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Smart Public Transportation System

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Abstract: This paper presents a smart solution to public transportation system which is an essential service and an inevitable factor that impacts the growth index of any country. The proposed smart system saves the precious time of the commuters as well as helps the service providers for economic operation of the transport system. This system is based on a combination of GPS, GSM/GPRS modem and ARDUINO ATMEGA328 microcontroller. The monitoring, supervising and control of the transportation process is hardware and software dependent. The system uses information technology and communication technology. The smart system provides the user with the arrival time and seat availability of the approaching bus. The functional components of the system are namely the bus module, bus stop module and base station (server module).

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I.INTRODUCTION

General public make use of the public transport service generally offered by governing bodies, due to the various advantages associated with this mode of transport. Public transportation is very much economical compared to private transportation such as taxis, cars etc. using own cars for every day transport is highly expensive when compared to public transport. The advantages of having own cars are: people can start and stop any time any-where, reaching out to places not slated in public transport, flexibility and saves time by not having to wait for the buses etc. However, the advantages of public transport overweigh the above mentioned advantages of having own cars. i.e. It offers advantages like far less fuel consumption, less risk factor, less traffic jams and large scale reduction in pollution due to carbon emissions which is the most sought issue of today by all nations which otherwise leads to global warming at an alarming pace and also which is increasingly making the metropolitan cities unfit for existence of life.

To speak of the other side of the discussion, public transport has some of the drawbacks such as unpredictable deviations in bus timing and unbearable discomfort due to overcrowding of the bus, which could be resolved by making it smart thanks to the latest advancement in the fields of communication and information technologies.

Considering these difficulties knowledge of bus information like arrival time at each bus stop and number of seats available can solve them to a large extent. Hence, an effective system that can provide valuable information is proposed in this paper. The proposed public transport system is designed to provide worthwhile bus data to passengers in which all the required information are gathered, processed and presented to them. This system also incorporates an accident sensor that passes the information from the bus at the accident spot to the police department for further action.

In this system, we have used three modules: bus module, base station module and bus stop module. Bus module is the one that is placed inside the bus. It has GPS (Global Positioning System) and GSM/GPRS modem. The current location and speed of the bus are received by this GPS and sent to the base station. Also the seat availability of the bus is found by using sensors in the bus module and it is sent to the base station simultaneously. These data are processed in the base station and valuable information is sent to the bus stop module.

II. LITERATURE SURVEY

In [1], Ajay Shingare et.al., .have presented the system that communicates through the android app the density measure, the nearest bus available on the route and all these system information of vehicle tracking and monitoring. The system also provides for the usage of rechargeable smart cards or cash transaction for issue of tickets in the bus.

The paper published by KJ jinesh et.al.,[6] have proposed a smart bus system that intimates the arrival time of the bus using the location data from GPS modem in which processing is done by VB.net. The information is sent as an SMS to users. Here, an alert message on over speed is also sent. A real time clock is used to find date and time. The upcoming bus stop is displayed in the bus after each stopping.

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A system that uses an accident detection algorithm by manipulating the vehicles speeds and its kinetic dynamism one second after application of brake has been presented in [3]. Further, the system also locates the bus using GPS which is in NMEA (National Marine Electronics Association) format that contains data separated by commas in order. The number of commas is used to identify the specific data like latitude and longitude.

In [7], SaedTarapiah et.al., have developed a system to intimate occurrence of accident on a route in advance through GSM/GPRS so that the bus can be diverted to other available routes, in addition to informing nearby hospitals about the accident. The system also provides an alarm sensor when the speed of the vehicle exceeds the pre-specified speed in the microcontroller.

III.PROPOSED SYSTEM

Our proposed model indicates the arrival time of the bus and the seat availability to the commuters. In existing systems, indication of arrival time and number of seat availability are done using ARM processor and PIC controller. In this paper, the use of ARDUINO UNO microcontroller for performing these tasks is presented. PIR sensors were used for passenger counting in the existing system, which have wide angle of detection and incorporate more error in detection. Also in the existing system, the next stop indicator is implemented using a switch and the driver presses it manually. In this system, it is implemented automatically by using the location of the bus and bus stop.

BLOCK DIAGRAM DESCRIPTION

Smart public transport system consists of three modules: Bus module, Base station module (server module) and Bus stop module. The prime components of the system are GSM/GPRS and GPS modem. GPS receives the location and GSM/GPRS module is used for transferring data between the modules.

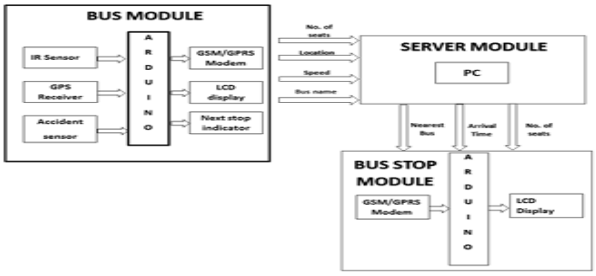

Fig.1. Block diagram of smart public transportation system

A.BUS MODULE

Bus module is placed inside every bus and it has GPS modem, GSM/GPRS modem, IR sensors, and accident sensor. All these are interfaced with ARDUINO UNO microcontroller. GPS modem receives the current location and speed of the bus. GPS location is specified by latitude and longitude. IR sensor is placed in the front and back doors of the bus. The front-door sensor is used to count passengers boarding the bus and back-door sensor is used to count passengers leaving the bus. IR sensor data is used to update the number of seats available in the bus. The exit and entry counts are reset at the end of every bus-stop duration. This information namely the bus name, location of the bus, speed and seats available are sent to the base station (server module) through GSM/GPRS modem for updation. Accident sensor senses the occurrence of accident and sends the location of the spot to the nearby police station through GSM/GPRS modem.

ALGORITHM

Step 1: Start.

Step 2: Initialize GSM/GPRS and GPS modem.

Step 3: Initialize available seats=total number of seats

Step 4: Read the entry-exit count of the passengers from IR sensor

Step 5: Calculate available seats = available seats – entry count + exit count.

Step 6: Read the GPS co-ordinates that specifies the current location of the bus.

Step7: Get the position of the approaching bus stop.

Step8: Compare the positions and when both match, the name of the next stop is displayed in the bus.

Step 7: Send bus name, latitude, longitude, speed and number of seats to the base station.

Step 8: Stop.

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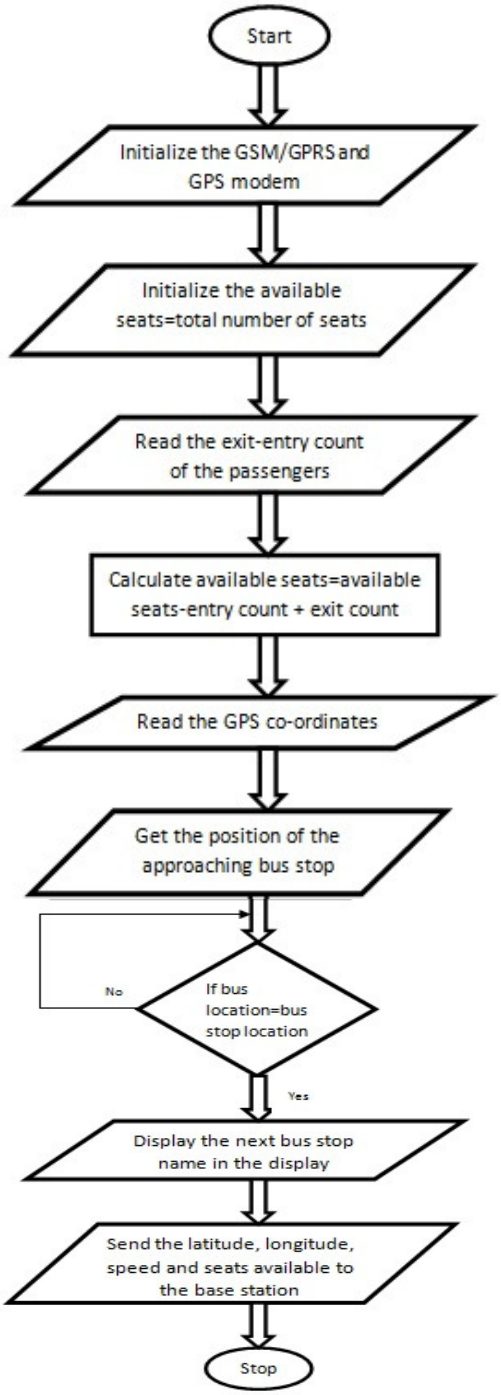
FLOW CHART



B.BASE STATION MODULE

This module is the central one in the system. This module consists of a personal computer with internet connectivity and with a dedicated database created into it. The current location of the bus i.e. the latitude and longitude are processed in pc computing the arrival time of the nearest bus is computed using Haversine formula. These data are updated in the web page. This web page data is communicable with the bus stop module. The location of the bus-stop is predetermined and stored in a database. The information from here are retrieved and displayed in the LED display are mounted at every bus stop.

ALGORITHM

Step 1: Start.

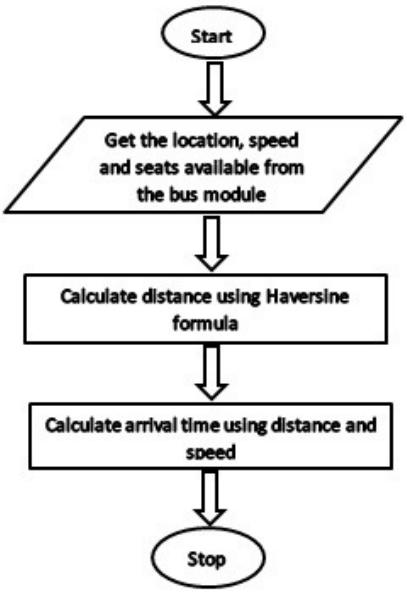
Step 2: Get the location, speed and available seats from the bus module.

Step 3: Calculate distance using Haversine formula.

Step 4: Calculate arrival time using distance and speed.

Step 5: Stop.

FLOW CHART



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C.BUS STOP MODULE:

This module consists of GSM/GPRS modem, LED display unit and ARDUINO UNO microcontroller. The arrival time and number of seats available are displayed at every bus stop. This information helps the passengers to know the time of arrival of the bus and how crowded it is. So that passengers can change the plan according to this information.

ALGORITHM

Step 1: Start.

Step 2: Initialize GSM/GPRS modem.

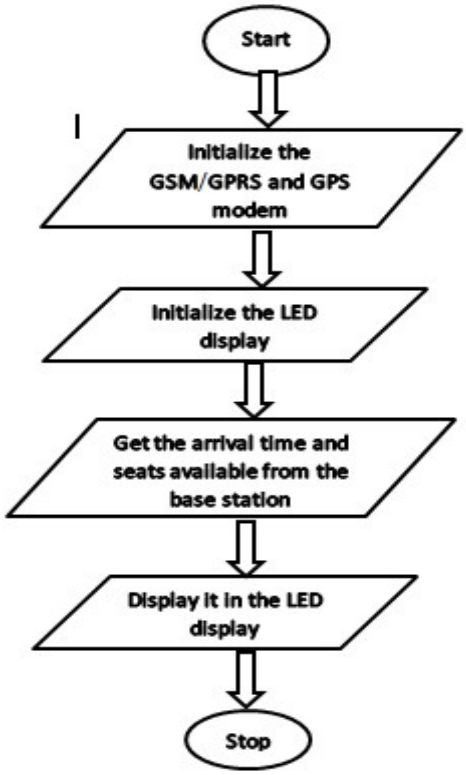
Step 3: Initialize LED display.

Step 4: Get the arrival time and available seats from website.

Step 5: Display it in the LED display.

Step 6: Stop.

FLOWCHART



IV.HARDWARE SPECIFICATION

Arduino Uno:

ARDUINO is open source hardware. It has both digital and analog input/output (I/O) pins which can be used to interface itself with various other boards and circuits. It also has serial communication interfaces (USB) which can be used for loading programs from personal computers. ARDUINO UNO also provides an integrated development environment (IDE). In this work ARDUINO ATMEGA 328 microcontroller is used. ARDUINO UNO has 14 digital input/output pins out of which 6 pins can be used as PWM outputs, 6 as analog inputs, 16MHZ ceramic resonator, a USB connection port, a power jack, an ICSP header and a reset button. It operates at a voltage of 5v and it has 32kb of flash memory of which 0.5kb is used as boot loader. ARDUINO UNO has only one serial port. For more than one serial communication, software serial library is used.

IR Sensor:

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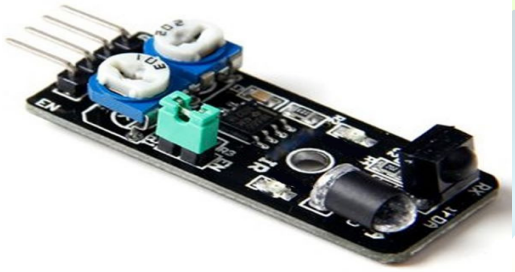
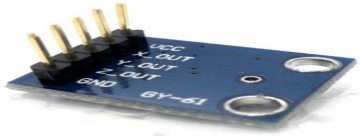
An infrared sensor is an electronic device. It has IR LED and IR photodiode. IR LED is an emitter which emits IR radiation. IR photodiode act as a detector. When this radiation falls on objects, it gets reflected back. The reflected radiation is received by IR photodiode. Depending upon the intensity of the radiation received its resistance and output voltage changes. If the surface of the obstacles is reflective in nature i.e. it is white, most of the radiation emitted by IR LED will get reflected back and reaches the photodiode. If the surface of the obstacles is black (non-reflective) in nature, It absorbs most of the radiation incident on it. So there is not much radiation reflected to photodiode. Depending on intensity of reflected light radiation IR sensor detects the objects. Hence, the passengers entering and exiting act as objects in the path of IR radiation wherein their incidence is detected by IR sensor.



Accelerometer:

Accelerometers are useful for sensing vibrations in system. Accelerometers are electromechanical devices that sense either static or dynamic forces of acceleration. Static forces include gravity, while dynamic forces can include vibrations and movement. Accelerometers can measure acceleration on one, two, or three axes. 3-axis units are becoming more common as the cost of development for them decreases. Most accelerometers are Micro-Electro-Mechanical Sensors (MEMS). The basic principle of operation behind the MEMS accelerometers the displacement of a small proof mass etched into the silicon surface of the integrated circuit and suspended by small beams. In this system, accelerometer ADXL335 is used to detect the occurrence of accident.



GPS Receiver Module:

A GPS receiver is a device that receives information from the GPS satellites and calculates the device's geographical position. It uses a global navigation satellite system made up of a network of 24 satellites placed into orbit by U.S Department of Defense. It works on the simple mathematical principle of trilateration. In our project GPS receiver is used to get the location and speed of the bus. Skylab SKG13BL ultra high sensitive and low power GPS receiver is proposed for this project. To calculate 2-D position, a GPS receiver must be locked on to the signal of at least 4 satellites. The GPS signal is applied to the antenna input of the module and it sends the position data in NMEA format. This string may contain many GPS parameters such as latitude, longitude, speed, time and so on.

GSM Module:

A GSM /GPRS module is a circuit that will be used to establish communication between a microcontroller and a GSM /GPRS system. It uses a SIM card just like mobile phones to activate communication with the network. GPRS is an integrated part of the GSM Network which provides an efficient way to transfer data with the same resources as GSM Network. Simcom SIM900A module is proposed for this system. It supports dual frequency 900/1800MHz and the modem can be controlled via a microcontroller through AT commands.

V.SOFTWARE REQUIREMENTS

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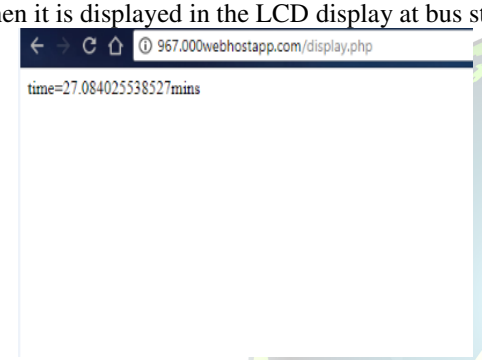
PHP:

PHP is a server scripting language, and a powerful tool for making dynamic and interactive web pages. It is a widely-used open source general-purpose language and can be embedded into HTML. It is extremely simple and offers many advanced features for a professional programmer. In our project, PHP is used for developing the server .It is the core part where all the linking and server actions are carried out.

VI. HARDWARE RESULTS

The arrival time is first updated in the website and then it is displayed in the LCD display at bus stop module.



VII.CONCLUSION

The proposed smart transport system has been implemented on a ARDUINO platform interfaced with GSM/GPRS modem and GPS modem. The software has been developed using PHP. Sending and receiving of arrival time and seat availability has been successfully implemented in the proposed system. Also the Accelerometer fitted in the system has been successfully implemented. The bus has been tested with accelerometer mounted on it and the report of the occurrence of the accident has been implemented. The next stop indicator was also implemented successfully to help the commuters. Thus it is proved that the proposed smart system offers better standard of living for common public by reducing the wastage of time of passengers and making it more convenient.

REFERENCES

[1] Ajay Shingare,Ankita Pendole,Nikita Chaudhari "GPS Supported City Bus Tracking & Smart Ticketing System",International Confernce on Green Computing and Internet of Things.

[2] Hind Abdalsalam Abdallah Dalallah "Design and implementation of an accurate real time GPS tracking system",Third International Conference on e-Technologies and Networks for Development 2014.

[3] Md.Syedul Amin,Jubayer Jalil,"Accident Detection and Reporting System using GPS,GPRS and GSM Technology",IEEE/OSA/IAPR International Conference on Informatics,Electronics & vision.

[4] Pham Hoang Dat,Micheal Drieberg,Nguyen Chi Cuong "Development of Vehicle Tracking System using GPS and GSM Modem.

[5] Reshma Rathod,S.T.Khot "Smart Assistance for Public Transport System", International conference on inventive computation technology 2016.

[6] Rose Mary John,Finky Francis,Joe Neelankavil "Smart Public Transport System", International Conference on Embedded Systems 2014.

[7] Saed Tarapiah " Applying web based GPS/GPRS ticketing and tracking mechanism to reduce traffic Violation in developing countries",. The international conference on digital information processing, e-business and cloud computing 2013.