

Digital Fuel Level Indicator By use of Float Sensor

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Abstract: *In today's fast paced world, monitoring systems are necessary to track the changes in the environment for better understanding of current scenarios and predictions there of. The same is true for fuel tanks in vehicles as well. By keeping strict track of fuel intake and consumption, vehicles can be made more fuel and cost efficient. This can be done using remote monitoring and data collection systems deployed at the site of the fuel storage tank. This proposed monitoring device is built on Atmega328 microcontroller that takes fuel tank level information from its sensors and analyses this data at the sensor edge to find patterns using edge analytics technology. To protect the fuel customers from theft at the gas stations and formulate better conservation strategies. The voltage Input value will be 5volt. The float sensor resistant value to the fuel level will be displayed in the value of litres in the LCD display.*

KEY WORDS: *Battery, Buck converter, Arduino UNO , LCD Display, Fuel tank*

I.INTRODUCTION

The Fuel level sensors, also known as fuel gauges, allow drivers to monitor fuel consumption and help them to determine when to refill the tank. They consist of two main components: the sensing system itself (also known as the sender) and the indicator (also commonly referred to as the gauge). The fuel rail sensor, commonly referred to as the fuel pressure sensor, is an engine management component that is commonly found on diesel, and some gasoline injected vehicles. It is a part of vehicle's fuel system and designed to monitor the fuel pressure that is present at the fuel rail. The sensor sends this signal to the computer, which then uses it to make adjustments to the vehicle's fuel and timing. When the sensor has an issue it can cause problems with the performance of the vehicle. Usually a bad or failing fuel rail sensor will produce a few symptoms that can alert the driver to a potential issue. The aim of our project is to monitor the level of the fuel in the vehicle fuel tank and to

automatically indicate the level information digitally, numerical value through LCD. We are already aware that modern vehicles display the amount of fuel in the fuel tank by the means of analog indicators, which oscillates between E (empty) and F (full) at its extreme ends or by digital bars running through E (empty) and F (full) indicators. To the contrary every one of us might have experienced the problem with improper estimations of the current fuel indicating system.

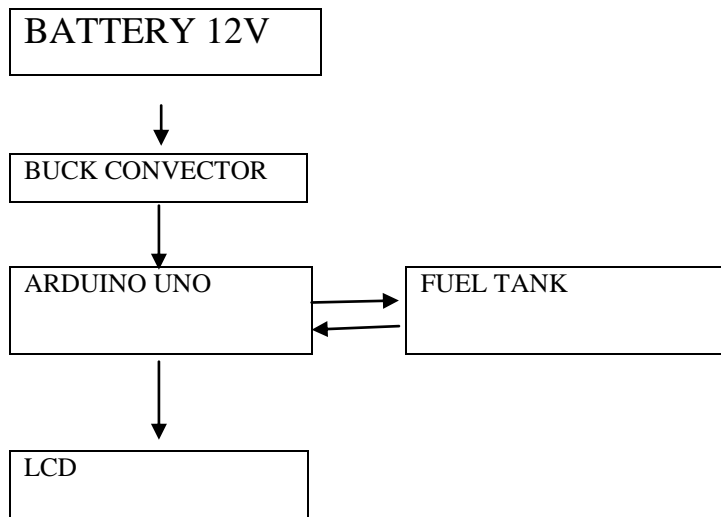
II.EXISTING SYSTEMS

- At present most of the vehicles are having analog fuel meters. This meter indicates only three states of fuel levels that are full, half and empty
- Digital fuel indicator The amount of fuel is indicating by using digital circuit so user or owner can know the right amount of the added fuel from
- the petrol bunk. This calculation must be used to calculate the mileage of the vehicles.
- To design digital fuel level indicator and battery life
- indicator with the help of non contact type fuel level sensor
- The reading which shows on LCD display in terms of liter and percentage

III.PROPOSED SYSTEM

The petrol tank with float sensor is connected to an Arduino UNO. The float sensor provides analog value to the Microcontroller ATmega328P which converts analog value to digital value which is further read by the microcontroller (which is flash programmable and erasable ROM). At last, the microcontroller gives the result of the amount of fuel in the tank which is displayed on a LCD screen. The system as a whole is Connected To A Battery

IV.BLOCK DIAGRAM



The main objective of this project by using Arduino Microcontroller to Monitor the fuel level in the tank and also gives the indication the amount of fuel left in the tank digitally (numerically). This project helps to avoid a lot of the 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 assumption of the level of fuel. The objective is to design digital fuel level and battery life indicator which would be the following.

Selecting appropriate automotive application (motor bike/car) for carrying out this study to indicate fuel level and battery health.

The aim of our project is to monitor the level of the fuel in the vehicle fuel tank and to automatically indicate the level information digitally, numerical value through LCD. To the contrary every one of us might have experienced the problem with improper estimations of the current fuel indicating system. Thus, digital (numeric) fuel indicator system will help us exterminate common problems like.

1. Misinterpretation of the amount of fuel left by the drivers,
2. petrol pumps theft cases,

Also, it will help us to know the current mileage of the vehicle.

V. COMPONENTS AND TECHNOLOGIES

LEAD ACID BATTERY

• The **lead–acid battery** was invented in 1859 by French physicist **Gaston Planté** and is the earliest type of **rechargeable battery**. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high **surge currents** means that the cells have a relatively large **power-to-weight ratio**. These features, along with their low cost, make them attractive for use in motor vehicles to provide the high current required by **starter motors**. As they are inexpensive compared to newer technologies, lead–acid batteries are widely used even when surge current is not important and other designs could provide higher **energy densities**. In 1999 lead–acid battery

sales accounted for 40–45% of the value from batteries sold worldwide (excluding China and Russia), equivalent to a manufacturing market value of about \$15 billion.^[8] Large-format lead–acid designs are widely used for storage in backup power supplies in **cell phone towers**, high-availability settings like hospitals, and **stand-alone power systems**. For these roles, modified versions of the standard cell may be used to improve storage times and reduce maintenance requirements. Gel-cells and absorbed glass-mat batteries are common in these roles, collectively known as **VRLA (valve-regulated lead–acid) batteries**.

In the charged state, the chemical energy of the battery is stored in the potential difference between the pure lead at the negative side and the PbO_2 on the positive side, plus the aqueous sulphuric acid. The electrical energy produced by a discharging lead–acid battery can be attributed to the energy released when the strong chemical bonds of water (H_2O) molecules are formed from H^+ ions of

the **acid** and O^{2-} ions of PbO_2 .^[9] Conversely, during charging, the battery acts as a **water-splitting** device.

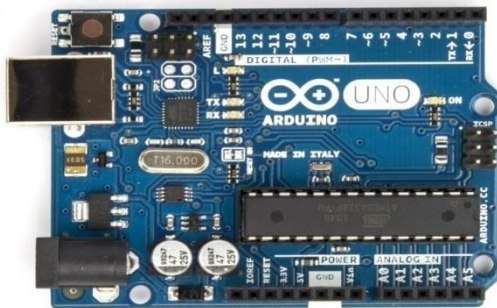


Buckconverter (stepdownconverter)

A buck converter (step-down converter) is a DC-to-DC power converter which steps down voltage (while drawing less average current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).^[1] Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that lower voltages by dissipating power as heat, but do not step up output current.^[2] Buck converters can be highly efficient (often higher than 90%), making them useful for tasks such as converting a computer's main (bulk) supply voltage (often 12 V) down to lower voltages needed by USB, DRAM and the CPU



ARDUINO UNO

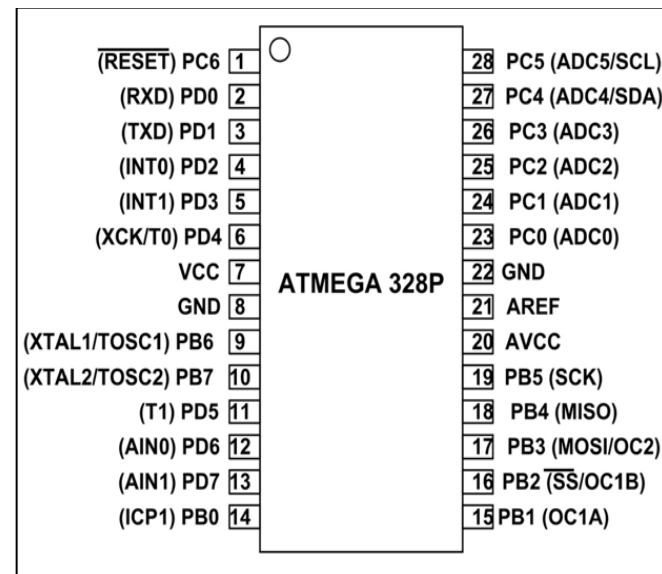


The major components of Arduino UNO board are as follows:

- USB connector.
- Power port.
- Microcontroller.
- Analog input pins.
- Digital pins.
- Reset switch.
- Crystal oscillator.
- USB interface chip

AT MEGA 328P MICROCONTROLLER

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core

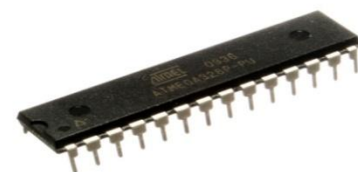


FEATURES

- High performance design
- Low power consumption
- Total number of Analog Input pins are 6
- Contains 32 kilobytes of flash memory
- Contains 2 kilobytes of SRAM
- Contains 1 kilobytes of EEPROM
- 16 megahertz clock speed
- Minimum & maximum temperature -40 degree centigrade to 105 degree centigrade

APPLICATIONS

- Industrial machinery controlling systems
- Solar powered machinery and applications
- IOT based applications



CRYSTAL OSCILLATOR

A crystal oscillator is an [electronic oscillator](#) circuit that uses the mechanical [resonance](#) of a vibrating [crystal](#) of [piezoelectric material](#) to create an electrical signal with a constant [frequency](#).^{[1][2][3]} This frequency is often used to keep track of time, as in [quartz wristwatches](#), to provide a stable [clock](#)

signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators,^[1] but other piezoelectric materials including polycrystalline ceramics are used in similar circuits. A crystal oscillator relies on the slight change in shape of a quartz crystal under an electric field, a property known as electrostriction or inverse piezoelectricity. A voltage applied to an electrode on the crystal causes it to change shape; when the voltage is removed, the crystal generates a small voltage as it elastically returns to its original shape. The quartz oscillates at a stable resonant frequency, behaving like an RLC circuit

crystal is adjusted to a particular frequency (which is affected by the mass of electrodes attached to the crystal, the orientation of the crystal, temperature and other factors), it maintains that frequency with high stability.^[4]

Quartz crystals are manufactured for frequencies from a few tens of kilohertz to hundreds of megahertz. More than two billion crystals are manufactured annually.^[citation needed] Most are used for consumer devices such as wristwatches, clocks, radios, computers, and cellphones. However in applications where small size and weight is needed crystals can be replaced by thin-film bulk acoustic resonators specifically if high frequency (more than roughly 1.5 GHz) resonance is needed. Quartz crystals are also found inside test and measurement equipment, such as counters, signal generators, and oscilloscopes.



LCD DISPLAY

A liquid crystal display or LCD draws its definition from its name itself. It is a combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screens that are generally used in laptop computer screens, TVs, cell phones, and portable video games. LCD's technologies allow displays to be much thinner when compared to a cathode ray tube (CRT) technology.

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. Here, in this able we're

going to use a monochromatic 20x4 alphanumeric LCD. 20x4 means that 20 characters can be displayed in each of the 4 rows of the 20x4 LCD, thus a total of 80 characters can be displayed at any instance of time.



- The LCDs are commonly used in all the digital wrist watches for displaying time.
 - The LCD (liquid crystal display) is used in aircraft cockpit displays.
 - It is used for displaying images used in digital cameras.
 - It is used in instruments panel where all the lab instruments use LCD screens
 - The television is main applications of LCD.
 - Mostly the computer monitor is made up of LCDs.
 - The LCDs are used in mobile screens.
- It is also used in video players..

I2C MODULE

I²C (Inter-Integrated Circuit), pronounced *I-squared-C* is a synchronous, multi-master, multi-slave, packet switched, single-ended, serial communication bus invented in 1982 by Philips Semiconductor (now NXP Semiconductors). It is widely used for attaching lower-speed peripheral ICs to processors and microcontrollers in short-distance, intra-board communication. VHV

C). This is a 16x2 LCD display screen with I2C interface. It is able to display 16x2 characters on 2 lines, white characters on blue background. Usually, Arduino LCD display projects will run out of pin resources easily, especially with Arduino Uno. And it is also very complicated with the wire soldering and connection. This I2C 16x2 Arduino LCD Screen is using an I2C communication interface. It means it only needs 4 pins for the LCD display: VCC, GND, SDA, SCL. It will save at least 4 digital/analog pins on Arduino

System Management Bus (SMBus), defined by Intel in 1995, is a subset of I²C, defining a stricter usage. One purpose of SMBus is to promote robustness and interoperability. Accordingly, modern I²C systems

incorporate some policies and rules from SMBus, sometimes supporting both I²C and SMBus, requiring only minimal reconfiguration either by commanding or output pin uses.

. RESISTOR

Resistors are the most commonly used [electronic components](#) in the circuits. A resistor is an electronic component that reduces or restricts the flow of electrons or electric current to certain level.

How much electric current does a resistor block depends on the resistance of a resistor. The resistors with more resistance will block large amount of electric current and allow very small amount of electric current. The resistors with less resistance will block very small amount of electric current and allow large amount of electric current. The electric current blocked by the resistor is wasted in the form of heat.

Resistors are the passive components. Hence, they cannot control the flow of electrons or electric current through them. However, they can restrict the electric current to certain level.

FLOAT LEVEL SENSOR

- Fuel level sensors, also known as fuel gauges, allow drivers to monitor fuel consumption and help them to determine when to refill the tank. They consist of two main components: the sensing system itself (also known as the sender) and the indicator (also commonly referred to as the gauge).
- Fuel gauges work by measuring the voltage across a variable resistor within the sensing system, to determine the level of fuel; which is then relayed to the driver via the indicating system. Several components work within the sensing system, enabling it to detect how much fuel is in a tank, including the float switch, a variable resistor, and a wiper. The sensor system is relatively simple compared to other sensors currently produced, although newer sensor systems can also utilize microprocessors for faster and more accurate measurements.
- The sensing system is located in the fuel tank and consists of a float—usually made of foam and connected to an actuating metal rod—attached to a variable resistor. The variable resistors used in fuel level sensors are often composed of a resistive material, where one end is attached to the ground, with a wiper (much like a very small windscreen wiper) that moves over the resistive material as the float moves. When the float moves due to changing fuel levels, the wiper moves across the resistor,

causing a change in voltage. The orientation of the wiper means that the highest resistance is experienced across the resistor when the tank is empty. At this point, the wiper is also as far away as possible from the ground end of the resistor. The change in current is then passed on to the indicator which in turn changes the reading.

- However, fuel level sensors in automobiles can often be inaccurate, especially when driving with a full tank. In this scenario, the float will rise to the top of the tank, with the wiper returning to the ground end of the resistor, resulting in a small resistance and a high current passing through the sensor. As the float drops in height, the resistance changes; but the gauge will often remain on 'full' for some time. This is because when the fuel tank is full, the float cannot position itself on top of the fuel, as it is blocked by the tank or is limited by the reach of the actuating rod attached to it; meaning that the float becomes submerged when the tank is full. This leads to inaccurate readings until the fuel drops to a level where the float can sit on top, allowing the resistance to change.
- Similarly, when fuel is low, the rod often does not extend to the end of the tank, causing the gauge to indicate an empty tank when actually some fuel remains.



VIAPPLICATION

- To produce a numeric readout of the amount of fuel left in the tank.
- Capable of being in the dash of the vehicle, thus needing no minimum modifications.
- This project is adaptable to all types of vehicles, to indicate the amount of fuel in the fuel tank.
- This project can be used in all types of vehicles, chemical tank, water tank, to indicate the amount of liquid in the tank with small modification of sensor.



VII.CONCLUSION

Thus The today's fast paced world, monitoring systems are necessary to track the changes in the environment for better understanding of current scenarios and predictions thereof. The same is true for fuel tanks in vehicles as well. By keeping strict track of fuel intake and consumption, vehicles can be made more fuel and cost efficient. This can be done using remote monitoring and data collection systems deployed at the site of the fuel storage tank. This proposed monitoring device is built on Atmega328 microcontroller that takes fuel tank level information from its sensors and analyses this data at the sensor edge to find patterns using edge analytics technology. These patterns and data are streamed to the internet, either an android app or a website. This paper presents the implementation of such a monitoring system based on Internet of Things (IoT) technology to protect the fuel customers from theft at t.The voltage mean value to fuel level will be displayed in the LCD display value of numerically(in litres) achieved . The display show the available fuel in the tank in percentage ,litres and bar lines are show successfully

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