Smart Fuel Theft Detection using ATmega 328

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Abstract- *Fuel theft has become a widespread occurrence as oil prices have risen. From an economic standpoint, a method has been designed to address these activities. Smart fuel theft detection with GSM warning is used in this system. In the event of an intrusion, the ATmega328 detects fuel theft in real time and sends an alert to the owner's phone. Microcontroller, GSM module, LCD, and ignition lock are all part of the system. The GSM module sends a signal to the microcontroller, which translates the data into text and sends it to the user. This SMS message comprises a statement about gasoline theft as well as the vehicle's registration number. This smart technology provides access to gasoline use 24 hours a day, seven days a week, and sends out alarms when fuel drains or storage tank leaks are detected.*

Introduction-

In this fast-paced world, we are developing new technologies that make people's lives easier and faster. However, in our rush to become more sophisticated, we are overusing fossil fuels. As we enter the twenty-first century, the world's population will eventually surpass ten billion people. The survival of such a large human population will necessitate a considerably faster use of resources. Natural resources such as crude oil, coal, and other natural resources will, of course, be affected by this population expansion. As a result of the current situation, we are utilizing existing resources at a rate that is causing a scarcity of crude oil. As a result, prices will rise all around the world. This increase in fuel prices will have a negative impact on the economies of many countries. As a result, this vast human population will face an existential crisis. Crude oil is becoming increasingly expensive. People have already begun stealing fuel on a larger scale. Many times, the crude oil within the large vehicles has been stolen. As a result, protecting the fuel from theft and robbery is an absolute necessity and priority.

As a result, the security of these natural resources must be improved as soon as possible. This human race has made significant technical improvements in nearly every aspect as it has progressed day by day. So, by utilizing or creating such technology, we have created SMART FUEL THEFT DETECTION USING MICROCONTROLLER ATmega328.

This device accesses the level of fuel stored in the tank through GSM technology and records any changes in level. If there is a theft in the car fuel, the sensors will automatically detect it as an abrupt change in gasoline level sends an SMS to the owner of the specific vehicle that there is a theft and turns on the buzzer at the same time. Anyone attempting to steal the fuel will be unable to silence the buzzer.

The current study was created using GSM technology in mind. This technique gathers crucial information. When an attacker tries to obtain unlawful access to the car, it sends a message. Because GSM is one of the most widely used forms of mobile communication, it is feasible and unique in that many of the systems and apps created may be modified to function with it because it is a globally utilized, implemented, and followed standard.

The task entails the design and fabrication of a remote fuel-level sensor, as well as remote fuel level monitoring. Messages sent from a compatible mobile phone are used to monitor the situation. At regular intervals, messages are sent to the owner. Another unique component of this study is the use of a remote password to lock the vehicle. During an intrusion, Siren might also be activated.

This fuel-level monitoring device will ensure optimal fuel use, lower operating costs, and help you make the most money possible. This system is simple to use, install, and maintain.

Components-

GSM SIM module - GSM (Global System for Mobile) / GPRS SIM module (General Packet Radio Service) TTL - Modem is a SIM900 Quad-band GSM/GPRS device that operates at frequencies of 850, 900, 1800, and 1900 MHz. SIM900 is a small cellular module that can send and receive GPRS data, send and receive SMS, and make and receive voice calls. It's low cost with small footprint, and quad band frequency make it an ideal choice for any project requiring long-range connectivity. This is a wireless system with no range restrictions. During an infiltration, a text message is sent to a predetermined number through GSM.

Specification:

1. Voltage range: 3.8V to 4.2V

2. 4V is the recommended supply voltage.

3. Amount of energy used:

- Idle mode 7.0mA -sleep mode 2.0mA

- Average GSM transmission current: 350 mA

- 2000mA GSM transmission (peek)

4. Module dimensions are 25 x 23 mm.

5. Interface: AT instructions and UART (max. 2.8V).

6. SIM card slot is a microSIM slot (bottom side)

7. Frequencies supported: Quad Band (850 / 950 / 1800 /1900 MHz)

8. Status indication: LED

9. Temperature range of operation: -20°C to +55°C.

ATmega 328-

Microchip has designed the ATmega 328 microcontroller. It's an 8-bit, 28-pin microcontroller that runs from 3.3 to 5.5 volts, though we use 5 volts as a standard. The ATmega 328 has several advantages, including low cost and high efficiency. It includes 23 programmable I/O pins that can be used for both input and output devices, eliminating the need to memorise the microcontroller's specific pin sequence. Because the ATmega 328 has eight ADC pins, there is no need for an external ADC.

Four pins are designated for digital voltage supply, ADC supply, Ground, and analogue reference pin for ADC, out of the total of 28 pins.

Specifications:

1. AVR microcontroller is a type of integrated circuit.

2. The size of the core is 8 bits.

3. Frequency: up to 20MHz

4. I/O count: 23

5. The size of the program's memory is 32 kilobytes (16K x 16)

6. Memory type for programmes: Flash

7. Size of EEPROM: 1K x 8

8. RAM Dimensions: 2K x 8

9. DIP-28 package (0.1" x 0.3" pin spacing)

10. Voltage range for supply: 1.8 V to 5.5 V

11. RoHS compliant (lead-free): Yes

Buzzer - A buzzer, often known as a sensor, is a mechanical, electromechanical, or piezoelectric audio signaling device that translates sound signals into audio signals.

Specifications:

6V DC is the recommended operating voltage.

4 to 8V DC (operational voltage)

30 mA rated current

At a distance of 10cm*, the sound output is 85dB.

2300 – 300 Hz Resonant Frequency

Continuous toning

-25°C to +80°C (working temperature)

-30°C to +85°C storage temperature.

Fuel level sensor-

A fuel sensor is an electronic device that measures the amount of fuel in a vehicle's tank accurately.

The following are the most prevalent types of gasoline sensors:

-Fuel float sensor

-Fuel sensor that is capacitive

-Sensor that detects ultrasonic waves

The float fuel sensor is the sensor utilized in this system. The opening or closing of a mechanical switch is required for float sensors. Direct contact with the switch or the magnetic functioning of a reed causes this. A permanent magnet encapsulated inside a float rises or lowers to the actuation level in a float sensor. The float adjusts its position in response to variations in the fuel level. It results in a change in resistance and, as a result, a change in the sensor's output voltage.

Specifications:

1. Advance Magnetic Technology

2. Normally Close Type

3. Corrosion Free Material

4. Ideal Operating Ratings: 2 metre cable length DC voltage ranges from 2 to 12 volts, Current: 5 to 50 mA DC

5. Max Switch Current: 500 mA (DC),

6. Max Switch Watt: 10W

LCD Display - Liquid Crystal Display is the abbreviation for liquid crystal display. It shows messages like "fuel theft discovered," "fuel theft in progress," "SMS

send successfully," and so on. As a result, LCDs are mostly utilized for testing purposes. Two different states of matter are used to make the LCD display (solid state and liquid state). A liquid crystal is used to create a visible image on an LCD. Liquid crystal displays are ultra-thin display screens that are commonly seen in laptop and computer screens, televisions, cell phones, and portable video games.

Working-
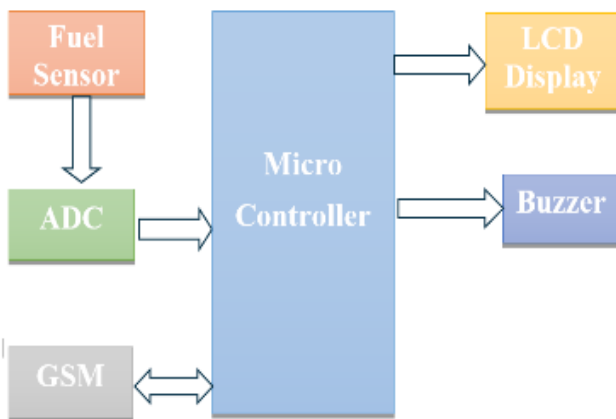
There are two levels in the fuel tank, the first one is the level till which the fuel is filled in the fuel tank and the second one is a minimum threshold level. Whenever an intruder is trying to steal the fuel from the vehicle or whenever there will be decrease in the fuel level a signal will be send to the microcontroller (the microcontroller is having an in build ADC converter). Now signals from the microcontroller will be given to the buzzer and the GSM module. With the help of the GSM module a message will be send to the owner's mobile phone alerting the owner about the theft happening with his/her vehicle. A buzzer will be turned on instantly whenever there will be fuel theft going on with the vehicle. Hence further fuel theft can be prevented.

Programming Interface

We have written our program in C language. This program will help in sending various signals to the microcontroller and then the microcontroller will act according to the signal received.

The algorithm for this flowchart is as follows:

Step 1:- Turn off the ignition key.

Step 2:- The system will be activated

Step 3:- The fuel monitoring begins.

Step 4:- If the level sensor detects a decrease in fuel level. It will be considered as theft and the microcontroller will send signal to the GSM technology and to the buzzer.

Step 5:- The Buzzer will be turned ON, making loud noise.

Step 6:- An SMS will be sent to the owner.

Step 7:- Stop the buzzer after 2 minutes.
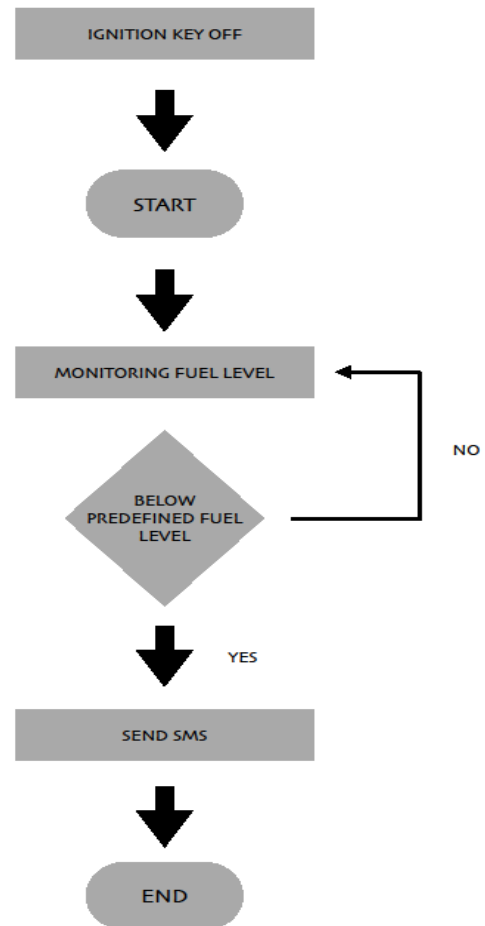
Conclusion- The user can access the quantity of fuel through this GSM technology. The sensors will detect any possible theft and will alert the owner via buzzer and simultaneously turn the buzzer on for 2 minutes. The intruder can't stop the buzzer and if the buzzer is not stopped within two minutes then it will be treated as a theft of fuel. This project can be used in different types of vehicles of all sizes.

We all know that due to the rising fuel prices the threat to the fuel's security is also increased and so such technologies are an absolute necessity. This technology also adds security to the vehicles resulting in money being saved. This technology can be applied to various types of vehicles, it can be from small vehicles to large vehicles. One can access to the fuel level remotely making it user friendly. This technology needs less power due to its low power consumption making it economical as well.

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