1807–1816, New York, NY, USA, 2010. ACM.

[5]. S. L. Lau and S. M. S. Ismail. Towards a real-time public transport data framework using crowd-sourced passenger contributed data. In 2015 IEEE 82nd Vehicular Technology Conference (VTC2015-Fall), pages 1– 6, Sept 2015.

[6]. W. L. H. Lim, J. T. W. Lum, I. J. W. Yeo, and S. L. Keoh. A crowdassisted real-time public transport information service: No more endless wait. In 2016 IEEE International Conference on Pervasive Computing and Communication Workshops (PerCom Workshops), pages 1–6, March 2016.

[7]. B. L. Menezes, K. Laddhad, K. B. Kresit, and K. Dutta. Challenges in RFID Deployment – A Case Study in Public Transportation. 2006. [8] M. S. B. Othman, S. L. Keoh, and G. Tan. Efficient journey planning and congestion prediction through deep learning. In 2017 International Smart Cities Conference (ISC2), pages 1–6, Sept 2017.

[8]. M. S. B. Othman and G. Tan. Predictive Simulation of Public Transportation Using Deep Learning. In Methods and Applications for Modeling and Simulation of Complex Systems. AsiaSim, 2018.

[9]. Thiagarajan, J. Biagioni, T. Gerlach, and J. Eriksson. Cooperative transit tracking using smart-phones. In Proceedings of the 8th ACM Conference on Embedded Networked Sensor Systems, SenSys '10, pages 85–98, New York, NY, USA, 2010. ACM.

[10]. P. Zhou, Y. Zheng, and M. Li. How long to wait?: Predicting bus arrival time with mobile phone based participatory sensing. In Proceedings of the 10th International Conference on Mobile Systems, Applications, and Services, MobiSys '12, pages 379–392, New York, NY, USA, 2012.ACM.

[11]. https://www.semanticscholar.org/paper/Efficient-journey-planning-and-congestion-through-Othman-

Keoh/4bbfc8b5d71ca7b57f8cb457c92dc1960ce0a555
[12]. EasyTracker: automatic transit tracking, mapping, and arrival time prediction using smartphones James Biagioni, Tomas Gerlich, Jakob Eriksson
[13]. A crowd-assisted real-time public transport information service: No more endless wait
[14]. Winwin Loon Haw Lim, Joe Tuck Wai Lum, Sye Loong Keoh
[15]. Towards a Real-Time Public Transport Data Framework Using Crowd-Sourced Passenger Contributed Data Sian Lun Lau, S. M. Sabri Ismail