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## Real-time tracking of water tanker using GPS, GSM, and Arduino

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### ABSTRACT

Vehicle tracking system is a well-established technology in this era which is used by fleet system and owner of vehicle all over the world. It is a very safe and reliable technology. In this paper a real time tracking system is proposed. It is going to design a system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global System for Mobile Communication (GSM). The design is an embedded application, which will continuously monitor a moving vehicle and report the status of vehicle on demand. Tracking device used in real time vehicle location tracking is made up with Arduino Mega, SIM800A module and GPS module. For doing so the Arduino Mega is interfaced serially to a GSM module and GPS module. The GSM module is used to continuously send the position of the vehicle from remote place. The GPS module that uses satellite technology for its navigation system will continuously give data like longitude, latitude, time, direction of travel etc. Google map is used to view the position of vehicle on a digital mapping. This proposal has significant application for vehicle security, salesman tracking and private drivers.

**Keywords**— Vehicle Tracking, Water Level Indicator

### 1. INTRODUCTION

With advancements in technology, there has been an increase in the usage of vehicle tracking systems. The design of vehicle tracking systems enable the display of a vehicle's position on Google Maps. The GPS, GSM modules controlled by Arduino MEGA are placed inside the vehicle. In this way, the vehicle position is updated every 40 seconds as the vehicle is moving. Vehicle tracking systems are very useful nowadays. This system enables the owner to observe and track the vehicle and find out about vehicle movement and past activities of automobile. This technology popularly called real time Vehicle Tracking Systems

has proved useful in ensuring the security of vehicles. This hardware is fitted onto the vehicle in such a manner that persons who are in or outside of the vehicle cannot see it. Thus, it is used as a covert unit which continuously, or as a result of interruptions to the system, sends location data to the monitoring unit. When a vehicle is stolen, the location data from the tracking system can be used to find the location and so inform the police for further action. When users make a request, the GPS coordinates of the vehicle are sent to a specified mobile. The user will be provided with the position of the vehicle in terms of latitude, longitude, time along with the direction of travel which can be viewed using Google Maps. This service is typically provided at a low cost. This information is available to authorized users of the system via internet websites that will be designed by us.

Different users can access the website and track the respective tanker to know its location.

### 2. RELATED WORK

The hardware and software of the GPS and GSM network have already been developed. The proposed GPS/GSM based System has two parts. The first is a mobile unit and the second is a controlling station. All system processes including the various interfaces for transmission of data have worked successfully. These results are compatible with current GPS technologies. A Vehicle Tracking System is a device that is fitted in a vehicle, to enable the vehicle owner to identify the vehicle's location. This paper proposes the design of a vehicle tracking system that utilizes GPS and GSM technology. This system built based on an embedded system, can be used for tracking and any car through GPS - Global Positioning System and GSM - Global System for Mobile Communication. This design will continuously monitor the location of a moving vehicle and report the status of the vehicle on demand.

A water level indicator system will be installed in the water-tanker to continuously monitor the level of water inside the tanker. A water Level indicator system is a type of system that indicates information about the level of water in the water body or container. It will indicate that whether the level of water is high or low.

Different levels of water will be considered inside the taker. A threshold level of water will be decided. If the level of water goes below this threshold level, then it will be considered the level of water is low. The output of this indicator system will be given to the driver of the respective tanker as well as to the authorised person in-charge to monitor the activities of water tanker.

A remote monitoring system based on SMS and GSM will be implemented through which the level of water will be sent to the driver or the authorised person. There are lot of advantages of this system. The main advantage is that it will indicate the driver in real time when the level of water goes below certain level thus the driver of the vehicle can take required actions in order the stop the wastage of water. One more advantage is that no manual observation is required to monitor the level of water. The authorised person and the driver can check the level of water with minimal effort. The level of water will be delivered via SMS along with the coordinates to mobile devices. Thus, by just checking the messages, the level will be monitored. It will ensure driver of water tanker takes required steps, for example reducing speed of the vehicle or checking if there is a leakage in the tanker etc and preventing the wastage of water.

Other advantages of water level indication system are that this system is very effective and easy to install. Its implementation is not complex and can be made with very less cost. This system also requires very little maintenance (once in three years). Also, this system is perfect for continuous operations and it consumes very less energy. Thus, making it ideal for any type of water tank.

**3. OVERALL PROPOSED METHOD**

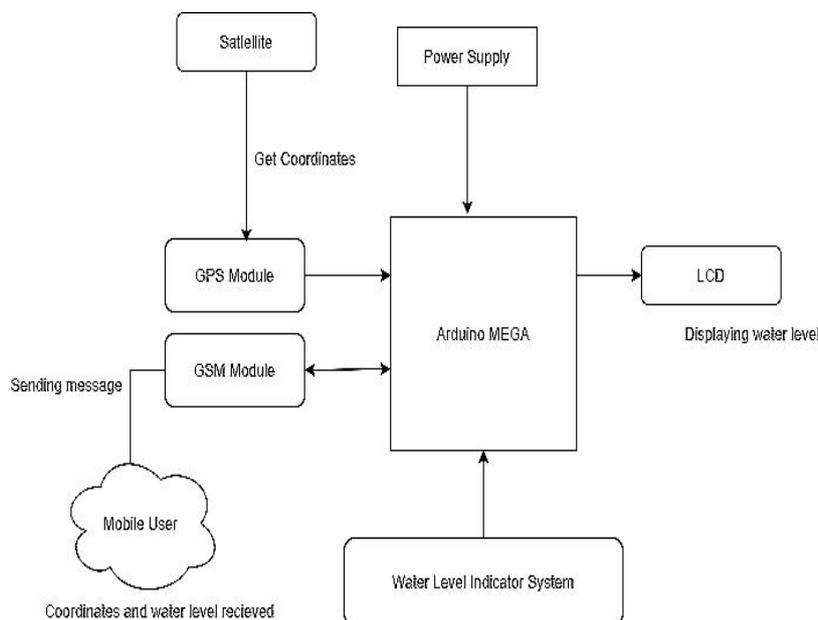
This paper proposes a vehicle tracking system for tracking vehicle theft using GPS and GSM technology. The GPS receiver and GSM modem utilizes Arduino MEGA2560. The system is affixed to the vehicle. A GSM mobile phone can be used to send

and receive the information. Therefore, the GPS system will send the longitudinal and latitudinal values corresponding to the position of vehicle to the GSM Modem. GSM Module gives various strings formats in output out of which we will only use & GPGGA string format. This format will be extracted using programming in Arduino MEGA If for example, an individual forgets where their vehicle is parked, an SMS can be sent to the vehicle GPS, The SMS sent would be transmitted through the GSM service provider, thereby reaching the vehicle. The vehicle will have a GSM device installed, which includes a SIM card. Through the GMS modem, the SMS will be received and sent to the Arduino MEGA2560 in the vehicle. Upon receipt of the message, the Arduino MEGA2560 checks the password and the request. If everything matches then it will perform the request required by the owner by sending a link that has longitude & latitude through Google Maps, showing the location of the vehicle.

Another system that will be installed is water level indicator system. The system will be implemented using Arduino MEGA programming codes. It will be also affixed with vehicle. Thus, the level of water will be continuously monitored and prevent it from getting stolen and preventing it. There will be total of 16 levels of water. Each level will be connected to Arduino with the help of wires. These wires will be immersed in water. Each location of wire will correspond to certain level that will be displayed in terms of percentage.

As the level of water will decrease, wires placed from top will start to come out of water inside the tanker. Thus, the wires still immersed in water will be shown and corresponding level will be displayed. The topmost wire (level 16) will correspond to 100% water level inside the tanker. Next level (level 15) will correspond to 93.75% of water level and so on. This system will help us to determine the level of water in the tanker and thus can help us to take various measures to prevent the water from being wasted.

There are several reasons due to which water is wasted. Main reason is over speeding of vehicle. The level of water in the tanker will also be notified to the driver. If the level falls to great extent, the driver can take certain measures to prevent the wastage of water. Also, the user the monitor the same and inform the driver to drive slowly and carefully.



**Fig. 1: Architecture of the system**

#### 4. CIRCUIT DESCRIPTION

##### 4.1. Interfacing GPS with Arduino

The programming language is written as the simplest form so that it is nothing to have any problem to understand. In programming for GPS module include libraries and defines software serial communication. The setup function for the GPS module is declared the Tx and Rx pin of the GPS module is input by using Serial.begin and also declared ss.begin to show the result on the serial monitor Serial.begin(9600).Tx and Rx of GPS module will be connected to pin 17(TX) and 16(RX)of Arduino mega respectively. Output of GPS that we will get on serial monitor contains various string format. We will extract \$GPGGA string format. \$GPGGA string gathers various data ,example 134658.00,5106.9792 ,N, 11402.3003, W,2,09,1.0,1048.47,M,-16.27,M, 08, AAAA\*60.We will extract values of – Latitude , Longitude and Time. These values will be used to determine the location

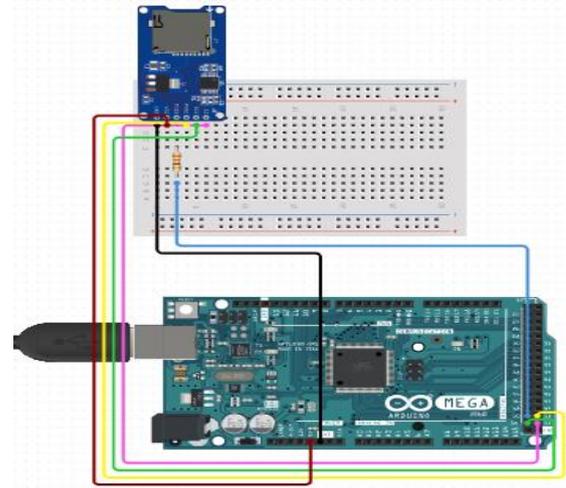


Fig. 3: Interfacing GSM with Arduino

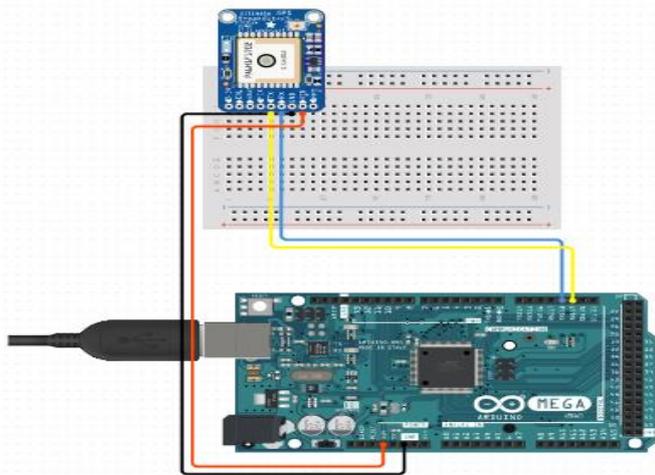


Fig. 2: Interface of GPS with Arduino

##### 4.2. Implementation of water level indicator

The water level indicator uses simple mechanism to detect water level. A constant 0v electrical level i.e. Ground is placed at the base of the water tanker from the Arduino.

The tanker uses 16 types of connections to indicate the water levels into it. The liquid crystal display is connected to analog pins no. 23,25,27, 29, 31 ,33,35,37,39,41,43 of Arduino. Output of all the 16 levels are not only shown in liquid crystal display but also indicated on the serial monitor.

##### 4.3. Interfacing of GSM with Arduino

In programming for GSM module include libraries and define software serial communication. Software serial library is used to allow serial communication on pin 19 and 18. In the name my serial and pass the digital pin numbers as parameters. The actual format is like software serial my serial (Rx, Tx). It gets to the configuration part of program inside setup. The first task is to set baud rates of software serial library to communicate with GSM module. GSM Tx and Rx pin will be connected to pin 16(Rx) and 17(Tx) of Arduino mega Sim placed inside GSM module which will send and receive message. GSM will be configured to send message using AT commands. "AT+CMGF" will set GSM module in the message mode. after that "AT+CMGS" will set GSM to send message to particular number. And thus, message will be sent. Then using data from GPS, URL will be formed. URL is sent via text message which opens in Google Maps. Water level is also sent along the URL. Information is gathered after regular interval of time and corresponding message is send to specified user.

#### 5. FLOW CHART

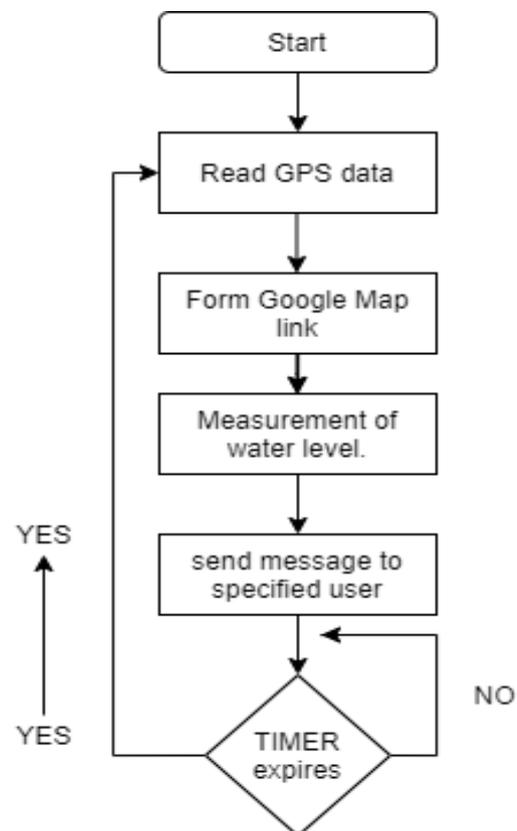


Fig. 4: Flow chart

#### 6. RESULTS

In this paper, GSM is used to send and receive message. The message will contain a URL link that will open of google maps. As soon as the user clicks on the URL link in the message, location of vehicle will be tracked. Along with the location, level of water in the tanker will also be displayed. Hence the user can know what is amount of water in the tanker. The system starts by sending "HEY THERE" message followed by a message "SYSTEM STARTED" After this, the final message will contain the URL as well as water level information. The LCD attached to the proposed system will also display the water level of indicator. The system will give output after certain duration of time that will be specified by the programmer. The time interval will be implemented using counter in the codes. Once a message in sent, system will wait for the counter to expire. As soon as the counter expires after one interval. Again, message will be sent to user mobile.

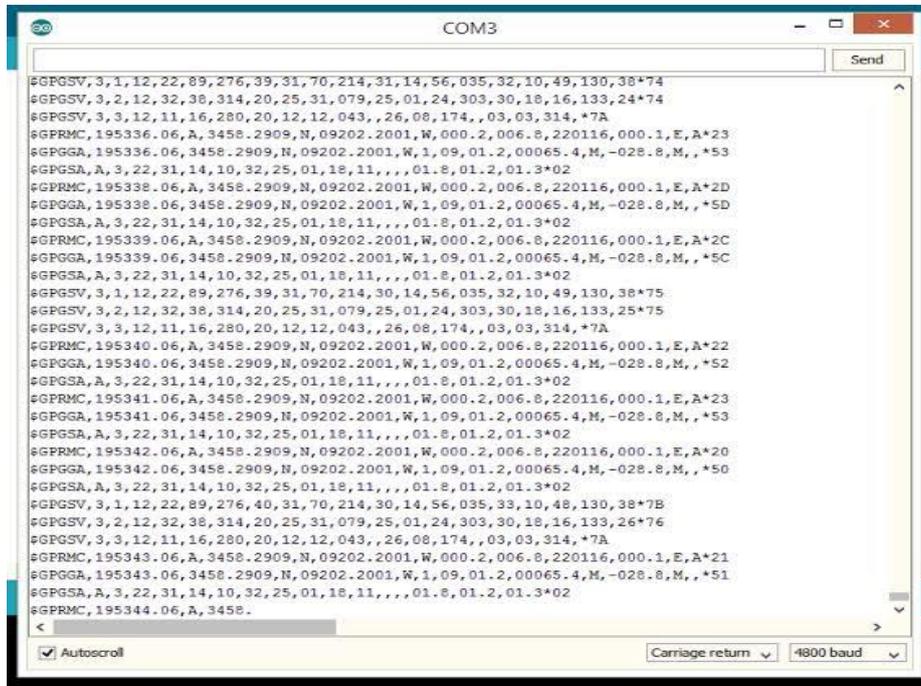


Fig. 5: Output of GPS

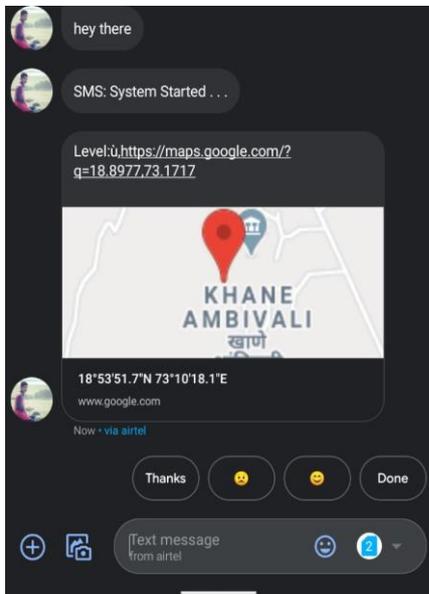


Fig. 6: Message sent to GSM via mobile

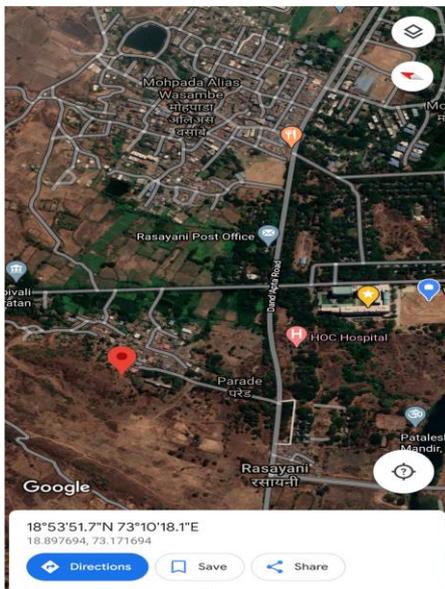


Fig. 7: Location on Google Maps

## 6. 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.
- 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.

## 7. CONCLUSION

Tracking system is nowadays the most important system for the person, they want their car security in efficient hands this is the main reason. So, the vehicle tracking system are getting popular day by day not only in metropolitan areas but also in small cities. This system is completely integrated and it becomes possible to the user to track their car very easily at any time and from anywhere. As the vehicle theft is increasing day by day but due to this people wasn't avoid buying vehicles but they found an efficient way to keep an eye on their vehicle without being very close to them. These systems keep a good control on the thefts and help avoiding them to some extent. Basically, in all these systems the GPS and GSM are used to track the vehicle. Using this system, the user determines the position of the vehicle, and the instance completed by it. The user is able to access the position of their vehicle at any instant of time. This system is reliable any very secure. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient. GSM module used in this paper to send and receive SMS. GSM module can support 2G, 3G and 4G but only 2G can supported in our country. Water level indication will help to monitor the level of water inside tanker. It will help us to prevent the wastage of water.

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