Smart fuel monitoring system

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***Abstract*- In today's fast paced world where digitalization is at peak making thinks more interactive and easier to deal with, -e have come up with the idea to develop a "SMART FUEL MONITORING SYSTEM". This unique system overcomes the problems such as the fuel digital Metering system will show the fuel in bar or deflection needle, so we cannot analyze the exact quantity of fuel present in the fuel tank. These days requirement of fuel is very high. Due to increasing number of vehicles. Cases of fuel theft from a vehicle are also increasing day by day. If fuel is stolen owners don't have any information about that. This proposed system consists of Arduino Atmega328, GSM module, Ultrasonic sensor, Buzzer, Flow rate sensor, LCD display together, these components form a comprehensive smart fuel monitoring system that offers real-time insights into fuel levels and consumption, enhancing operational efficiency and reducing the risk of fuel-related issues.**

***Keywords*- Arduino UNO, GSM module, Ultrasonic sensor, Turbidity sensor, LCD display.**

I. INTRODUCTION

In the digital era, vehicles play a crucial role in ensuring efficient transportation of goods and people. They enable connectivity, supporting the digital economy by facilitating the movement of products and individuals. Additionally, vehicles contribute to accessibility, allowing people to reach various destinations conveniently. Fuel, on the other hand, remains the lifeblood of these vehicles, powering their engines. The availability and affordability of fuel directly impact the cost and sustainability of transportation. As we advance in digitalization, optimizing vehicle efficiency and exploring smart fuels monitoring system become essential to reduce environmental impact and support a more sustainable future.
The "Smart Fuel Monitoring System" is a game-changer for a greener future. This innovative solution keeps a close eye on fuel consumption in a smart, efficient way. By monitoring fuel usage, it helps cut down on pollution, offering a sustainable alternative. This system aligns with our commitment to reduce the environmental footprint, paving the way for a cleaner and more eco-friendly tomorrow.
Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank. The above furnished fact is considered in "SMART FUEL MONITORING SYSTEM " and found out a proper solution for indicating the exact availability of fuel in the tank digitally. Here we are indicating the amount of fuel in the tank in Liters. This value in Liters like (1 ,2,1.2 and 1.8 Liter) .This project mainly concentrates about the indication of fuel level in two-wheeler tanks. This project helps to avoid a lot of problems like fuel Bunks at fuel stations, fuel theft and prevents us from getting into situations where we have to push our vehicles due to assumptions of the level of fuel.
Nowadays the fuel indicator system for the two wheelers is digital but they do not display the exact amount of fuel which is present in the tank i.e. They show the amount of fuel with the help of pointer bars and not in numbers or digits like Liter, so this problem is taken into consideration for our project work of developing the smart fuel monitoring system for two wheelers which shows exact amount of fuel in terms of Litres(L).

II. SYSTEM OVERVIEW

The SMART FUEL MONITORING SYSTEM operates like First, sensors and supporting devices attached to fuel tanks to measure the fuel level in real time. This data related to the level is then sent to an Arduino Uno board (ATmega328), which acts as the hardware hub. The Arduino Uno (ATmega328) processes this information and transmits it to LCD display and to the owner of vehicle through GSM.

The software running on the Arduino Uno (ATmega328), programmed using the Arduino IDE, manages the flow of data. The main software, likely developed using a programming language like C or C++, analyzes the data received from the Arduino Uno (AT mega 328). It provides real-time insights into fuel availability in tank in liter (just like 1.2liter), spots any unusual patterns, and generates reports. The Arduino Uno's (At mega 328) role in the system is important, acting as a bridge between the hardware and software components, facilitating efficient fuel monitoring.

III. PROBLEM STATEMENT

Nowadays public face so many problems with respect to vehicles, such as the fuel digital metering system will show the fuel in bar or deflection needle, so we cannot analyse the exact quantity of fuel present in the fuel tank. These days requirement of fuel is very high due to increasing number of vehicles. Cases of fuel theft from a vehicle are also increasing day by day. If fuel is stolen from the fuel tank of a vehicle, its owner doesn't have any information about it. The present system displays the amount as entered but the quantity of fuel filled in the customer's tank is much lesser than the displayed value.

One of the main problems occurring at petrol pump is that the meter at petrol pump displays the amount of fuel as entered by the pump operator but the actual quantity of fuel filled in customers tank is much less than the value displayed by the meter at the petrol pump.

IV. PROPOSED SYSTEM MODEL

The Smart Fuel Monitoring System comprises an Arduino Uno AT mega 328 as the central control unit. Connected to it are an Ultra-sonic sensor for continuous fuel level sensing, a Turbidity sensor for purity checking, a GSM module for communication, and an LCD for real-time display. The Ultra-sonic sensor feeds data on fuel level to the Arduino, which processes and sends it to the LCD for user-friendly visibility. Simultaneously, the Turbidity sensor assesses fuel purity. In case of sudden changes indicating potential fuel theft, the Arduino triggers the GSM module to send a notification to the owner.

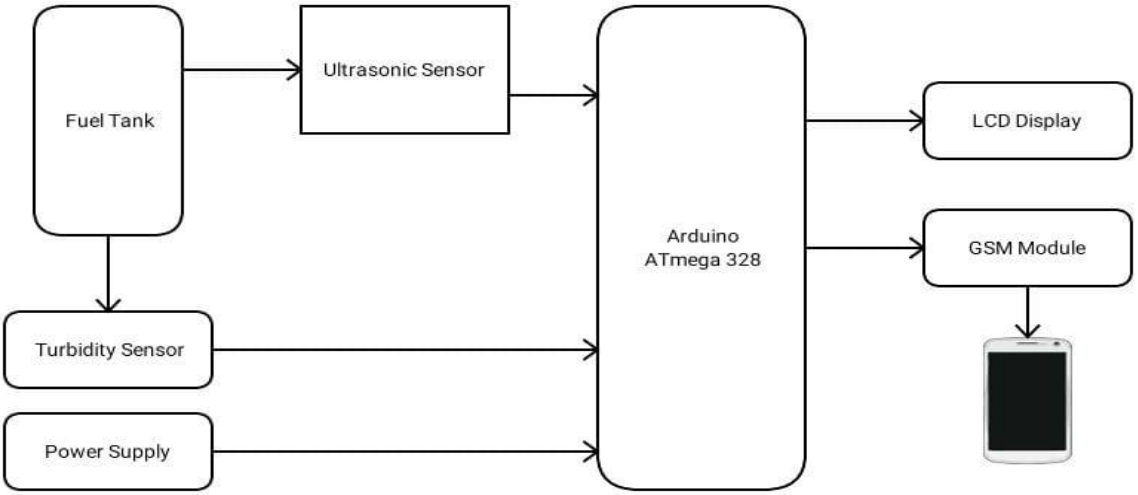
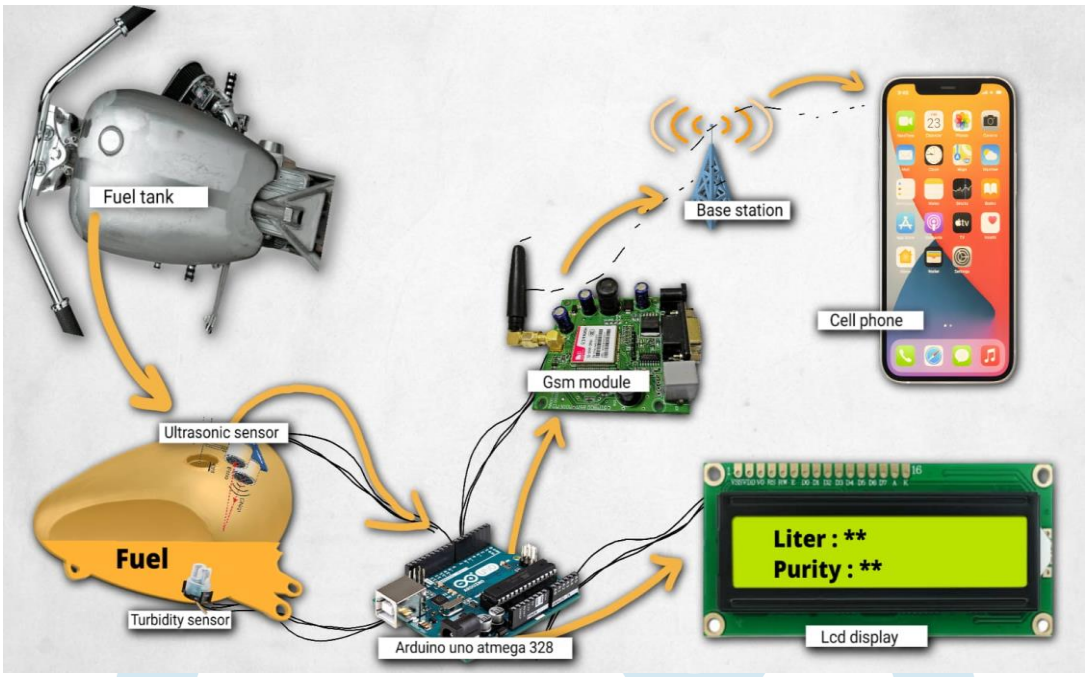
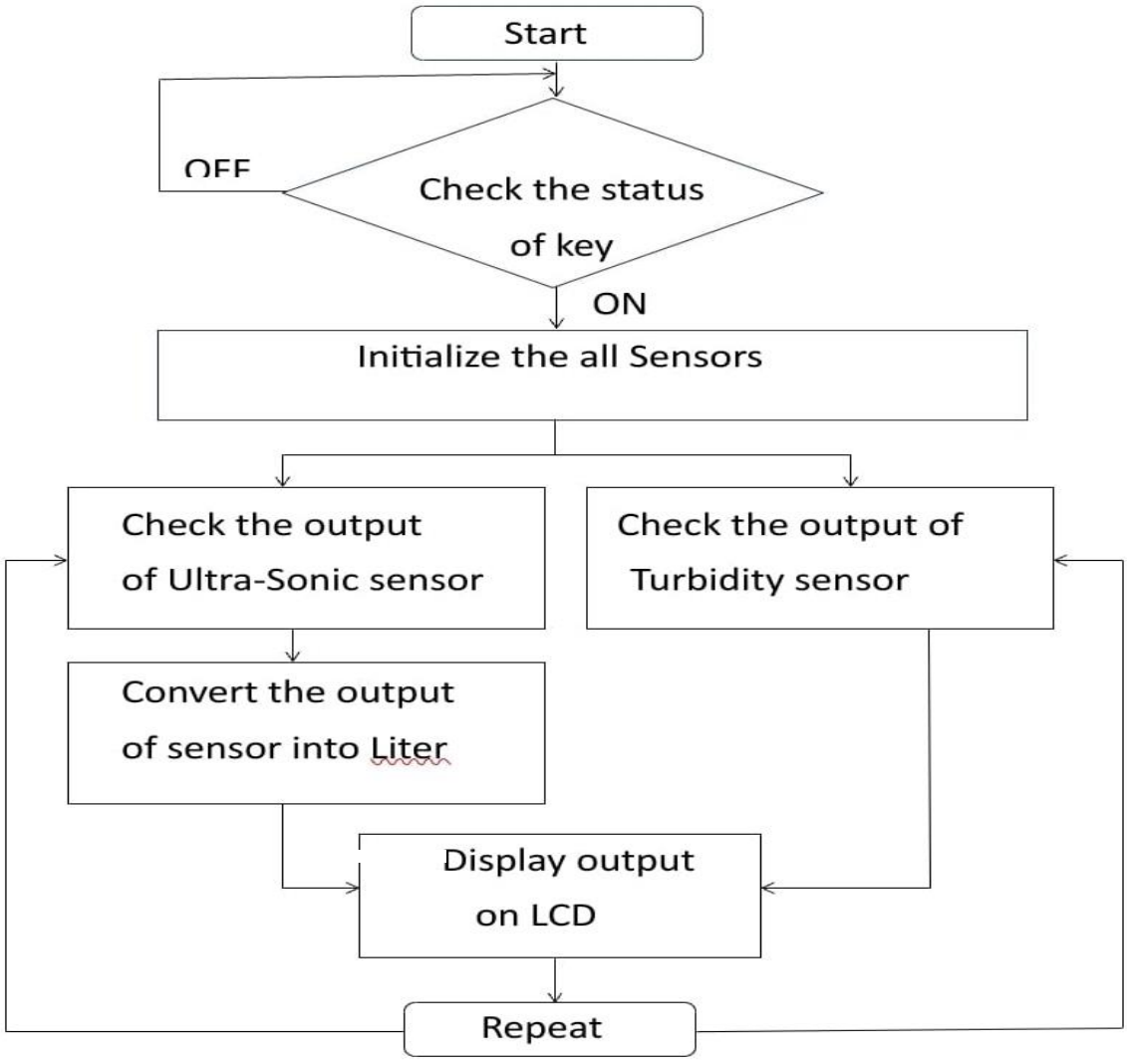


Fig:- Block diagram

Flow diagram

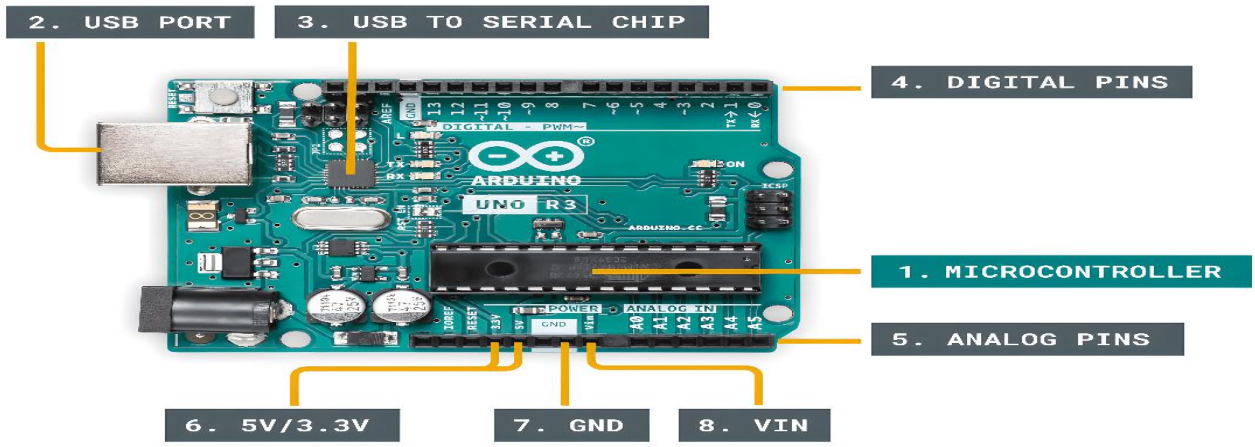


V.FLOWCHART



VI. SYSTEM REQUIREMENTS

1) Arduino ATmega328: -



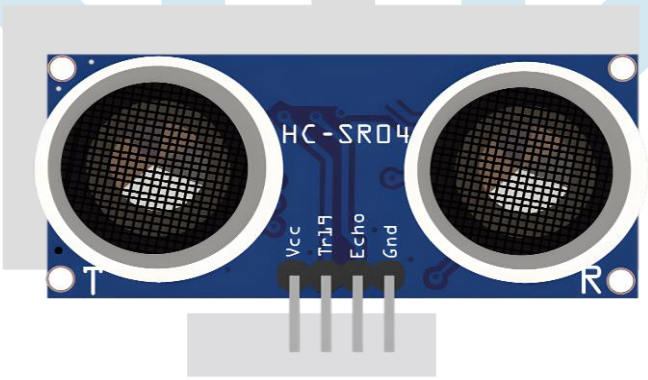
Arduino is an Italian open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

Arduino ATmega328 specification:-

1. Operating Voltage: 5V.
2. Input Voltage (recommended): 7-12V.
3. Input Voltage (limits): 6-20V.
4. Analog Input Pins: 6.
5. DC: Current per I/O Pin: 40 milli Ampere.
6. DC Current for 3.3V Pin: 50 milli Ampere.
7. SRAM: 2 KB (ATmega328).
8. Digital I/O Pins: 14 (of which 6 provide PWM output).

In this project Arduino Uno AT mega 328 act as the main control unit, processing data from sensors and managing the overall system. It interfaces with the other components like GSM and LCD

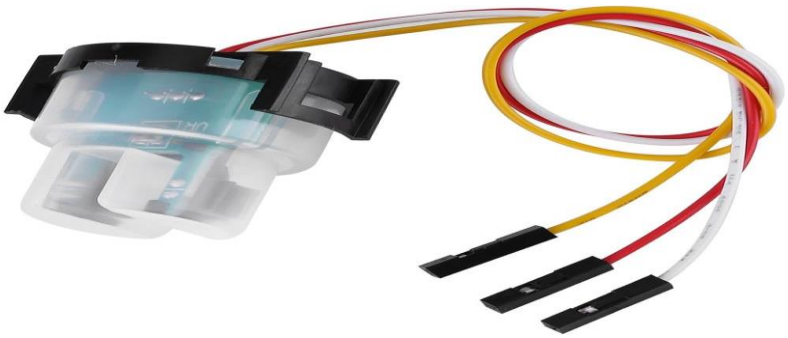
2) Ultra-sonic sensor: -



Ultrasonic Sensor can generate and sense the Ultrasonic energy. It broadly works in 3 phases transmitters, receivers and transceivers. Echo is basic of principle of working of Ultrasonic sensor. The Ultrasonic waves are transmitted to an object and the reflected waves are received by the sensors. Ultrasonic sensor easy to install This means the tank need not to be modified, by drilling holes just for a sensor installation.

In this project Ultrasonic sensor Measures the fuel level continuously and provides real-time data on the amount of fuel availability in Liter on LCD display

3) Turbidity sensor: -

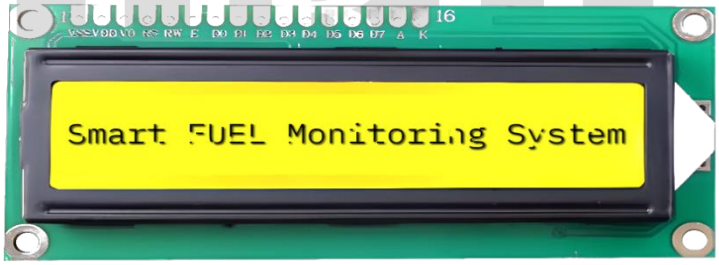


Turbidity sensors measure the amount of light that is scattered by suspended solids in a liquid, such as water. When the concentration of total suspended solids (TSS) and total dissolved solids (TDS) in a liquid increase, the turbidity also increases.
In this project turbidity sensor Checks the purity of the fuel by measuring turbidity, ensuring its quality.

4) GSM: -

A GSM module is a device that allows electronic devices to communicate with each other over the GSM network. GSM is a standard for digital cellular communications, which means that it provides a platform for mobile devices to communicate with each other wirelessly
In this project GSM enables communication with the owner by sending a message in case of sudden changes, such as fuel theft. It acts as a notification system.

5) LCD: -



An LCD (Liquid Crystal Display) works by using liquid crystals sandwiched between two layers of polarized glass. These crystals can twist or align when an electric current is applied.
The Arduino uno AT mega 328 collects data from a sensor, processes it, and then sends appropriate signals to the LCD to display the fuel quantity information in Liter .

VII. ADVANTAGES:

1)The main advantage of this project is that it detects fuel theft.
2) Exact quantity of fuel present in the fuel tank can be measured in Liters & displayed on digital display in Liters (e.g. 1.25 Liters).
3)The proposed system is cost effective.
4) If the fuel tank has any leakage, it will also be detected.

VIII.CONCLUSION

This is a unique circuit designed and implemented to display exact quantity of fuel in liter present in fuel tank. It can also detect fuel theft, if any, in addition to checking the purity of fuel**.**

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