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Fuel Monitoring, Vehicle Tracking and Security System Using Arduino Mega

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Abstract: ***In present world many people's having their own Vehicles. Fuel is essential to run vehicle. The main aim of this paper is monitor fuel in vehicles and provides security to the vehicles. Vehicle tracking and accident alert system also implemented in this design. This system contains GSM module, GPS,IR sensor, Ultra Sonic sensor, Vibrate sensor, Fuel flow sensor, Arduino Mega, Motor and keypad. Fuel flow sensor is used to detect the amount fuel filling at petrol bunk and it will display filled amount of fuel on LCD. Ultrasonic sensor is used to measure fuel level in vehicle. GSM is used to send messages about fuel levels, vehicle location, security password and accident alerts. Whenever ignition will be ON, one time password (OTP) will be send to registered mobile number. After entered correct OTP using keypad, then only vehicle will starts. If anyone entered wrong password it will give an alarm. Vibration sensor is used to detect accidents to the particular vehicle. Whenever accident happens to particular vehicle it will send an alert message to the concerned persons about current location of the vehicle. Such that we can save many lives of peoples by intimating to the surrounding hospitals and higher authorities in proper time. In this design Arduino Mega is used as a controller***

Keywords: GSM, GPS, OTP, Fuel Flow Sensor, Vibration sensor

1. INTRODUCTION

Now a day's all fuel bunks using digital displays in order to display the value of fuel adding to the vehicle. But we don't know whether they adding accurate value or not. In present days many of petrol bunks are manipulating their meter readings, such that it displays the amount or volume as entered by the operator but the total volume of fuel filled in the consumer's tank is lesser than the exhibited value. The pumps are tampered or manipulated for the petrol bunk owner profits. Due to these tampering huge profits for the petrol bunk owners and also same time the customers are embittered. Many vehicles have analog fuel meters hence not possible to precisely know the amount of fuel currently filled in the vehicle and also not possible to cross check the quantity of fuel filled at the petrol bunk. In this design we focuses on creating

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a digital display of the exact amount of fuel flowing into the vehicles tank[1].so that it helps in cross checking the quantity of fuel filled at the petrol bunk. It sends a message to the owner about of petrol bunk location and amount of fuel filled in the tank using GSM module. To track the location GPS is used. Ultrasonic sensor is used to measure fuel level in the tank.
Now a days security is of major factor. Instead of finding solution human searching for alternative way which can provide a full-fledged security. In the pervasive network society peoples are also facing problems with the risk that others can easily access the same data from anywhere. In present scenario there is no safety to vehicles since all vehicles are not manufactured with inbuilt antitheft systems. In this design to start vehicle user must enter one time password (OTP) using keypad which is fixed in vehicle. If anyone enter wrong password it will give an alarm. If any accident happened to vehicle immediately message will be sent to registered mobile number. Vibration sensor is used to detect accidents to concern vehicle.

Proposed System

The below figure 1 shows proposed system of Fuel Monitoring, Vehicle Tracking and security system Using Arduino Mega.This system contains GSM module, GPS, IR sensor, Ultra Sonic sensor, Vibrate sensor, Fuel flow sensor, Arduino Mega, Motor, keypad and LCD.

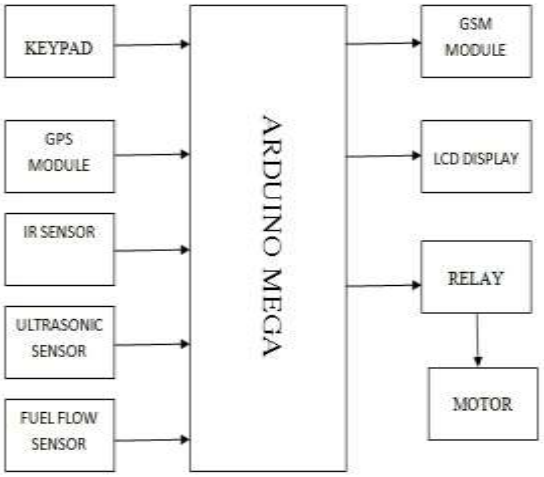


Fig 1: Block diagram of proposed system

Working**:**

In this project we designed a digital display of the exact amount of fuel flowing into the vehicles tank so that it helps in cross checking the quantity of fuel filled at the petrol bunk.When the fuel tank key is opened SMS will be sent to the vehicle owner indicating the amount of fuel present in the tank.When the fuel tank key is closed once again an SMS will be sent to the vehicle owner indicating the amount of fuel filled at the fuel filling station and location of the fuel station.The level of fuel in the fuel in the tank will be continuously displaying on lcddisplay. where as while filling the fuel at fuel filling station it will be continuously displays fuel flow rate.Everyone wants to be as secure as to be possible. Hence

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it provide password based vehicle access control system to avoid vehicle theft.Once the password entered correct only the vehicle ignition will start.Vibration sensor is fixed to the vehicle.If any accident happens to the vehicle accident alert message will be sent to the respective numbers.

Arduino Mega:
Arduino Mega is a one of the low-cost high-performance microcontroller board. Arduino Mega has 54 digital input/output pins in that 15 pins are PWM pins, 16 analog input pins,16 MHz Crystal Oscillator,4 UARTs, USB connection, An ICSP header, Power jack and one Reset button. It contains all inbuilt interfacing ICs to support the analog and digital inputs to the microcontroller.

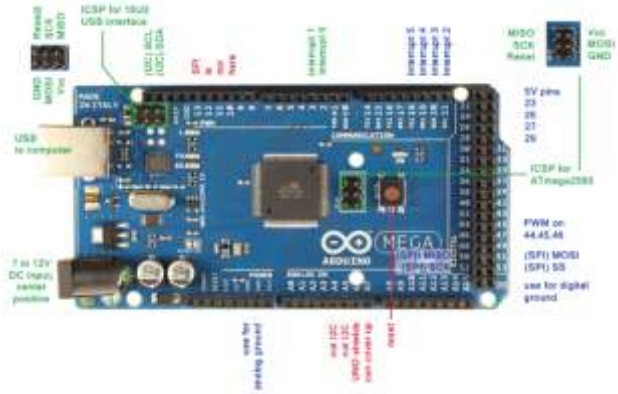


Figure 2: Arduino mega board

It works with the power supply of 5V DC. Power supply can be given form either USB cable or battery or AC-to-DC adapter.

Key Pad:
Keypad is a set of buttons that usually contain digits, symbols and alphabets. It is used as an input device. In this design we used 4x4 standard alphanumeric keypad. It has 16 push buttons. Board can be used with both 5V and 3.3V systems. It is suitable all micro controller architectures.



Figure 3: 4 X 4 matrix keypad

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Ir Sensor:
IR stands for Infra-Red. It is a passive component. Infrared sensor is an electronic sensor that measures infrared (IR) light that is emitted from objects in its field. They are used to detect the motion. The radiations emitted from the objects are at a Infrared wavelengths which is invisible to our human eye. This radiation can be detected by using this sensor. The term passive here refers to that it does not generate or radiate any energy for detection purpose. The detection process entirely depends upon the emission or reflection of radiations from the objects. They are commonly used in burglar alarms and automatically activated lighting systems.
Ultrasonic Sensor:
It is based on measuring the properties of sound waves with frequency above the human audible range. Their operation is mainly based on generation of high frequency sound waves and then receiving and evaluating the properties of reflected pulse from the object.



Figure 4: Ultrasonic Sensor

They are very sensitive to temperature and angle of target. There are two modes of operation.

They are:
Reflection mode: In this mode the ultrasonic transmitter sense a sound signal in a particular direction. Then this pulse bounces off a target and returns to the receiver after a time interval [10]. The receiver then records the length of this time interval and calculates the distance travelled.
Direct measurement mode: In this the transmitter and receiver are two separate units that move relative to each other.

Fuel Flow Sensor:
It is a sensing element used in flow meter to record the flow of fluids. They can be used in water conservation systems, storage tanks, hot water systems, irrigation systems etc. The sensors are solidly constructed and provide a digital pulse connected each time the amount of liquid passes through the pipe. The output can be easily connected to an Arduino for monitoring the liquid or fuel usage and calculating the amount of liquid remaining in the tank. It has following features. Open Collector Output, Fluid Temperature: 0 to 60oC, Fluid Pressure: up to 85 psi, Supply Voltage 2.4 - 26V etc.

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Figure 5: Fuel Flow Sensor

Gsm:
GSM stands for Global System for Mobile communication. GSM is a cellular network which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network. The coverage area of each cell varies according to implementation environment.

Lcd Display
LCD stands for Liquid Crystal Display. It is a flat panel display technology which uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.

Vibration Sensor:
Piezoelectric sensor is used for detecting accidents to the vehicles. Vibration sensor is one type of piezo electric sensor. It is a low-cost high sensitivity sensor. Vibration sensors are placed on the chassis of vehicle, one at front end and another at rear end. The voltage levels produced are proportional to the intensity of vibration. A threshold voltage value is set to distinguish between the low and high intensities. Whenever vibration levels exceed more than certain threshold levels it indicates accident alert.

Software Tool:
Arduino IDE 1.8.5 is used to design this proposed method. Arduino IDE is open-source plat form. This software can be used to any Arduino board. It provides easy interface to develop any application using Arduino board. The Arduino language is merely a set of C/C++ functions. All standard C and C++ constructs supported by avr-g++ should work in Arduino.

2. RESULTS AND DICUSSION

This proposed system has great security compared to other systems. This design consists of GSM, GPS, Fuel flow sensor, Arduino Mega, Vibration sensor, Ultrasonic sensor, Keypad, Motor and LCD Display. Vibration Sensor is fixed to the vehicle. If any accident happens to the vehicle the threshold level of vibration sensor exceeds, and immediately alert message will be sent to the corresponding person along with the location. GPS (Global Positioning System) is used to get the location details. These location details will send by using GSM(Global System for Mobile communication).

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Whenever user opened cap of the petrol tank immediately the amount of fuel in the fuel tank will be sent to the authorized persons like owner and driver of the vehicle shown in below figure 6.

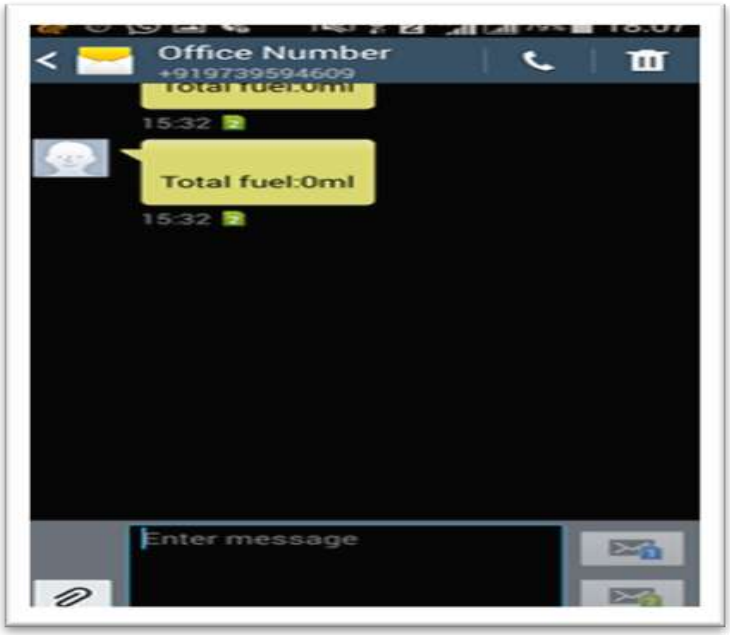


Figure 6: Received SMS before filling the fuel tank

After filling fuel tank in the digital display it shows the amount of fuel present in the vehicle and an SMS will be sent to the authorized persons indicates that total amount of fuel filled at fuel station and location of fuel filling station.

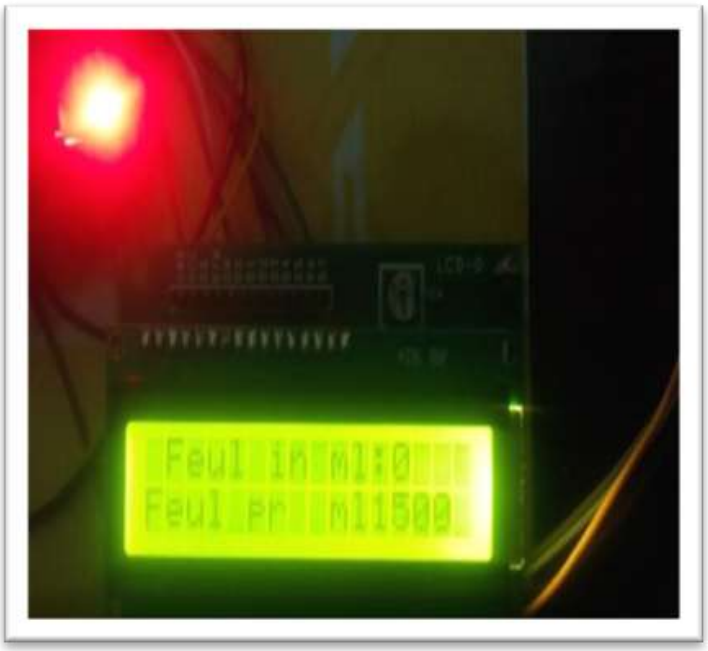


Figure 7: Fuel present in the fuel tank after filling

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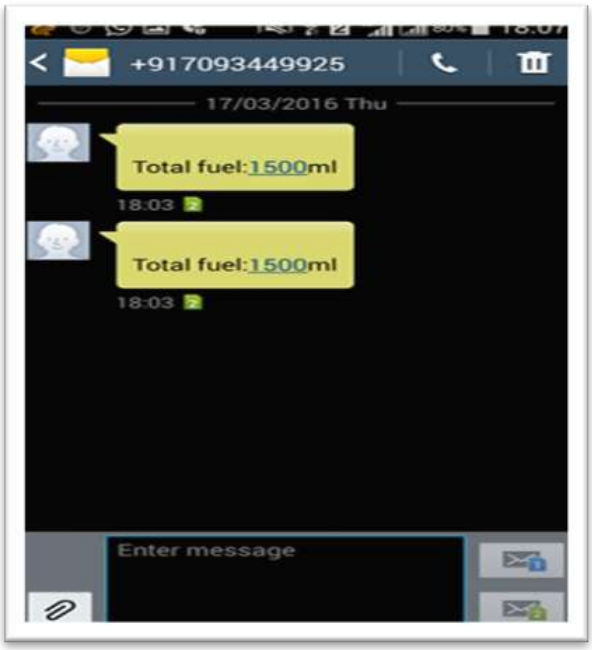


Figure 8: Received SMS after filling the fuel tank

To start vehicle user needs to enter OTP. Then after entering the one time password (OTP) through keypad, if OTP matches then motor will run and ignition of the vehicle will turn on.
Figure 9: Enter the pin message displaying on the LCD





Figure 10: OTP Received Through SMS

The below figure shows kit snapshot of Fuel Monitoring, Vehicle Tracking and security system Using Arduino Mega.

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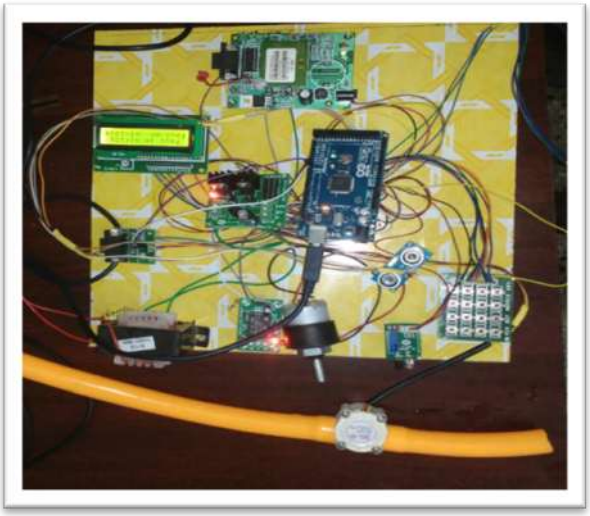


Figure 11: Overview of the circuit

3. CONCLUSION

In present world so many petrol/diesel bunk operators trying to cheat common people by manipulating their machines with different techniques. So, with this proposed method we can easily catch this type of cheatings. This method will give an exact amount of fuel filled into vehicle. It also has security and alert features. So that this design is very helpful to everyone.

Future Scope

The applications in project have proved to be very important and it much required for the society. The project has the potential in it. So that it gives way for future development of the project. The project can be improved by calibrating the fuel flow sensor. So that it continuously updates the data for every 10 ml of fuel and also collision avoidance and fuel leakage system can be developed further.

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