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Design of Bus Tracking and Fuel Monitoring System

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ABSTRACT

The need for efficient public transportation system such as buses is rapidly increased due to the increasing in population, the students need to predict the arrival time of the bus and then plan their journey from their home. Fuel monitoring have been the major problem that most of bus companies looking to solve. Due to the rapid advancement in technology it had been designed and implemented almost in every vehicle nowadays. This system develops a bus tracking and monitoring the fuel to provide a facility for the management requirements by the administrator. This system based on Arduino, GSM/GPS by which we can predict arrival time in addition to graphically showing the bus location on Google map. The use of the fuel sensor in this system is to monitor the fuel level. The design also enables the owner of the buses to monitor the bus instantaneously because the system administrator can easily maintained database information of buses and its fuel tank at any time of the service. Our project is about to design and implement a cost effective and efficient bus tracking system in order to avoid bus passenger's unnecessary waiting in the bus stops and administrator could maintain the fuel more efficiently.

Keywords : GPS, GSM, Microcontroller, Sensor

I. INTRODUCTION

The challenges of successful fuel monitoring involve efficient and specific design, and a commitment to implementation of the monitoring project, from data collection to reporting and using results. Tracking uses GPS technology to identify, locate and maintain contact reports with one or more fleet vehicles. Implementing real-time vehicle tracking as part of a commercial company's mobile resource management policy is essential for comprehensive operational control driver security and fuel savings.

Rising fuel costs constantly challenge fleet operators to maintain movement of vehicles and monitor driver behavior to avoid delaying traffic conditions by either, reconfiguring routes or rescheduling timetables. This aims to minimizing time and distance. Fuel monitoring system help the administrator to know the exact amount of fuel content of the bus, so fuel theft could be avoided and administrator could maintain the fuel more efficiently.

The design and development of a bus tracking and fuel monitoring system can be used as real-time application. The system principally monitors vehicle moving and tracking such as position, speed and arrival time at a particular station. GPS is increasingly being used in vehicle tracking and monitoring services. To resolve the problems like traffic jams and fuel theft Iot processor based bus tracking and fuel monitoring is implemented as well providing information for the vehicle owner.The system has been designed for vehicle tracking and fuel monitoring will provide effective and real time

vehicle location using GPS and GSM and indicates fuel level using fuel level sensor. A GPS based vehicle tracking will inform where your vehicle is and where it has been and how long it has been. The system uses geographic positions and time information from the global Positioning Satellites.

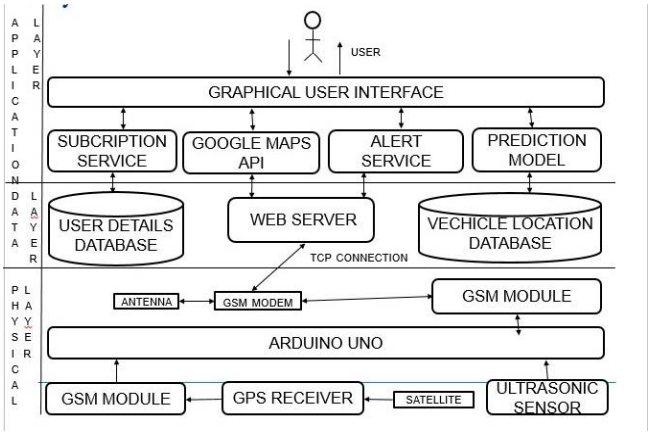
The system has on board which resides in the vehicle to be tracked and a Base Station that monitor data from the various vehicles. This project ability is accurately detecting the vehicle and monitors the fuel level in the tank. Our proposed system makes the user not wait for long time on bus stops they can get the location of required bus from the current location so that they could plan their departure accordingly. Furthermore, and administrator could ensure the fuel level.

II. IMPLEMENTATION

The project consist of a GPS receiver, GSM modem, ultrasonic sensor with a microcontroller. The whole system is attached to a bus. The GPS system will send the latitude and longitude to the GSM modem and ultrasonic sensor will send the fuel level to the GSM modem.

The SMS sent would come through the GSM service provider and then reach the bus, which is travelling, because the bus has a GSM device with a sim card. The GSM will receive the SMS and send to the microcontroller in the bus.

ARCHITECTURE DIAGRAM



Architecture diagram

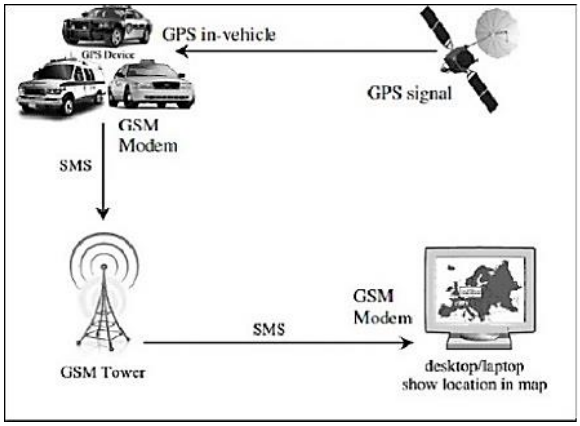
DIAGRAM DESCRIPTION

In the above architecture diagram, the bus is installed with the GPS tracking device and ultrasonic sensor which is enabled with the GSM/GPRS module. The GPS device obtains the spatial data from its nearest available satellites. It calculates the location with the nearest point from the bus position to the road position. The ultrasonic sensor obtains the fuel level present in the tank.

The location and the fuel level is then sent to the database server using GSM/GPRS module and ultrasonic sensor. The application server is linked with the database server that reads the location input from the database. Hence the location is displayed on the map using map server.

CONCEPT AND OVERVIEW

The bus tracking and fuel monitoring system takes input from GPS and send it through the GSM module to the desired mobile using mobile communication. The GPS is to find the location of the monitored or tracked bus and then uses the satellite or radio system to send the location data to monitoring centre.



TECHNOLOGY USED

A.GSM TECHNOLOGY

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.

B. GPS Technology:

GPS or Global Positioning System is a satellite navigation system that provides location and time information irrespective of climate conditions to the user. GPS provides continuous real time, 3D positioning, timing and navigation, worldwide. The GPS is a satellite-based navigation system consists of a network of 24 satellites located into orbit. To estimate 2D position and track movement a GPS receiver must be located on to the signal of maximum of three satellites. The user's 3D position (latitude, longitude and altitude) can be determined with four or more satellites. Once the vehicle position has been determined, the GPS unit can determine other information like time, distance to destination, speed and other.

SOFTWARE REQUIREMENTS

A.ARDUINO COMPILER:

The Arduino IDE is a cross-platform application written in java, and is derived from the IDE for the processing programming language and the wiring project. It is designed to introduce programming to artists and other new comers unfamiliar with software development. It includes code editor with feature such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. There is typically no need to edit make files or run programs on a command-line interface. Although building on command-line is possible if required with some third-party tools such an Ino.

The Arduino IDE comes with a C/C++ library called "Wiring" (from the project of the same name), which makes many common input/output operations much easier. Arduino programs are written in C/C++.

B. GOOGLE MAPS

Google maps is a desktop and mobile web mapping service application and technology provided by Google, offering satellite imagery, street maps, and Street View perspectives, as well as functions such as a route planner for travelling by foot, car, bicycle (beta set), or with public transportation. Also supported are maps embedded on third-party websites via the Google Maps API, and a locator for urban businesses and other organizations in numerous countries around the world. Google Maps satellite images are not updated in real time, however, Google adds data to their Primary Database on a regular basis. Google Earth support states that most of the images are no more than 3 years old.

HARDWARE REQUIREMENTS

For designing this hardware many types of devices are used to make it perfectly working. All the devices are purchased from different manufacturers. These components are soldered on a soldering board. The following list of hardware are required for this system.

- Power Supply
- Arduino Microcontroller
- GPS technology
- GSM module
- LCD display
- Ultrasonic sensor

A. POWER SUPPLY:

It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

B. ARDUINO MICROCONTROLLER:

The Arduino Atmega328 is a microcontroller board based on the Arduino Uno .It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a power jack, a 16 MHz quartz crystal, a USB socket, an ICSP header and a reset button. It possess everything needed to support the microcontroller, just it has to be connected to a computer with a USB cable or it can be powered with an AC-to-DC adapter or battery to get started. The reasons of using the Arduino board which comes with ATmega328 is for easy interfacing with the GPS and GSM module and for easy programming (in embedded C) of the microcontroller. The Arduino boards come with a library for interfacing with module and for dealing with analog or digital inputs and outputs.

C. ULTRASONIC SENSOR

The Fuel sensor is used to monitor the fuel content and fuel tank. Fuel sensor consists of sending unit, variable resistor. The sending unit is located in the fuel tank of the car. It consists of a float, connected to a thin, metal rod. The end of the rod is mounted to a variable resistor. The more resistance there is, the less current will flow. In a fuel tank, the other end of variable resistor is connected to the ground. When the float is near the top of the tank, the wiper on the variable resistor rests close to the grounded (negative) side, which means that the resistance is small and a relatively large amount of current passes through the sending unit back to the fuel gauge. As the level in the tank drops, the float sinks, the wiper moves, the resistance increases and the amount of current sent back to the gauge decreases.

D. LIQUID CRYSTAL DISPLAY (16X2):

A Liquid-Crystal Display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCD are available to display the arbitrary images (as in a general purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7 segment displays as in a digital clock.

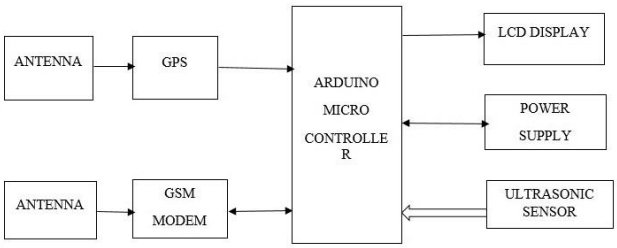
They use same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. LCD are used in a wide range of applications including computer monitors, televisions, computer monitors, Instrumental panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators and telephones, and have replaced cathode ray tube displays in most of the applications.

III. LITERATURE SURVEY

In the recent past, there have been many technological developments in order to provide better security for the vehicles. Few of the technologies provide security in the form of locking system. The manufacturers of the vehicles also are striving for providence of better systems for the

vehicle's security and protecting it from theft. Recently, there has been implementation of the central locking system and also theft detection system. But this method had the drawback that it alerts even the local user. This paper narrates providing the security systems using the GPS and GSM. The vehicle tracking system has been implemented to track the current location of the vehicle. The details of the current position can be sent through the GSM. There are certain systems like remote monitoring system which provides the details of the vehicle's position through an SMS. In the present system, not only the tracking of the vehicle's location is discussed but transfer of the information to the owner's mobile is implemented if the vehicle is subjected to theft. Not only this, in this, monitoring the status of the engine of the vehicle is also discussed by providing a thermistor for continuous monitoring of the temperature. This method also has a feature of automatically slowing down the speed of the vehicle when few particular zones like schools and hospitals etc., which are detected by GPS are approaching along with the voice message output.

IV. PROPOSED SYSTEM



DESCRIPTION

In this project it is proposed to design an embedded system which is used for tracking the bus and monitoring the fuel level by using GPS(Global Positioning System),GSM(Global System for Mobile communication),ultrasonic sensor.

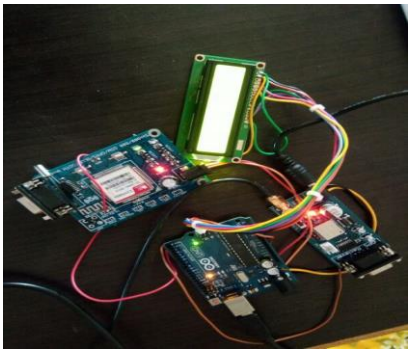
In this project Arduino microcontroller is used for interfacing various hardware peripherals. This project will continuously monitor the bus location and fuel level and report the status of the bus on demand.
For doing so, the Arduino microcontroller is serially interfaced with the GSM modem and GPS receiver. A GSM modem is used to send the position (Latitude and Longitude) and the fuel level of the bus. The GPS modem and ultrasonic sensor continuously give the data i.e. the latitude and longitude indicating the position of the bus and fuel level of the bus.

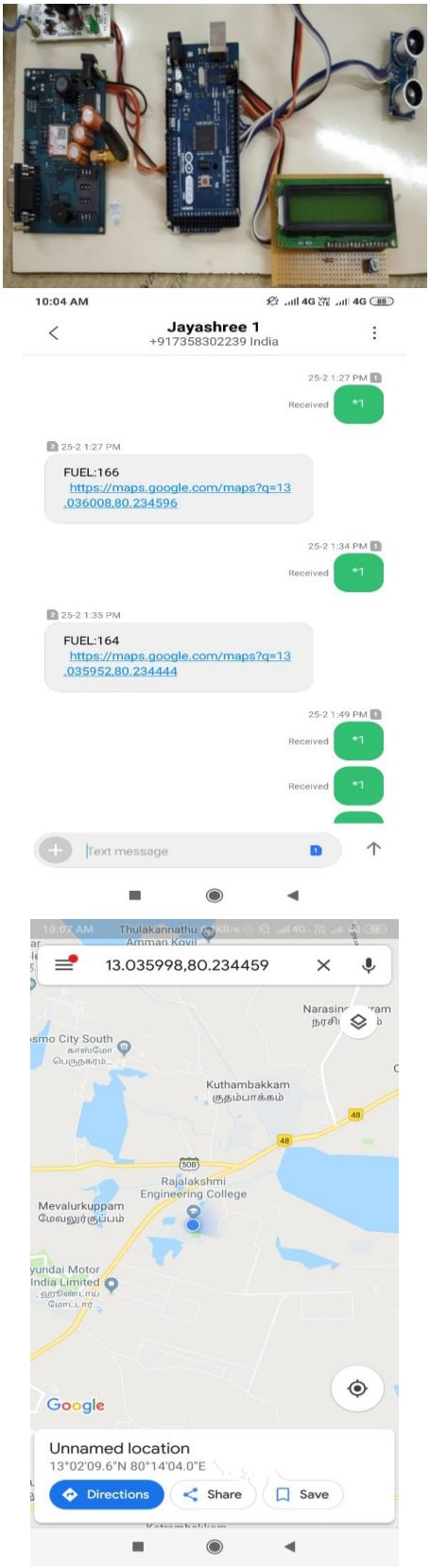
The hardware interfaces to microcontroller are LCD, GSM modem, GPS Receiver and ultrasonic sensor. The ultrasonic sensor is used to indicate the fuel level of the bus.

When a request by user is sent to the number to the modem, the system automatically sends a reply to that particular mobile indicating the position of the vehicle in terms of latitude and longitude and the level of fuel present in the tank. A program has been developed which is used to locate the exact position of the bus and also to navigated track of the moving bus on Google map.

V. RESULTS

These are the outputs which are observed for our project while under working.





The project titled "Design of bus tracking and fuel monitoring system" is a model which contains two modules one is bus tracking unit and another one is fuel monitoring unit. The bus tracking module is done with the help of gps receivers and GSM modem. The fuel monitoring module is done with the help of ultrasonic sensor. Bus Tracking System and fuel monitoring system resulted in improving overall productivity with better fleet management that in turn offers better return on your investments. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

We have completed the project as per the requirements of our project. Finally the aim of the project i.e. to trace the vehicle is successfully achieved.

VI. FUTURE SCOPE

- We can use the EEPROM to store the previous Navigating positions up to 256 locations and we can navigate up to N number of locations by increasing its memory.
- We can reduce the size of the kit by using GPS+GSM on the same module.
- We can increase the accuracy up to 3m by increasing the cost of the GPS Receivers.
- We can use our kit for detection of bomb by connecting to the bomb detector.
- With the help of high sensitivity vibration sensors we can detect the accident.
- Whenever vehicle unexpectedly had an accident on the road with help of vibration sensor we can detect the accident and we can send the location to the owner, hospital and police.
- We can use our kit to assist the traffic. By keeping the kits in the entire vehicles and by knowing the locations of all the vehicles.

- If anybody steals our car we can easily find our car around the globe.

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