Smart Local Transport Tracking System using IoT based technique

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Abstract: *Commuters in city often come across the situation whether to wait for the Municipal Transport bus or to hire cab/taxi or walk to reach the destination. Many people are often late to office because they wait for the bus instead of taking taxi or just simply walking. Decision of whether or not to wait at a Municipal Transport bus is easy if people had an simple real-time mode to see each Municipal Transport bus's location, commuters could make a more accurate decision. The Smart Local Transport Tracking System is a real-time announcement system that will help commuters. Commuters can make the correct decision of whether to wait for the Municipal Transport bus or to hire cab/taxi or walk to reach the destination. This system is a dynamic system. It is developed to display the real-time location/s of the Municipal Transport buses in Metro city at every Municipal Transport bus stop and Local Train / Metro stations. The same information can be shown in commuter's Smartphone using Google map and Android App. To see the real-time information of Municipal Transport buses commuters have to install Google map and specially designed Android App.*
Keywords: *IoT, Transport Tracking System, Smart Transport.*

I. Introduction

The Smart Local Transport Tracking System is designed to display the real-time location/s of the Municipal Transport buses and Local trains/Metro trains in city. The proposed system gets GPS data of the location/s i.e. Latitude and Longitude, and send this information it to control section. Control section send this information to the LED/LCD displays placed at every Municipal Transport bus stop. These displays show the current location and arrival time Municipal Transport buses. The same information is to be sent to Android app, which gives exact location on Google map and arrival time is displayed along with it.

II. Related Work

In a paper by Tareq Binjammaz, Ali Al-Bayatti, Ashwaq Al-Hargan [1], GPS receivers are used to provide vehicle position and velocity data. However, GPS cannot provide the high quality positioning information required by applications due to atmospheric effects, receiver measurement errors, and multipath errors. Gaurav Chheda, Niket Gajra, Manal Chhaya, Jitesh Deshpande, Saylee Gharge proposes in [2] enable the tracking device to obtain GPS data of the bus locations, which it will then transfer it to centralized control unit and depict it by activating LEDs in the approximate geographic positions of the buses on the route map. It will also transmit its bus numbers and route names continuously as soon as the bus comes within the range of the receiver at the stop all the information will be transmitted will be displayed on the LCD screen installed on the bus stop. The proposed system uses the latitude and longitude, same information is to be sent to Android app, which gives exact location on Google map and arrival time is displayed along with it.

III. Developed System

The Smart Local Transport Tracking System will employ many different sections, all working together to get GPS information, process the information and show the location on LCD screens and on Android App in Smartphone. It also give information about expected time of arrival of Local Transport bus/Local train/Metro. The Smart Local Transport Tracking System is divided into five sections:
a)   Transmitter section
b)   Receiver section
c)   Control section
d)   Software section
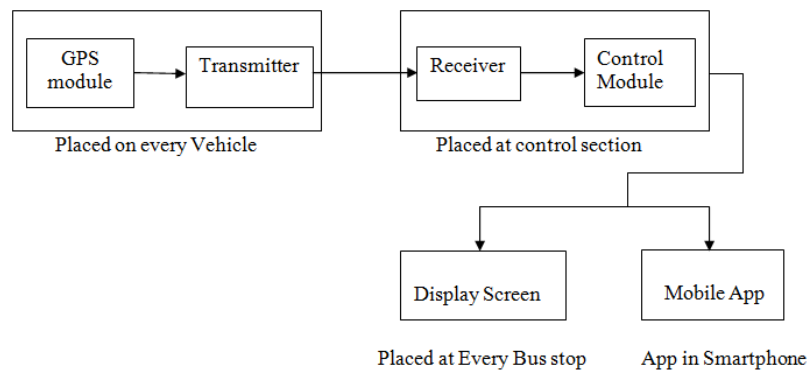e)   Power supply section

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Figure 1. Block diagram of Smart Local Transport Tracking System

The system will consist of a transmitter module installed on every Municipal Transport buses and receiver module installed on every Municipal Transport bus-stops. Transmitter module transmits the currents latitude and longitude of the Municipal Transport bus to the control section. Control section along with software section processes the data and sends this data to particular receiver module which is placed at every Municipal Transport bus-stops on route basis and on internet using GSM module, from where Android App in Smartphone of commuters gets updated. Android App in Smartphone gives exact location of the Municipal Transport bus on the route using Google map and expected time of arrival. Receiver module receives this signal, it sends this information using Arduino microcontroller system to the LCD displays which shows Municipal Transport bus numbers and expected time of arrival.

IV. Power Supply
Power supply section of The Smart Local Transport Tracking System typically required for the GPS and transmitter that is placed on local transport bus, sends the current GPS location to the receiver. Receiver and control module receives data periodically from GPS module and display screen to show the current location of buses/metros/local trains. The Transmitter and receiver sections are placed on the local transport bus and local transport bus-stop respectively, as both the Transmitter and receiver module are run on the Arduino micro-controllers requires power supply. Connecting an Arduino board directly to a battery, is a good option, but battery may drain after duration. In this system Solar panels with high capacity rechargeable batteries is used. To increase the voltage capacity a boost converter in the circuits is used.
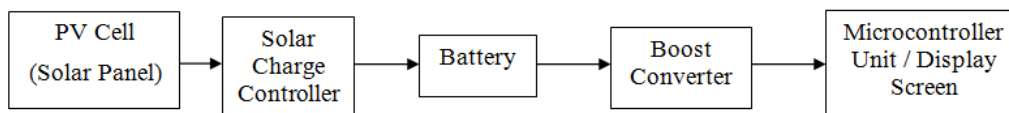

Figure 2. Power supply.

V. Transmitter Section
The first section of the Smart Local Transport Tracking System is a Transmitter section. It receives the GPS information through the GPS module (sim800) which is placed on Municipal Transport Buses. The GPS module (sim800) will acts as the communication link between system and the satellites. This information passed on to the Arduino microcontroller board, which has ATmega328/P microcontroller, which processes the GPS information, separates the latitude and the longitude coordinates of current location of the Municipal Transport Bus from the received string. These readings obtained will then be sent to control section using GSM module, which regularly transmit the Municipal Transport bus's current location information to the control section, which will then be further processed and send to the receiver module.
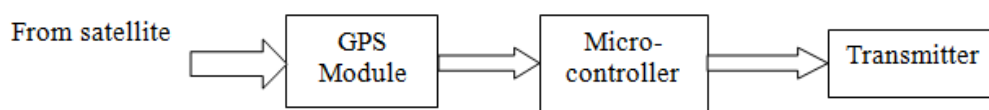

Figure 3. Transmitter Section

VI. Control Module

Upon receiving the information string from GSM module sent by transmitter, coordinates (Latitude and longitude) of current location of the Municipal Transport buses are separated by the control module along with the software module. These coordinates will then send to receiver's GSM module for further processing.
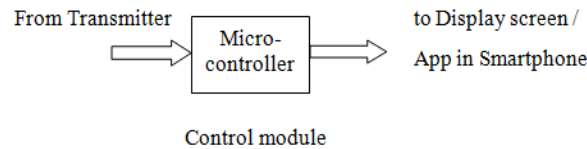

Figure 4. Control Section.

VII. Software Module

Software module is present in transmitter section, receiver section and control section. Arduino microcontroller present in transmitter section receives the information string of current location of municipal transport buses. A software section separates the coordinates (Latitude and Longitude) from it and sends to the control unit using GSM module. Control section is a database created on cloud, which periodically get updated. It sends information to the receiver section placed at every municipal transport bus stop on route basis. This information is helps to display information on LCD display. Control section using software sends this information on internet, which in turn Android App in Smartphone of commuters gives the information using Google Map

VIII. Receiver Section

The receiver section consist of GSM module which receives the current location (latitude and longitude) from control section, it sends this information using Arduino microcontroller system to the LCD displays LCD displays shows Municipal Transport bus numbers and expected time of arrival of each Municipal Transport bus.

IX. Display Section

Transport tracking system's display screen is placed at every bus stop and at every railway/metro station. This screen gives the information about Bus number, route number & expected time of arrival of next bus and Local train/Metro to destination & expected time of arrival. The main part of this proposed system is to create an App for Smartphone's. In this App user has to enter information about current location and destination. This App is connected to the server in control module. Based on information entered in App, software find the nearest bus stop and nearest Local train/Metro stations. This software also gives information about expected arrival of Bus/Local train/Metro on nearest bus stop/station. Software also gives the route to bus stop/station from your location on Google map.
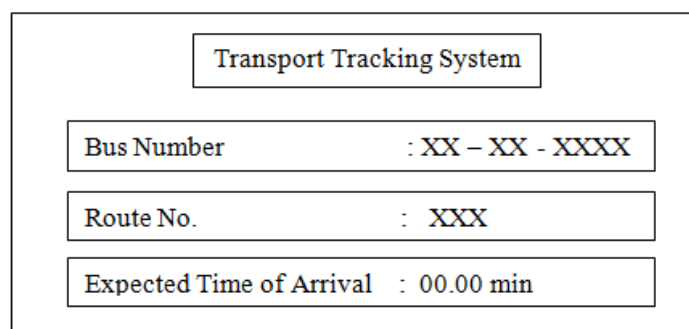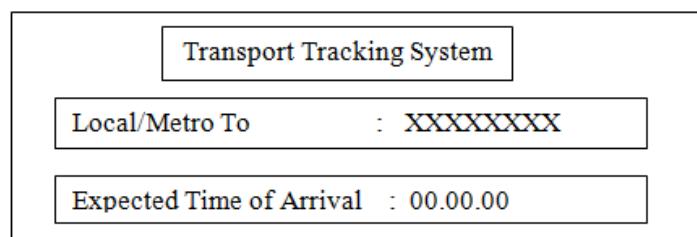

Figure 5. Display Screen placed at Every Bus Stop

Figure 6. Display Screen placed at Every Local/Metro Station

Figure 7. Display Screen of App in Smartphone

X. Conclusion

This paper, Study of IoT based Smart Local Transport Tracking System, gives the outline of Transport tracking system in city, where modes of transportation are different. The proposed system tries to give exact location of local transport vehicles on display screens and on android App using Google map. This helps commuters to reach their destination as early as possible by avoiding the wait time at bus stop or at stations.

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