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Smart Public Transport System Using Android Application

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ABSTRACT: As population is growing, the traffic management issues and public transport service information awareness is the need for passengers to be updated about. Thus, we propose a GPS based Intelligent Public Transportation System which provides the solution to most of these issues bycombining existing technologies .This is a real-time system for tracking of public buses from any location at any time. With the use of mobile technology and IOT in this system, one need not wait for the bus to arrive for a long time. The user is made aware with precise information about the current location of nearest buses approaching the bus-stop, average travelling time, adaptive travelling time dynamically, real-time data on a mobile application. The passengers can get thedesirable bus information like waiting time to help them decide when to catch which bus. Here, technologies like GPS and Android app are used which can satisfy passengers who travel by the means of public transport.[1]

KEYWORDS: IoT, Android app, Real-time location tracking,, E--ticketing.

I. INTRODUCTION

Public transportation in today's world inurban places demands to increase rapidly due to thefactors like population growth, travel means andavailability. This requires designing a system that isaffordable, reliable and economical from the user'sperspective. Services are mostly run by governrnentowned transport companies.

This paper is toimplement a user-friendly application that facilitates the public transport of the cities for effective journey for the commuters; thus reducing their waiting time. It can also help the Transport Department to manage an efficient public transport system by tracking of buses and others factors to be considered for buses during its travelling time. Abundant applications have been developed in market today which gives the required details such as bus-routes, its timings, and prediction of arrival and departure time of different buses.

The paperpresented here aims to build an android applicationthat takes it to next level by facilitating thepassenger's details about the vacant seats, bus timings and the current location of any bus in a real time environment. The details would be madeaccessible to all the passengers using thisapplication anytime anywhere using the concept ofInternet of Things (IoT).

In existing system, waiting time is not provided and present conditions of buses as well as vacancy of seats are still not known. Thus, to overcome these vulnerabilities in the existing system, the system "Smart public Transport System Using Android Application" is being developed using IoT. [1].

II. RELATED WORK

In [2] authors used the sensor system having Global Positioning System (GPS), Near Field Communication (NFC), Temperature and Humidity sensors, which are always connected with the internet via a GSM network to track the location, commuter and ambience inside the bus. The monitoring system is used to extract the raw data from thesensors

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database, convert it in to a meaningful context, triggers some events with in the bus and provide information to the bus driver.In [3], authors have implemented an android application. Buses carry GPS devices to track their positions. By this positions to server are periodically updated. Client application displays map showing the position of bus. It shows where buses are on a map and provide students and staffs the updated information at different time interval using RTC.In [4], system includes GPS enabled Android Mobile as GPS Device, open source software and an easy-to-manage user interface via a web server with Google Maps. The system includes GPS/GPRS hardware for location acquisition and message transmission, GCM to transfer location information, and third party open source App Server to temporarily store location. The real-time tracking management system is composed of four components, a GPS Device, a server and a database, GCM & Client application. In [5], ITS implementation of bus service at Singapore is introduced which uses sensors, mobile and GPS and Cloud storage for actual real-time functionality of system.In [6], authorshave used GPS using android system. GSM modem, provided with a SIM card uses the same communicationprocess we are using in today's phone. Usage of Google APIs which sends the Vehicles current location based on its IP address is done. It introduces a real-time vehicle tracking system using a global positioning system(GPS) technology system to get the area of the vehicle. Trilateration is used to determine absolute or relative locations of points by measuring the distances

III. PROPOSED ALGORITHM

A. *Design Considerations:*

Hardware design components:

- Interfacing of Arduino Uno with ESP8266 Wi-Fi module so as to know about available Wi-Fi networks Using jumper cables and breadboard.
- Now connecting GPS module to the above so as to obtain location of moving bus.
- Also SD card is connected for keeping track of previously travelled paths and route-tracing.
- This system sends required real-time data to the android application 'E-SmartPMPML' and website created.
- Also source at which passenger wants to enter the bus is auto-generated.
- As system provides dynamic information data is refreshed after every 10 seconds .
- Bus-ticketing instead of using traditional devices we are using today, the ticket can be generated from the app itself if connected to printer that too wirelessly and a ticket copy is sent to user's mobile about the same as a backup if he/she loses his/her ticket.

B. *Description of the Proposed System::*

Aim of the proposed algorithm is to provide real-time location data of bus with arrival time to the users so as to reduce their waiting time for buses. The proposed system has 3 main functionalities.

Step 1: Tracking Bus location:

Real-time tracking of buses is done using GPS technology. Here, GPS is interfaced with Arduino and ESP8266 which in turn continuously tracks the GPS location after given fixed delay. This GPS data is sent to server which in turn updates the data to database and then provides response to the user on his/her mobile app. Thus , user is aware of bus location. This data of GPS in latitude longitude format .So it is maintained and stored in SD card which we are using to store the tracking of route travelled by the bus.And it can be displayed on Google Maps.So user comes to know about where the bus actually is. This facility is even provided on website.

Step 2: E-ticketing:

This module is generated to reduce paper wastage as well for a copy of ticket is provided to passenger on his app by the conductor. Conductor module is given the facility of printing e-ticket. The parameters here are User's mobile number, message and the necessary ticket details.

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Step 3:Wireless Ticket Printing module:

We have also designed a system where any Bluetooth printer can be connected to the conductor app and then conductor clicks print by entering necessary bus details.A user is given the hardcopy of the ticket directly through the app itself.

IV. PSEUDO CODE

Step 1: User can use either website or mobile app to get the real-time bus details.
Step 2: User gives source and destination as input and click submit.
Step 3: Required information about buses by clicking various facilities provided by app. They are:
- a) Bus's current location.
- b) Tracing of bus route.
- c) Ticket details.
- d) Waiting time for bus to arrive with their bus numbers prioritized according to time.

Step 4: Similarly, conductors can login into the conductor module using unique username and password.
They can do following changes:
- a) Update Bus details
- b) Print ticket wirelessly or generate e-ticket.

Step 5: Conductor logs out after operation is performed.
Step 6: End

V. SIMULATION RESULTS

The simulation results given below comprises of the actual GUI of mobile app where the user will be able to use it in Fig.1. This proposed module is implemented in Android. As mentioned all available functionalities which will be provided are organized in Grid like format. Proposed system is compared with the existing real-time user apps and gives all bus-details in proper organized manner unlike other apps creating confusion in user's minds. We considered the simulation for buses travelling to same destination but with different routes .In Fig 2.we have also provided user tracking their own location as well as Google map is embedded in our application enabling user to use Google maps as well with all its existing functionalities.

The GUI showed in Fig. 3 is of the hardware which we used in implementation of the system with proper connections as well as its output being connected to server through Wi-Fi. Also system searches for available Wi-Fi networks and gets connected to it automatically. In Fig 4, we have shown the e-ticketing module with running example for a sample ticket which will be printed and provided to the user and e-ticketing is achieved.

Given below are the implementation screenshots showing :

Fig 1. User's mobile app.
Fig 2. Find me.
Fig 3. Conductor module.
Fig 4. E-ticketing
Fig 5. Wireless ticketing.
Fig 6. Hardware implementation screeenshots.

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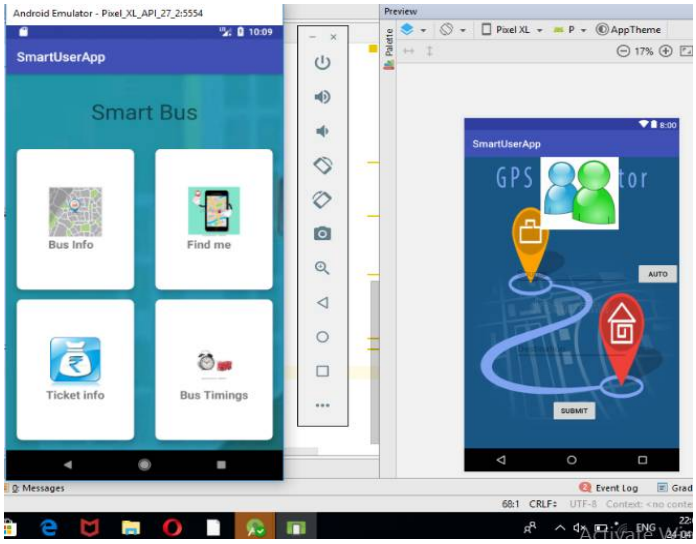

Fig 1. User's mobile app

Here, the above implemented mobile application is in Android which provides functionalities in the grid view.The userjust has to click on image. There are 4 services offered:
1.Bus info: Shows all required bus details like bus number, time, location, source, destination
2.Find me: Shows user's current location.
3.Ticket info: All the fare details like ticket price on basis of kms and age group are displayed.
4.Bus timings: All schedule bus timings like when buses are available are displayed.

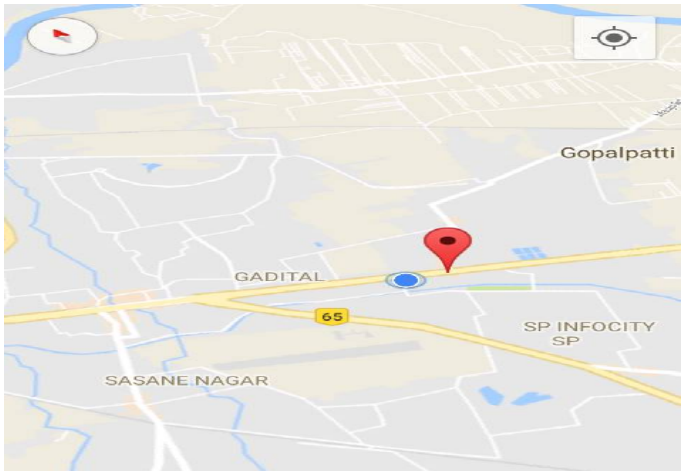

Fig 2. Find me

Fig 2 provides the users current location where it is. Red marker is the display symbol , Google maps is displayed with marker on it.

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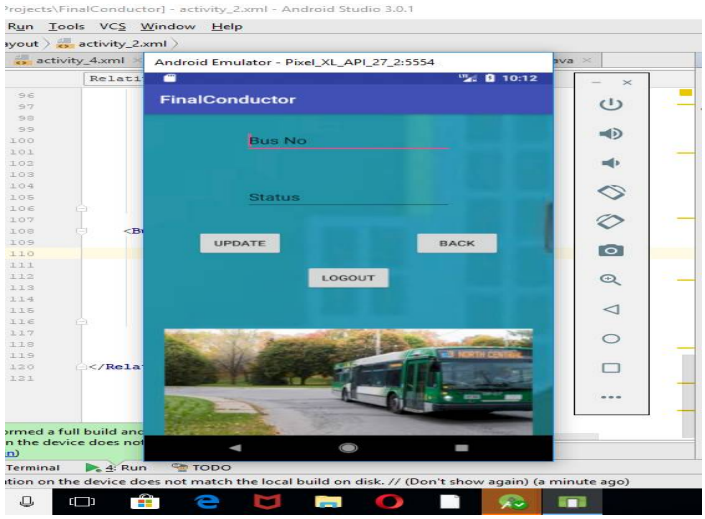

Fig 3.Conductor module

The above figure displays the conductor module where the conductor can perform various operations like update, add and delete bus details by logging in system using unique username and password.Here the conductor can also update the bus status if it is failed if in emergency bus status if it is failed in emergency conditions or has delayed.

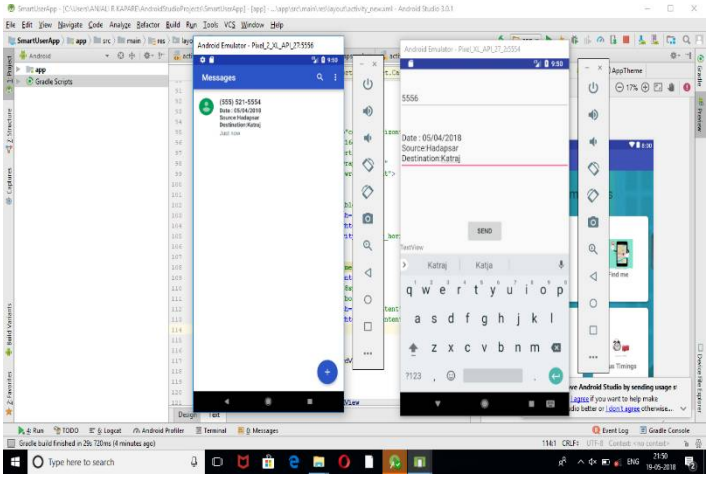

Fig 4:E-ticketing module

The conductor is given the facility of sending bus ticket in a soft copy format directly on the user's mobile. This is done so that the user can have a copy of the ticket incase his hard copy of a ticket is lost. The informationshown in e-ticket is: date, source, destination, ticket price .

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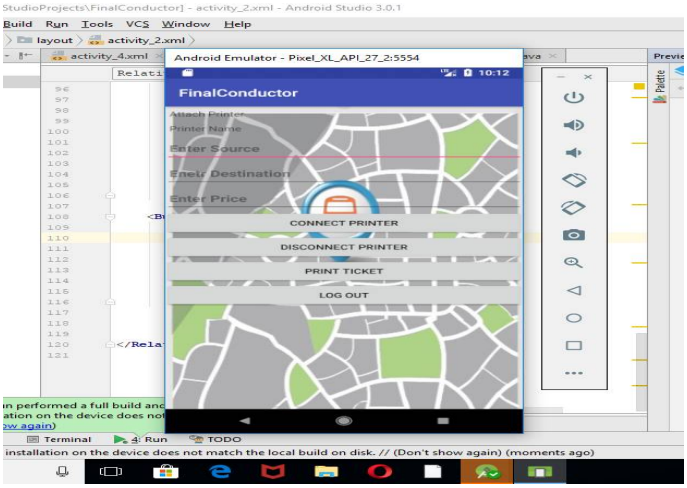

Fig 5.Wireless ticket printing module.

This module is directly interfaced with the conductor app module where the conductor wirelessly prints the hard copy of ticket using wirelessBluetooth printer.He/she just have to enter the source, destination, details and click and thus print is generated.

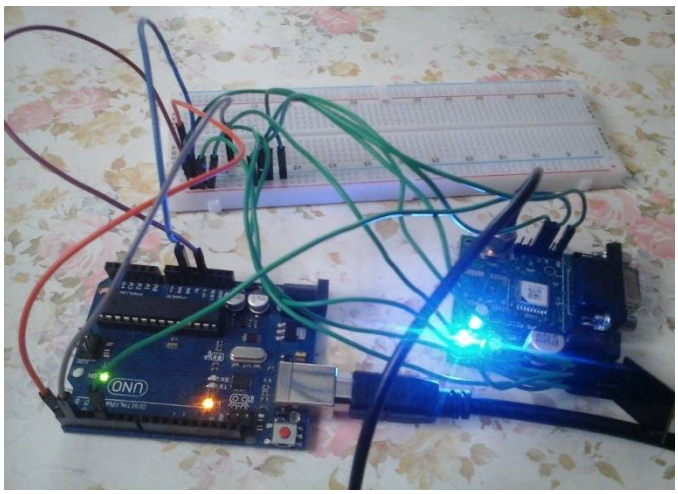

Fig 6.Hardware module

Hardware module consists of Arduino board , ESP8266, GPS Receiver module interfaced with each other using Jumper Wires. The Arduino is given power supply through USB or either we can use power bank with capacity above 1000mA.

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VI. CONCLUSION AND FUTURE WORK

The above results depicts the values of real-time location tracking and the proposed system produces much better results than other systems in an organized table format.. The proposed system is also a very user-friendly application. Minimum hardware components are used here so as to reduce complexity.

In future scope, this system can also be useful in the Travel management department of various commercial as well as educational organisations for the efficient management of pick-n-drop service for either students or employees. Also functionality of voice alert messaging of bus details if implemented further for the same system, it will be more useful and efficient.

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