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REAL TIME BUS TRACKING AND SEAT UPDATING SYSTEM

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Abstract: Transportation is something that humans can't avoid in this 21st century .A significant portion of daily hours are spent commuting , hence the transportation system needs to be efficient and effective.Bus schedule is not regular and is overcrowded by people due to a lack of proper transport management system . To overcome these problems a GPS based tracking system and IR and pressure sensors based passenger counting system is being used.The proposed system lets the passengers track the bus on a particular route by getting the information sent on their cell phone. The real-time location of the bus is provided along with the approximate count of the number of passengers riding on the bus. So the Passengers can easily get to know about the timings and seat availability instantly , which allows the passenger to decide whether to wait or the upcoming bus or would he/she will have to ride the next bus after that. All this helps to reduce the time and effort of the passenger .

Index Terms **- GPS tracker , IR sensor , Adruino.**

I. INTRODUCTION

India's population growth rate is 1.13% and is continuing in that rate . Since it's a devoloping nation , urbanization is taking place in a rapid manner . It is predicted that by the year 2030, 40.76 percentage of the country's population will be residing in the urban areas, according to a survey conducted by the UN State of the World Population. Many major cities are experiencing a rise in rural-urban migration. Migrants arrive from various parts of the country which puts the transportation system on strain . Public transport is the only medium for the middle class population.Train and bus transport system comprised of a major role in public transport. Road transport incorporates bus transport systems. Buses make up to 90 percentage of the total public transport in Indian cities.Bus timings are irregular in almost every cities . Passengers can plan their travel if they know about the timings beforehand . Passengers get to a bus which is overcrowded and is unaware that the next bus to that station has many empty seats . This results in overcrowding due to the lack of a proper management system . Overloading of vehicles makes rides uncomfortable. This creates a dissatisfaction among the passengers as they have to travel in an arduous way. All this lead to the increase in privately owned vehicles resulting more congestion and pollution on the roads . This proposed system provides information of the location of the bus and the seat vacancy in the bus.

II. OBJECTIVES

- To get the real-time location of the bus.
- To get the real-time seat occupancy of the bus.
- To get the schedule update of the bus.

III. LITERATURE REVIEW

3.1 DEVELOPMENT OF AN ANDROID BASED REAL TIME BUS TRACKING SYSTEM

This paper proposes a application for students which has all the information about the bus such as location . This enables the students to find the exact location of the bus so that they can plan accordingly . The location is shown in a google map interface . Students can also get the details about the bus such as Bus driver number .The location is updated instantly in the form of latitude/longitude .

3.2 BUS TRACKING USING RFID READERS

RFID is Radio-frequency identification which consist of a tag which usually emits Radio frequency signals and is passed to a reader . This method is implemented by placing an RFID tag at every bus stop and whenever a bus arrives , it reads the RFID tag and gets the location from it . This is updated in the application after the scanning is done . Their are many disadvantages for using this method . One is the tag can get tampered after several days . Another one is that the bus should be parked at a bus stop so that the reader can identify the tag in the bus . The only advantage is that this system is economically friendly and easy to implement .

3.3 LOW-COST BUS SEATING INFORMATION TECHNOLOGY SYSTEM

A reliable and efficient transport service is still a struggle for the public transportation system . Lack of a real-time data is the major cause for this issue . This study proposes a method in which seat availability in a bus is acquired using the help of IOT-based system . It mainly contains an array of sensors , force sensitive sensors and a raspberry Pi microcomputer and a USB camera to validate the preceding information . Using GSM services, this data is uploaded to an online platform and is visualized in a mobile/desktop. A 20-seater bus was used for testing purpose . The exact seating arrangement is shown to users in real-time . This method is hard to implement as each seat should be installed with a microcomputer and other IOT modules .

3.4 REAL TIME BUS MONITORING SYSTEM

This system proposes a model which tracks the bus location using GPS (Global Positioning System) and GPRS (General packet radio service). System only focuses on the current location of the bus and shows the ETA to the nearest bus-stop . The passengers receive these information in form of an SMS (Short Messaging Service) . Only the admin has an access to a Web based user interface to alter or add new data to the database .

3.5 BUS TRACKING APPLICATION

This system uses a different approach in location estimation of the bus . it contains 3 steps . The first one is when the bus location is send to satellite and is processed using a Kalman filter . then it's sent to a web-server with the help of GSM services . The next part is when the retrieved data is processed to get the latitude and longitude and is passed to a Google map API . The last part is the visualizing part where the processed location is marked in the map using the API .

3.6 ANDROID BASED SCHOOL BUS TRACKING SYSTEM

This is a mobile application which ensures student security . Vehicle monitoring system is the main part of this application . Parents care about their child's safety .This application facilitates authentication , attendance monitoring , vehicle tracking etc. Contact details of drivers,teachers,parents are shown in the app . They are the end users of the application . System uses technologies like GSM/GPRS , GPS . Parents can monitor their child in real-time .

3.7 REAL-TIME BUS TRACKING SYSTEM

Many people uses the public buses daily . People have no idea if a particular bus is stuck in traffic or not . People are a unaware of the incidents and is eagerly waiting fot the bus . Calling the bus directly is not an apt solution for this problem . This paper proposes a complete software solution which is easily updatable , scalable and can supports all operating system in different users' phone .

IV METHODOLOGY/THEORY/MODELLING

4.1 Bus tracking module

This is the part where location tracking is done . So this module contains mainly 2 components . One is to track and other one is to upload the details acquired to a web-server . For tracking U-blox Neo-6M GPS Module is used and for uploading the data NodeMCU ESP8266 is used.

4.1.1 U-blox Neo-6M GPS Module

This Module comes with an active antenna . It is also cost-effective. The main advantage of this module is the performance of this module . It's high performance enables faster processing .It is of very small size . The receivers are highly flexible and have a capability of high level integration which makes them perfectly suited for mass production as it is cost-effective and is of small size.

4.1.2 NodeMCU ESP8266

NodeMCU ESP8266 NodeMCU is a wifi system on a chip .it is produced by Espressif Systems. The EP8266 -12E WiFi module was further modified to make this module. This chip is also a highly integrated chip . The functionality of this chip is to provide a full internet connectivity in a tiny package. It can be programmed using the Arduino IDE directly using a USB port .We can establish a WiFi connection by simple programming . We can also define input or output pins according to your needs . It can be used as an access point and/or station . We can use this module to host a web server or connect to the internet to fetch or upload data .

4.1.3 Working

A user gives input in the form of source and destination stops on a particular route. The route will consist of multiple stops.GPS modules are installed on the bus. The GPS module tracks the location of the bus in real time and sends the data to the server through which it is displayed on the Google Map interface to the user. To send data to the server NodeMCU esp8266 module is used as it has built-in support for wifi connectivity. This data is constantly updated to the server and real-time data is continuously provided to the user on the client device. These information are computed and the location is found out . The location details is shown to the user both in a tabular and graphical way . The most recent bus stop which the bus has passed is shown in the top of the tabular data . The information gets updated every 10 seconds . The graphical data shows a pointer on the current location of the bus .

4.2 Passenger Counting Module

This would enable us to count the number of passengers in the bus currently and the passenger can see that in the app.The components used in this module are IR sensors and Arduino Uno.

4.2.1 IR sensors

An IR sensor or Infrared Sensor is an electronic instrument which is used to sense its surrounding or certain characteristics . The module has a particular range and in that range it can emit/detect IR radiations . IR transmitter and Receiver is in-built in this module and can sends IR signals and looks for reflected IR signal which helps to detect any obstacle . If the receiver isn't getting ant feedback , that means their is some obstacle in its range. This module also has a potentiometer which helps to adjust the range of detection . The sensor is stable and it even responds in complete darkness.

4.2.2 Arduino Uno

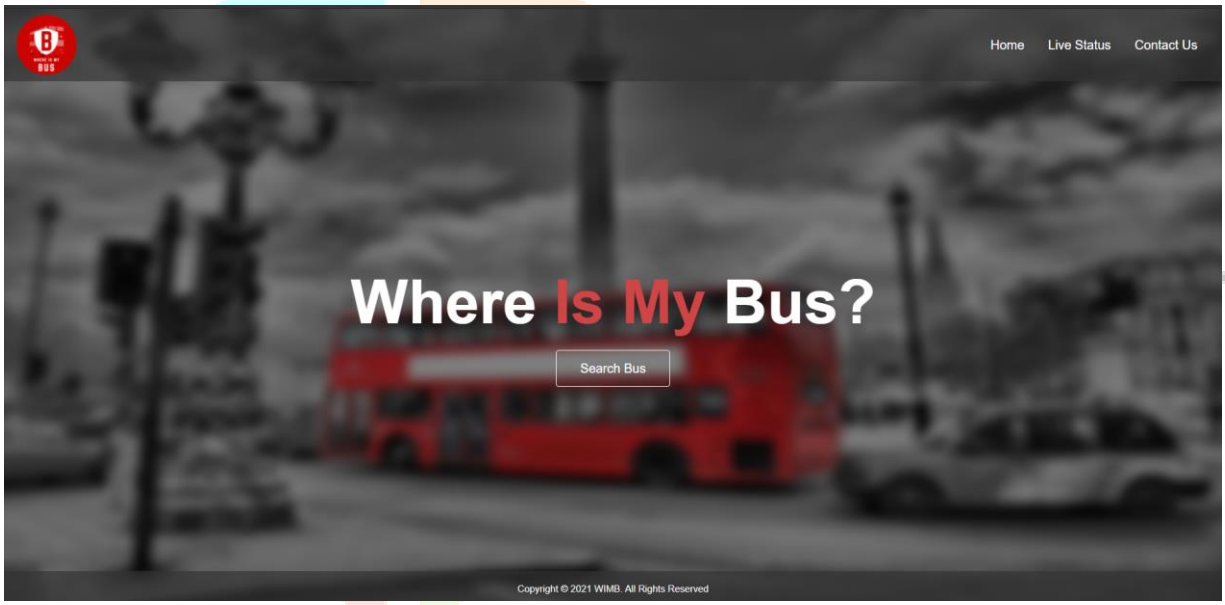
It's an open-source microcontroller . The board is based on the Microchip AT mega328P microcontroller .It was developed by Arduino.cc Sets of digital and analog input/output pins are equipped in it which can be connected to various boards or other circuits.

4.2.3 Working

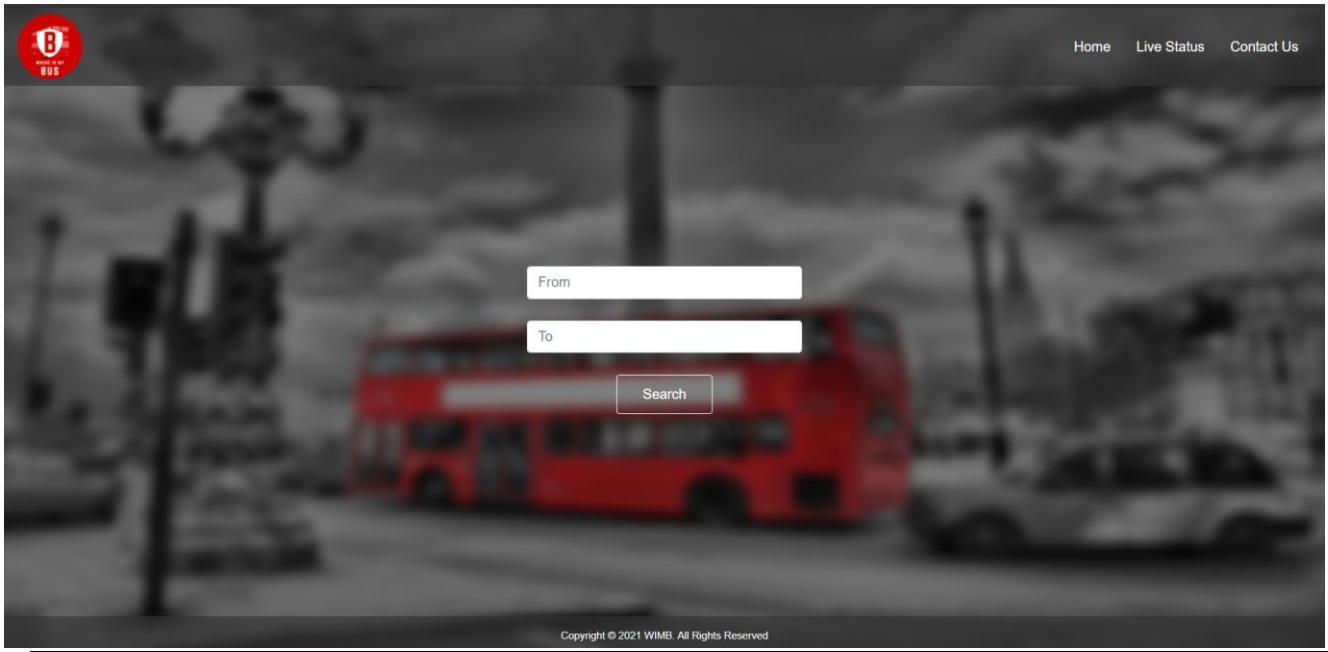
Passenger counting module is implemented using IR sensors. The module consists of two IR sensors, one for the front door and the other for the back door of the bus. These sensors are connected to the Arduino. The sensors recognize when a person passes through its vicinity as the input to the sensor is low. A count variable is used in coding to keep track of the number of passengers. Passengers will board the bus from the back door, the count will increment. Passengers will alight from the front door of the bus and the count will decrement. The purpose of recording the number of passengers is to let the user know whether there is any vacancy on the bus beforehand depending on the bus size as each bus has a different capacity. Depending on the bus size the information is provided in the form of categories like vacant, crowded, overcrowded.

V. USER INTERFACE

5.1 Home Page



5.2 Search Bus



5.3 Bus Search Results with Seat Vacancy

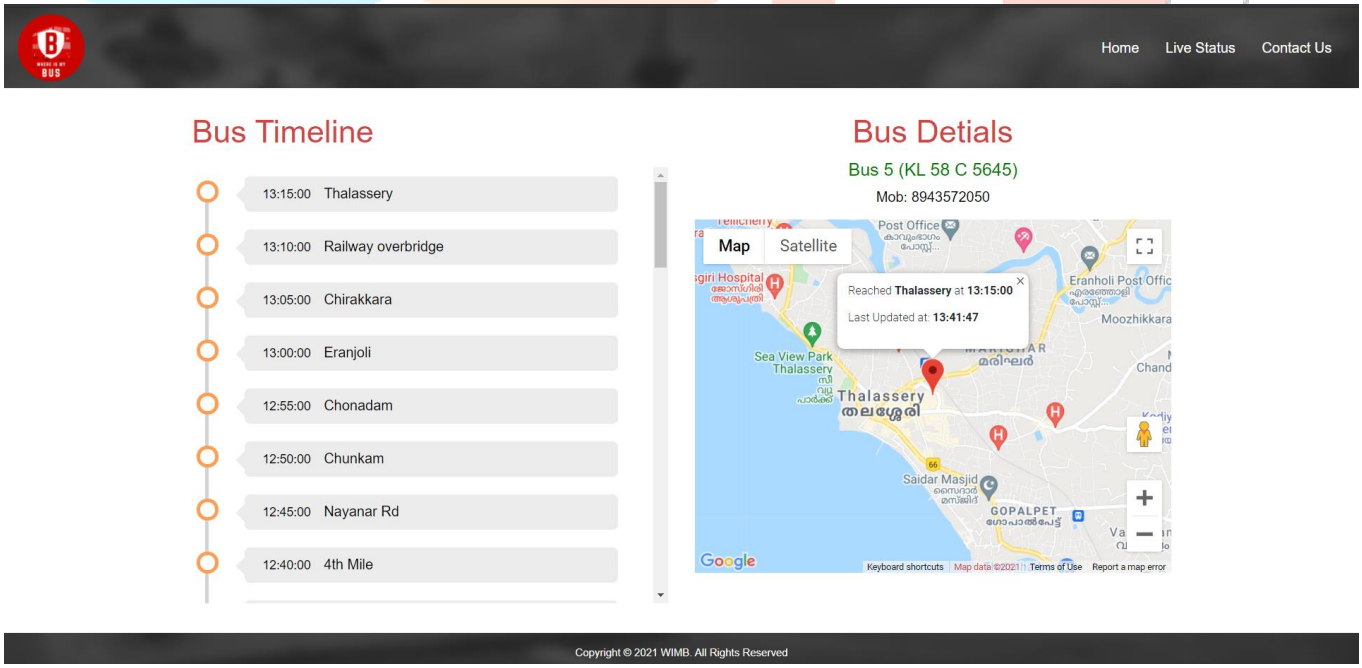
< Back

Search Results

Sl no	Bus Name	Bus Number	Departure Station	Departure Time	Destination Point	Destination Time	Seat Count	Bus Route	Status	Action
1	Bus 2	KL 58 F 4568	Kadirur	09:55:00	Kuthuparamba	10:15:00	24/40	TLY-KPBA	Left	View
2	Bus 8	KL 58 A 7120	Kadirur	10:10:00	Kuthuparamba	10:30:00	12/43	TLY-KPBA	Left	View
3	Bus 5	KL 58 C 5645	Kadirur	11:25:00	Kuthuparamba	11:45:00	17/45	TLY-KPBA	Left	View
4	Bus 11	KL 58 C 6734	Kadirur	11:40:00	Kuthuparamba	12:00:00	24/40	TLY-KPBA	Left	View
5	Bus 2	KL 58 F 4568	Kadirur	12:55:00	Kuthuparamba	13:15:00	8/40	TLY-KPBA	Left	View
6	Bus 8	KL 58 A 7120	Kadirur	13:10:00	Kuthuparamba	13:30:00	25/43	TLY-KPBA	Left	View
7	Bus 5	KL 58 C 5645	Kadirur	14:25:00	Kuthuparamba	14:45:00	26/45	TLY-KPBA	Up Coming	View
8	Bus 11	KL 58 C 6734	Kadirur	14:40:00	Kuthuparamba	15:00:00	12/40	TLY-KPBA	Up Coming	View

The green columns shows that the bus hasn't arrived there yet. The red columns shows that the bus has left that particular station .Individual bus details can be acquired by pressing the 'View' button . Seat count is shown in (Vacant seats / Total number of seats) manner .

5.4 Bus Timeline And Details / Live Status



The name in the top of the timeline is the bus stop which the bus has passed most recently .The map in the right side clearly shows the current location of the bus using a red pointer .

VI. RESULTS AND DISCUSSIONS

In most of the research papers, bus tracking is being implemented by using GPS. The advantage of using GPS is that it provides real-time tracking and instant status observation, remote-informing and updating related to the management of the status and travel of public transportation vehicles. In section 3.1, the information from the GPS module was passed on to the central server and presented to the user in the form of mini-computer based systems and digital monitors. These devices were installed at the bus stops and pro vide the commuter the status of the public transportation system and the arrival of the nearest vehicle to the related bus stop. Authors in this paper have also used GPS as their primary tracking technology . They have used two applications, one for the client and the other for the server. In section 3.4 with the help of GSM Module, GPS Module, and microcontroller the user can gain the data about the location of the bus by calling the number of SIM which is present in the tracking system. The call

will be disconnected after two rings and the user will receive an SMS, it will provide the longitude and the latitude of the exact location of the bus and the user can find the location of the bus by using google maps. Section 3.2 has proposed a system containing RFID TAGS, which contains the bus stop billboard display, the mobile application, and the control room application. It also contains bus simulator and a server. The bus simulator is useful in computing the current location and to send this information to the GPRS server. The server in this system plays a very important role and carries out functions such as to maintain the entire database of bus routes, calculate the ETA(Estimated Time of Arrival) based on the location data received by it. The advantage is that GPS works in all weather conditions so there is no need to worry of the climate as in other navigating devices.GPS receivers have become much more accurate over the last couple of years. GPS costs you very low in comparison other navigation systems.The most attractive feature of this system is its 100 percentage coverage on the planet.GPS-GSM based solution does not work in rural areas due to poor signal strength and network connectivity problems. Taking these issues into consideration section 3.5 has used WiFi technology to provide bus tracking. WiFi Routers are placed at bus terminals and WiFi modules are placed inside the buses. When the bus arrives at a certain bus stop, the WiFi module gets connected to the router and this information in the form of latitudes and longitudes is sent to the cloud which is then received by the user on an Android device. Artificial Neural Networks (ANN), MQTT (Message Queuing Telemetry Transport) protocol is used to give an accurate estimate of the arrival time (ETA) to the commuter by means of an application. In section 3.4 algorithms such as a statistical classifier algorithm for the estimation of bus arrival times along with GPS and Google Maps are used for navigation for real time tracking, bus route stops and other information available to the user after scanning the QR codes available at bus stops. For counting the number of people section 3.3 have made the use of Arduino Uno, Force sensitive sensor , potentiometer, data collection software module. The pressure sensors on the bus seats detect any weight above 20 kg and count it as a person occupying a seat. In section 3.3 have used Passive Infrared sensor . The sensors start detecting the people when the bus starts moving. All the sensors and GPS are interfaced externally with a gateway .

The proposed paper is the combination of all the above methodologies . Location tracking is done using GPS modules . Seat occupancy is measures using IR sensors .Passengers are able to get the information in real time using the website .Passengers are able to get the location and seat vacancy of the bus at an instant . All this helps to get a cost-efficient solution for a real time bus tracking and seat allocation system .

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