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Digitised bus navigator with self authorization facility using IoT

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Abstract---An autonomous bus ticketing is a modern bus transportation technology. Smart bus ticketing is a transportation innovation that is developing as technology advances. To get to their destination, every passenger requires reliable transportation. The smart bus ticketing system was created with the help of making things work via internet by including the IOT domain. All passengers will be bringing RFID tags whereas the bus will be having a RFID reader which makes the access for the passengers to select their destination for their journey. The amount will be deducted, and a notification will be shown on the output display screen. After boarding the bus, the passengers can view current location of the bus with live tracking that carried out using the google map interface in via GPS module which gets the data and syncs it to the Google Map widget to display the Map view so that the illiterate people can easily understand the current location of bus. In addition to this Fire and accident detection are also deployed to give more security and comfort for the passengers. The whole process is carried out using Node MCU controller which has an in-built Wi-Fi module called ESP8266.

Keywords---Node MCU, IOT, RFID, Fire Detection, Accident Detection, WIFI-server, WIFI- client, GPS module, Blynk App and WIFI Communication.

Introduction

The transport system is the most utilized sector by the public for commutation. In this people prefer bus transport for many of their usefulness. There are many factors which must attract the public and make them feel comfortable while using the bus transportation by adding some features which is built using the current technologies. The bus acts as the transmitter section which is carried with the Wi-Fi- server and the transport office acts as the Wi-Fi- client whereas this communication is carried out using internet connection as the whole project is carried out using IOT (Internet of Things) domain. The passenger's safety and the care for society, over the world. Bus tracking is playing a major role for the public, especially for women and children. IOT based bus tracking system is used for tracking a bus. The main ingenious thing in this project is deploying the automated ticket collection which gives a contribution for Digital India. The digitized ticket collection is deployed using RFID module which will be owned by all the passengers. The RFID tag will be carried by the passengers and the receiver of the module will be placed in the bus's entrance whereas a display which has the details about the destination places are displayed, so that the users are allowed to select the destination and the required bus fare for the corresponding destination will be deducted and the details will be displayed via the BLYNK app prospect of bus is very important nowadays. people are mostly using buses and even a government buses are dispatching out from the depo at irregular time. Then to make the passenger feel more secure we added a live tracking of the bus with google map interface so that the passengers who are new can have a count on the stops and current location.

Security in buses is also one of the important factors to be considered. There are many bus accidents occurring and it takes more time to inform the ambulance and because of this many passengers lost their life and faced serious health hazards. So, to overcome this we have added a vibration sensor which detects the accident and sends the live location details with the aid of GPS Module with an alert to the transport office which acts as the receiver section. Buses have lots of electrical connections and there are chances for passengers to carry any electrical or electronic appliances which are prone for getting fire easily and lead to fire accidents. The passengers traveling by bus to get accurate location of bus. It will improve the prospect in the bus. The system is to tracking bus using GPS (Global Positioning System). The bus tracking location is done with BLYNK app. The BLYNK app is shows the bus stopping, route of the particular ending place. Being in travel it is difficult for the passengers to get the smell of smoke due to high ventilation in buses. So, to overcome this we have deployed flame sensor which will detect the fire and it will actuate a buzzer to alert the passengers and safe them from serious fire accident which also saves the bus from getting damage because of fire accident. The entire system is carried out using the micro-controller named Node MCU. In this there is a Wi-Fi module that is integrated into it which is called as ESP8266. In this project we will be using two Node MCU

one as Wi-Fi- server and the other as Wi-Fi- client. The programming for the entire project is done with embedded C using Arduino IDE software.

Existing System

There is no transmitter or receiver in the current technique, which employs only one Node MCU microcontroller. It exclusively helps make use of an automated bus ticketing system and live tracking. It is compact and low-cost since it requires only a few components. As a result, the amount of work required is also minimized. We can conserve energy primarily because this existing technology uses fewer components.

Drawbacks

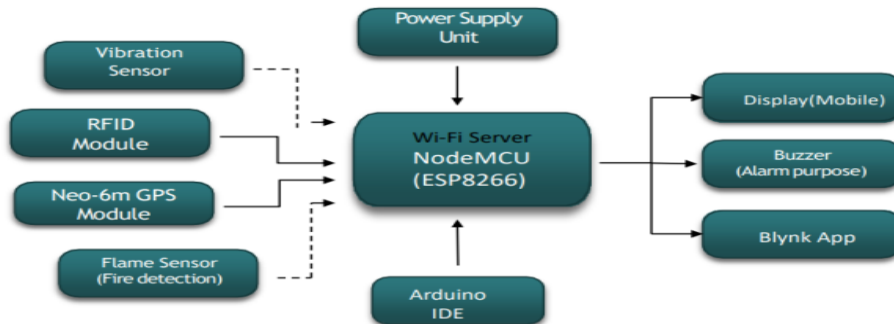
After boarding the bus, the passengers do not feel completely at ease. The bus has no security against any threats, and there is no transmitter or receiver to send messages about the bus's and passengers' status to any centralized location. The present system is cost-effective, yet the lives of passengers are more essential than money. Despite the fact that it employs IOT technologies, it serves no use other than to interface with Google Maps.

Proposed System

The purpose of the proposed system is to make the bus transport a way far better than other commuting which must give more comfort for the people and attract them toward the usage of public bus transport as people tend to choose private sectors for the aesthetic factors. If the public travel to get exact location of buses along with the moving of bus stop according to the time of traffic situations, then it will raise the integrity [5]. It uses the latest technologies like IOT (Internet OF Things), RFID (Radio Frequency Identification) modules and tags, GPS module for Live Tracking along with interface of Google Maps. The buses dispatching is a major role of transportation. The system of bus realization is on the bases of large data, and it is predict us from traffic .This work includes two divisions one is transmitter, and the other is receiver[6]. The block diagram for transmitter is given below:

A) Block Diagram of Transmitter Section:

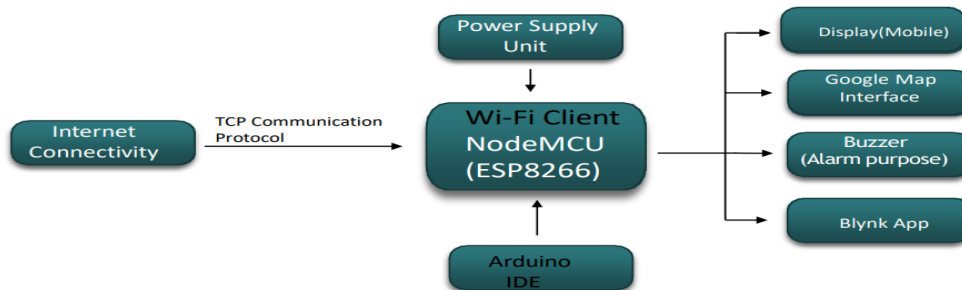
TRANSMITTER SECTION:



The bus which acts as the transmitter section has Wi-Fi- Server which is the Node MCU and it is a MSN (Multi Sensor Network) integrates Vibration Sensor which is used to detect accident and any kind of fire accident is detected by the flame sensor. Bus playing a the major role in India because of low cost of tickets and its moving to long distance. GPS module is locating place and it helps to find the destinations. The passengers information and location of the bus are shown in the BLYNK application and it interfaces with google map [7]. The RFID module is used to gather the passenger information and the BLYNK app which has the google map interface which receives the data from GPS module to display the live location. The current location and an alert is sent to receiver section in case of any accident. Commutations which is immensely showing its improvement and economizing globally, the overall people living in Cities of India contributions immensely for the development of the commuting carried out via bus which are run by the government. The existing method that is present is inadequate, ineffectual and positively unmanageable. Therefore the major drawback is to make the payment method more effective and in an automated way. The gradual usage of electric –tickets worldwide made it to reach the peak, so to make India to follow the Digitized methods in all means we have to adopt this technique. The proposed system is an highly automated way for getting the bus ticket done by interfacing mobile named BLYNK and also by integrating RFID module along with it to make it more easier and technically attractive [8]. The receiver section's block diagram is given below:

B) Receiver Section's Block Diagram:

RECEIVER SECTION:



The transport office acts as the receiver section which is the Wi-Fi- client. This section is having blocks like buzzer which is used to alert the office if any accident occurs, and it will display the live tracking of bus with the help of BLYNK App. The current method which uses manual ticketing with paper based system leads to lots of human errors and many miscommunications so to overcome this ticket collecting via RFID is used [9]. The communication between transmitter and receiver is carried out by using TCP Communication Protocol. The common thing is that the entire system works only in internet access as it is built on IOT (Internet of Things) technology.

Implementation and analysis with results

Transmitter section

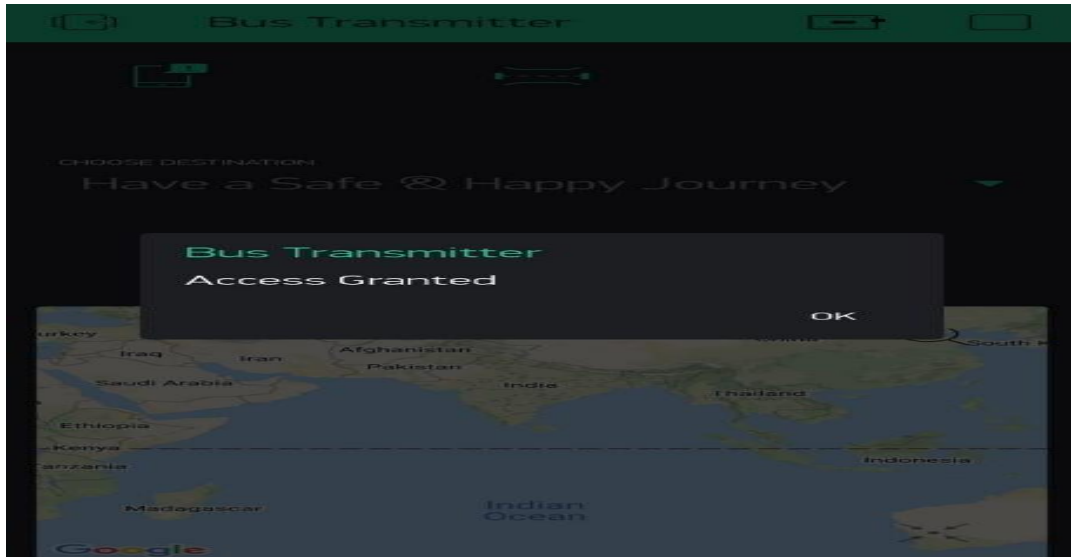
Basically the implementation of this project is done using integrated modules like RFID, GPS module, Vibration Sensor, Smoke Sensor and buzzer which are connected to the NodeMCU in Transmitter Section. The data from sensors and GPS are sent to the receiver Section's NodeMCU.

C) Blynk Workspace for Bride Widget:



The data transfer is done via BLYNK app with the help of a widget named Bridge from the work space which will make the two Node MCU communicate each other by the server client method using TCP Protocol. The fast expansion of India's population has resulted in increased crowding at public bus stops. People wait for buses for a long time and then abruptly cluster near the bus when it arrives, causing an accident. People also travel in overcrowded buses on footboards, causing an accident. Overcrowding can also be caused by theft. All of this is due to a lack of precise understanding about how to access buses at many bus stops. An IoT-based bus tracking system is developed that shows the vehicle's current location as well as available seats in arriving buses. This decreases the amount of time spent waiting for a bus and the amount of people at bus stops. It also lowers the chances of mishaps and thefts [10]. The BLYNK App Workspace with Bridge Widget is shown in the image above.

D) RFID Verification Notification in Blynk

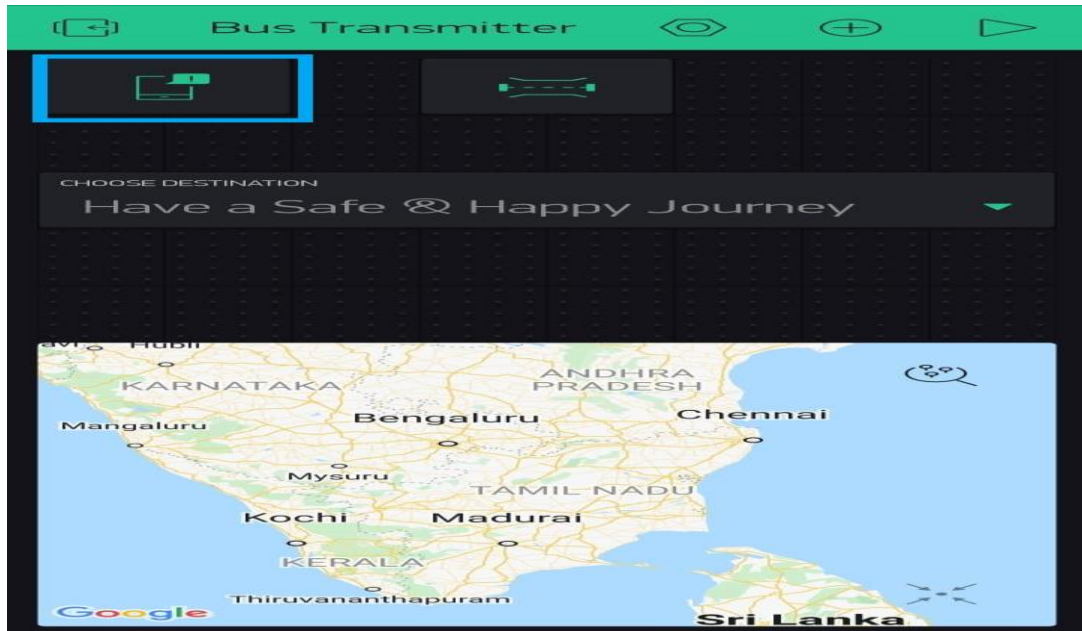


The first stage is passenger authentication via an RFID module, with each passenger having their own unique RFID tag, and a display with a BLYNK Graphical User Interface at the bus's entry. When the RFID verification is completed, a text notice with the text "Access Granted" will flash on the display.

E) Destination Selection Dropdown Menu Box:

Once the verification is done then the user is allowed to choose the destination from drop down menu box in the same BLYNK App User Interface. Three sample locations are provided in this prototype. (Kanchipuram, Vellore and Bangalore).

F) Notification Widget



The text notification for the entire process which are displayed on the BLYNK App Display which makes the user an easy access for the journey is selected from the widget section of the BLYNK App.

G) Google Map Interface

The Google map interface embedded with GPS module which is connected to the Node MCU in the transmitter section[11&12]. This live tracking will allow passengers to know their current location while travelling, and it will communicate the location information to the receiver section, which is the transport office, in the event of an accident or a fire. The transport office get to be able to track if a bus deviates from its path because of the GPS feed of bus network that is attached. For each bus service, bus stops and their stop coordinates are obtained. The bus stations are frequently close together, and Google Maps can generate a route between them that follows the bus route's path.

H) Vibration Sensor

The bus vibration data are recorded by the acceleration sensors embedded into the smartphone in Crowd-sourcing mode. The bus vibration signals collected, on the other hand, are dependent on the smartphone's own coordinate system; the signals will change as the smartphone's posture changes, and the drift of bus acceleration signals is introduced in the inertial coordinate system, which displays the actual situation of the bus vibration. To address this issue, the space coordinate transformation is used to map acceleration signals collected by the smartphone's coordinate space to the inertial coordinate space, overcoming the drift of acceleration signals caused by the smartphone's posture change and

ensuring the accuracy and stability of the acceleration signals regardless of the smartphone's posture.

I) Smoke Sensor

An Iot Technology is used for this IOT-based smoke detector system, where the smoke sensor MQ-2 is attached and the output is displayed via the BLYNK application. Anywhere on the earth, the sensor value can be viewed in real time. A notice message is issued to the concerned person when the sensor value crosses a certain pre-defined value.

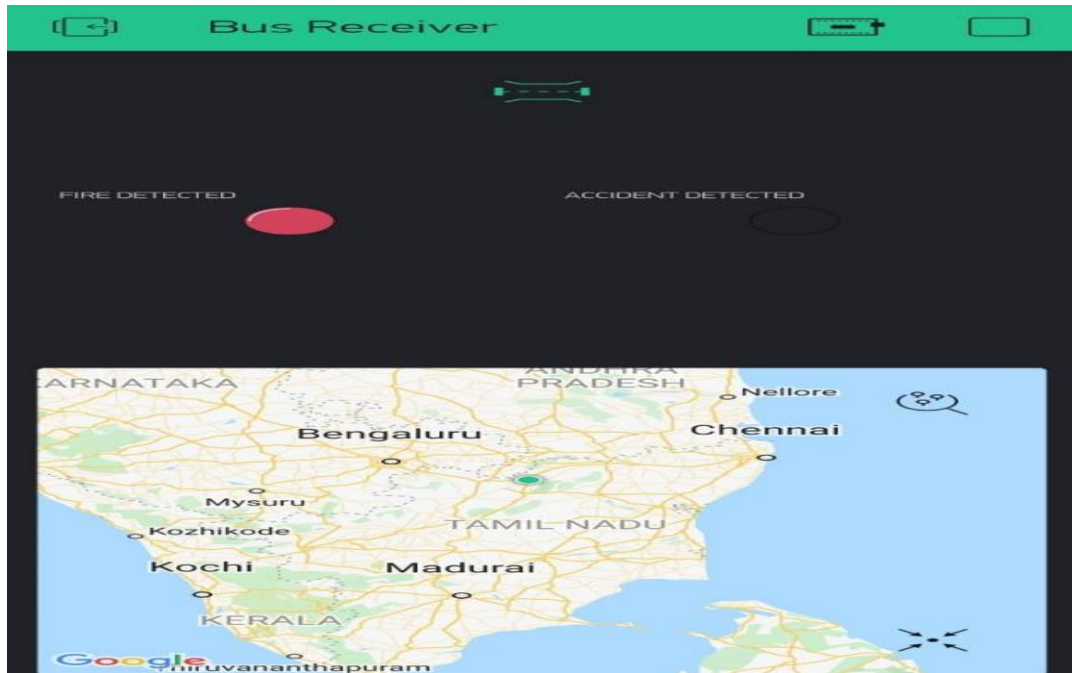
Receiver section

Receiver section which is the transport office has a NodeMCU which acts as the client for the server (Transmitter Section). The transmitter section which is the bus has a Vibration sensor for detecting accident and a smoke sensor for detecting fire. If the bus faces any accident, then the transport office (receiver section) will get an alert from the buzzer [13]. The transport office also has a display with BLYNK Graphical User Interface where a LED widget is placed for monitoring purpose. Same like transmitter section the receiver also has the google map interface where the location of bus is transmitted to transport office's BLYNK App via the Bridge Widget.

J) Accident Detected Indication

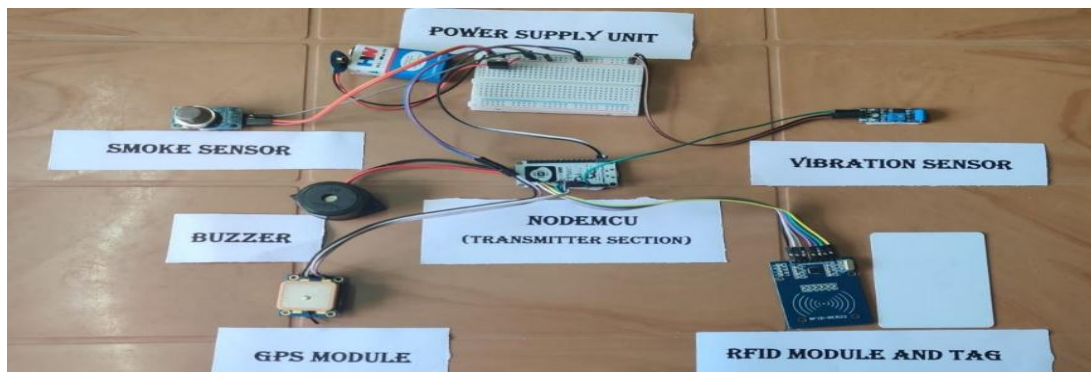
When the vibration sensor on the bus sends a signal to the receiver section with a buzzer sound and the virtual Blue LED in the Blynk App in the Receiver Section turns on which means there has been an accident. Then with the help of location shared from the bus the officers will alert an ambulance directly to the spot in short span of time.

K) Fire Accident Indication

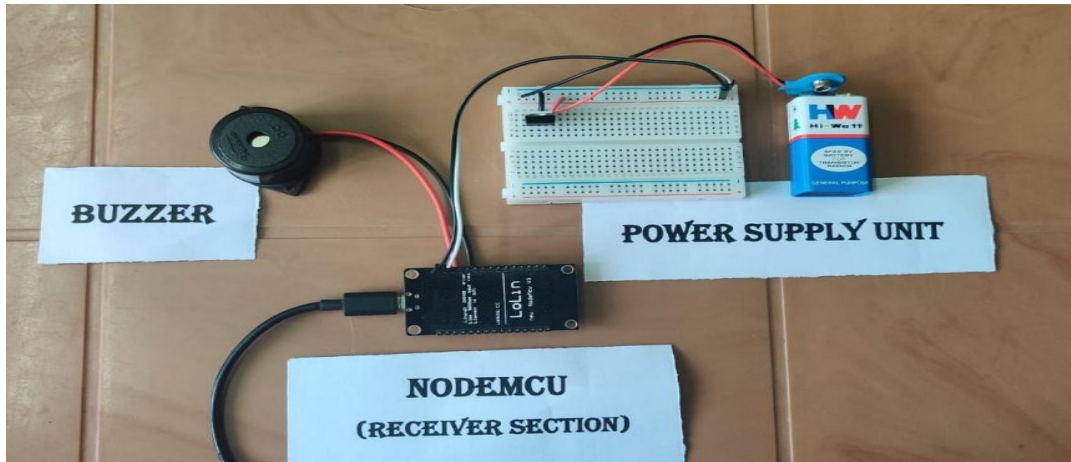


The fire disaster may be mild, and passengers on the bus may be able to overcome it; but, in the case of serious fire accident, the occurrence must be reported promptly to the transport office in order to save lives and extinguish the fire[14]. So a threshold value is established and if the value is achieved then the transmitter will send an alert comparable to accident and it will turn on the virtual red LED on the BLYNK App.

L) Transmitter Hardware Part



M) Receiver Hardware Part



Transmitter Hardware Part Tabulation

S.no	Components name	Ranges
1	GPS module	3m position accuracy
2	RFID module and tag	13.56 MHz
3	Buzzer	31Hz to 655 Hz
4	Smoke sensor	0.42 to 10 micron
5	Power supply unit	100 to 240 V
6	Vibration sensor	1Hz to 8000 Hz
7	NODE MCU	0 – 3.3 V

Receiver Hardware Part Tabulation

S.no	Components name	Ranges
1	NODE MCU	0 – 3.3 V
2	Power supply unit	100 to 240 V
3	Buzzer	31Hz to 655 Hz

Conclusion

The digitized bus navigator with self-authorization is completed successfully using the advanced IOT technology and made a cost effective smart bus transport system which have a safer section of automated communication between the bus and transport office in a very easier and faster way and provided the passenger a very safer and comfortable journey in public transport [15].

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