Smart Bus Tracking and Management System

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Abstract -- Internet of Things (IoT) joins the objects of this present reality to the virtual world, and empowers at whatever time, anyplace network for anything that has a turn ON and turn OFF switch. It constitutes to a world where physical things and humans and other living things, and virtual information and situations, collaborate with each other. Substantial measure of information is created as expansive number of gadgets is associated with the web. So this expansive measure of information must be controlled and changed over to helpful data keeping in mind the end goal to create productive frameworks. In the world of Internet of Things (IoT) when we have all the technologies to revolutionize our life, it's a great idea to develop a system which can be controlled and monitored from anywhere. In this paper, we concentrate on developing a Smart Bus Tracking and Management System using Arduino Uno, Wi-Fi Module, Router and GPS.

Index Terms- Internet of Things (IoT), Arduino Uno, GPS, Router and Wi-Fi module.

I. INTRODUCTION

As the Wireless Sensor Networks have scientifically advanced more rapidly and more proficiently, they have become the key source for the advancement of IoT. They find use in almost all fields including smart grid, smart transportation systems, smart home, smart hospitals, and so on. The safety of private and public vehicles is a major concern nowadays so having GPS vehicle tracking system ensures their safety while travelling. Bus Tracking System becomes very important these days, especially for students who come late to bus stop. In our College many students and staffs are not aware of exact timing and location of the college bus. So we have planned to implement a smart bus tracking system for easy transport facility using IoT. If you have GPS system installed in your bus, you can track your bus location using Google Maps. Arduino has been used as a platform to work. In this project, we will send the location coordinates to the Cloud or Server via Wi-Fi module using Arduino. In this bus tracking system, we have to use Google Maps, GPS Module for getting the Location Coordinates, Wi-Fi module to send data to computer or mobile over Wi-Fi and Arduino is used to make GPS and Wi-Fi talk to each other.

A. Motivation

The inspiration for this project was to limit and curtail the difficulties and issues related with Bus transport framework in India. India is a developing country with tremendous population. Here, we confront numerous issues in our day by day life, for example, water, power, logistics, and economy. In this way, to overcome no less than one of these issues as a civilian of our nation I have chosen to contribute my side to provide safe and smart bus tracking and management system. As we experience day to day issues with our bus transport, my commitment is to limit the issues identified with it. The real-time bus position information on Google maps and bus arrival and leaving time is additionally presented.

B. Literature Survey

In past works given in SeokJuLee [1], they have actualize transport vehicle tracking for UCSI University, kuala-Lumpur, Malaysia. It is developed for settled course, giving the candidates with status of bus after determined time period utilizing LED panel smart phone application. Technique used is Arduino microcontroller Atmega328 based Arduino UNOR3 microcontroller. Additionally, for GPS, GSM/GPRS module a similar controller is used. Program to control them is composed in C programming language, compiled and saved in microcontroller's flash

memory. The testing results in this paper give; testing in-vehicle module, testing web server and database, testing smart phone app. In PengfeiZhou [2], foreseeing transport entry time with cell phones is given. Innovation utilized is participatory detecting of users. This model framework with various sorts of Android based cell phones and thoroughly explores different avenues regarding the NTU grounds carry transports and in addition Singapore transports over a 7week time span, then taken after by London in 4-weeks. The proposed framework in arrangement is all the more for the most part accessible and is vitality agreeable. The assessment comes about recommend that the proposed framework accomplishes extraordinary expectation exactness contrasted and those operator initiated and GPS based solutions. The model framework predicts transport entry time with average tolerance of 80 sec. In MashoodMukhtar [10], the vehicle tracking system exhibited in this paper can be utilized for situating and exploring the vehicle with a precision of 10 m. The situating is done as latitude and longitude alongside the correct area of the place, by making utilization of Google maps. The system tracks the area of a specific vehicle on the client's demand and reacts to the client by means of SMS. The got SMS contains longitude and latitude that is utilized to find the vehicle on the Google maps. The vehicle tracking system enables a client to: remotely switch ON the vehicle's ignition system, remotely switch OFF the vehicle's ignition system, remotely bolt the entryways of the vehicle, remotely open the entryways of the vehicle, and remotely track a vehicle's area.

II. PROPOSED SYSTEM

To design a web based application to the users who wants the real time information of the bus using Arduino, Wi-Fi module, GPS module and Google maps.

Our system provides the relevant information regarding all the bus numbers going from user's source & destination along with the route details, real time location. Generally our system is operated by GPS which is attached with the bus. Firstly GPS receives the satellite signals and then the position co-ordinates with latitude and longitude are determined by it. The location is determined with the help of GPS and transmission mechanism. After receiving the data the tracking data can be transmitted using any wireless communications systems. In this project Arduino UNO is a microcontroller to program with Wi-Fi module. Based on IoT, the students/staff can access this information of a bus based on users source and destination through the android application. Our proposed system gives the real time location of bus. Smart bus tracking technology is advantageous for tracking and monitoring a college bus.

III. IMPLEMENTATION DETAILS

In the development of smart bus Tracking and Management System controlled by Arduino microcontroller, hardware and software components are needed.

A. GPS (GLOBAL POSITIONING SYSTEM) MODULE

The GPS is a system for calculating position from signals sent by a network of satellites. To accurately determine the position and it is able to determine the strong signals. GPS tracking system is easy to use, mobile friendly, as intuitive user interface and is designed to communicate with a wide variety of GPS devices. The GPS receivers were much simpler than today, they provided only the latitude and longitude position, the rest was on account of the user who needed to calculate the map.

Fig .1. System Block Diagram

Fig.2. GPS Module

B.   ARDUINO MICROCONTROLLER

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 analogue 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 an AC-to-DC adapter or battery to get started.

Fig.3. Arduino

C.   ESP8266 WI-FI MODULE

The ESP8266 Wi-Fi module is a self-contained SoC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 module is not capable of 5-3v logic shifting and will require an external logic level converter. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP / IP Connections.
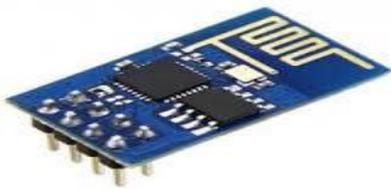
Fig.4. ESP8266 Wi-Fi module

D.   WI-FI

Wi-Fi also allows connectivity in peer-to-peer mode, which enables devices to connect directly with each other. Devices that can be use Wi-Fi technology include personal computers, Smart phones and tablet. Wi-Fi compatible devices can connect to the internet via WLAN network and a wireless access point.

Fig.5. Wi-Fi

Wireless communication systems consist of transmitters, antennas and receivers. In this project JioFi is used as router for connecting with ESP8266.

E.   ARDUINO IDE

Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

F.   THINGSPEAK

Cloud whose task is to upload all static information about bus i.e. to collect the data of the latitude and longitude from the Wi-Fi module and analyze the data which in turn send it to the mobile application of the user. The cloud we used is ThingSpeak. ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyse live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB® code in ThingSpeak you can perform online analysis and processing of the data as it comes in. Some of the key capabilities of ThingSpeak include the ability to:

- Easily configure devices to send data to ThingSpeak using popular IoT protocols.

- Visualize your sensor data in real-time.

- Automatically act on your data and communicate using third-party services like Twilio® or Twitter®.

IV. WORKING OF THE SYSTEM

To track the vehicle, we need to find the Coordinates of Vehicle by using GPS module. GPS module communicates continuously with the satellite for getting coordinates. Then we need to send these coordinates from GPS to our Arduino by using UART. And then Arduino extract the required data from received data by GPS. Before this, Arduino sends command to Wi-Fi Module ESP8266 for configuring & connecting to the router and getting the IP address. After it, Arduino initialize GPS for getting coordinates and send them to the cloud via ESP8266 module. Later, we can see the current location of the bus at the red spot on the Google maps.

V. RESULTS AND DISCUSSION

The proposed system is more user friendly than existing system. And it also gives greater performance than RFID, GPS-GSM systems. In the proposed system the signal connectivity and also the cost are achieved.
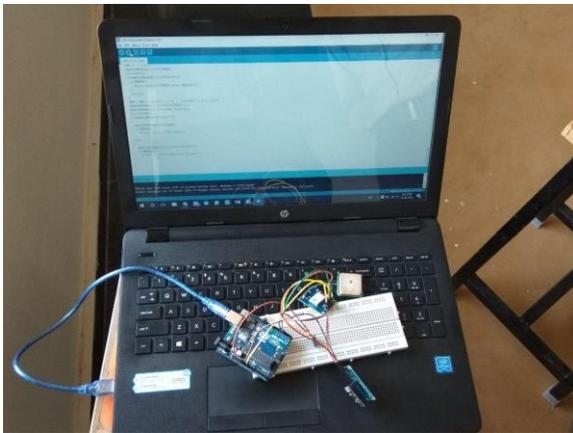
Fig.7. Uploading of GPS and ESP8266 using Arduino IDE.
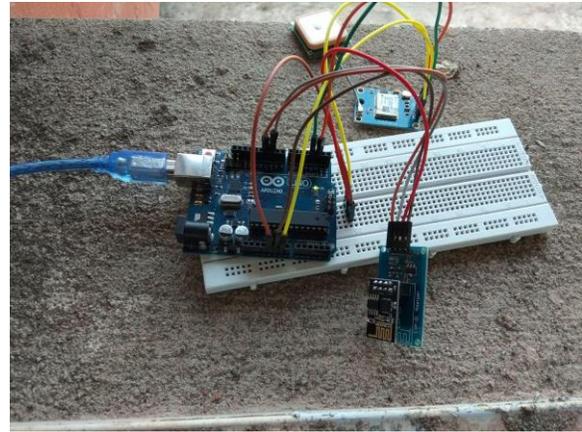
Fig.8. Circuit Connections
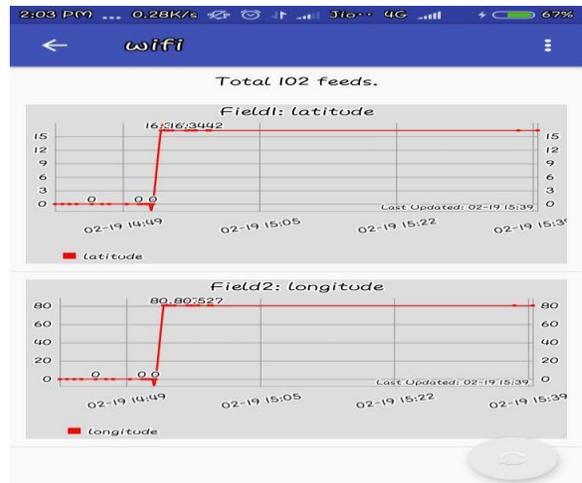
Fig.9. Final output (latitude and longitude) derived from ThingSpeak.

VI. CONCLUSION AND FUTURE WORK

This proposed work is successfully designed, implemented and tested. Our system reduces the waiting time of remote users for bus. With the mobile application we can track the location of bus at any point of time. All the current information is stored to the cloud and it is retrieved to remote users via mobile application. This system is more user friendly for users to get information visually shown on Google Map. User can freely get this mobile application for real time tracking of bus which provide interactive interface environment. So by using this application remote user can just wait or they may reschedule their journey according to the availability of bus. So this

paper presents a system which provides high practical value in the modern fast era. The system has high practical value and cost efficient. This work is having a wide scope. A mobile application which can be further modified using cloud with GPS module. Use of video camera to this system would take this system to the next level in the field of security. It will help to monitor the crimes that happen now days which is witnessed by common people every day. This would prove a major breakthrough in reducing the crime rates; with use of motion sensors the speed of the bus can be calculated. Also, with the use of RFID tags we can implement E-ticketing system in the buses and E-bus pass system which is an eco-friendly as there is no need of generation of plastic bus passes.

ACKNOWLEGEMENT

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