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Design and Development of a Novel Digital Fuel Level Indicator System for a Modern Two Wheeler

Mr. Sujit Kamlesh T[1], Mr. Kumaran G[2], Mr. Suganth S[3], Mr. Gokul L S[4]
1,2,3 Students, Department of Mechanical Engineering,
Bannari Amman Institute of Technology, Erode, Tamil Nadu, India
4Assistant Professor II, Department of Mechanical Engineering, Bannari Amman Institute of Technology, Erode, Tamil Nadu, India

Abstract— *In this improved technological world, digitalization has improved the effective analysis of tasks which have to be carried out by human effort, if the fuel indicators replaced with digital meters than the analog it could be analyzed and an effective amount of fuel can be filled in the vehicle. This system could indicate the amount of fuel inside the fuel tank digitally in numerical values (ex: 2.020L, 2.555L, and 5.025L). This method is mainly focused on the indication of fuel in vehicles. The old systems could not indicate the exact level of fuel present in the fuel tank. This system could eliminate the adulteration of fuel in gas stations while filling in fuels and the approximate filling of the fuel by the driver while traveling. These issues could be considered for the development of numerical value indicator in milliliters in the fuel tanks of the vehicle.*

Keywords: Float sensor, ADC, LCD, fuel tank.

I. INTRODUCTION

Analog fuel level indicator is implemented in an automobile which shows the amount of fuel left in the fuel tank. The analog fuel level indicators use a dial gauge indicator. The amount of fuel that is filled in the gas stations and to avoid the mismatched quantity of fuel refilled in the tanks thus some gas stations show approximate fuel on filling the tank. Digital meter is also known as electronic digital meter. This mainly displays the values in the type of numerical digits. It has an electronic LCD display which is far better than analog meters. It consists of a liquid crystal display and it updates the information at an interval of some specified time. This digital meter has a moving coil meter and that is connected to the coil and the resistor in the series connection. The analog fuel meter has the lowest permissible frequency range but in the case of digital fuel meter, it has a high permissible range. The digital fuel meter has the high susceptibility but low in analog fuel meter to electric noise. To avoid getting cheated by the gas stations where the numerical value shows the correct amount but in reality, the quantity is less. So this system helps in displaying the exact amount of fuel present in the fuel tank and also to cross-check the amount of fuel getting refilled in the gas stations.

II. PROPOSED METHOD

Float sensor senses the level of fuel present inside the fuel tank and sends the generated analog voltage signal to the ADC. The ADC converts the analog voltage signal created by the float sensor into digital values. The digital signal which is converted by the ADC is sent to the Arduino UNO ATmega328P. The program which is suitable for the execution of the setup is uploaded on the Arduino board. The program receives input from the ADC and the program is run. After the compiling of the program, the input values are executed and the output is validated. In this project, we are indicating the amount of fuel present in the fuel tank in liters using Float sensors, Analog to Digital Converter (ADC), and displaying it using the LCD display. This could be used to monitor the exact amount of fuel to be filled in the vehicle in gas stations.

III. FLOAT SENSOR

A Float sensor is an electrical ON/OFF switch that used to check or monitor the level of the liquid. When the liquid rises or does down, then float automatically operates to specify the level of liquid in the tank. The magnetic forces of the magnet which placed inside of the float ball which operates the reed switch to turn ON. When the float moves away from the reed switch, the switch will turn OFF automatically.

Fig:1 Float Sensor

This is a type of sensor which is used to detect the level of liquid in the tank. This is mainly used in the pump and indicators. It consists of a Magnetic float sensor that has an electromagnetic ON/OFF switch. The main process of the float sensor is to sense the level of water present in the tank or sump. The float consists of a permanent magnet and a switch is present in the white stem of the sensor. As per the rise of the water, the float rises and falls, and the switch gets activated by the magnet in the float. These signals received to the sensors which control the level of water in the tank.

IV. ANALOG TO DIGITAL CONVERTOR

.Analog to Digital converter may be a terribly helpful feature that converts associate analog voltage on a pin to a digital variety. By changing from the analog world to the digital world, to interface to the analog world around us. Not each pin on a microcontroller has the flexibility to try and do analog

to digital conversions. An ADC is used to convert continues-time and continues-amplitude analog signals to discrete-time and discrete-amplitude digital signal. An ADC performs continuously by sampling the input and to limit allowable bandwidth of the input signal. The performance of the ADC mainly depends upon the bandwidth and the signal to noise ratio. The bandwidth of the ADC depends on the sampling rate and the SNR is mainly to produce a resolution, linearity, and accuracy. The SNR consists of an Effective number of bits. An ADC is used to match the bandwidth and the signal from the SNR to be digitalized. An ADC is provided with an electronic device that converts input analog voltage. The period of time required to convert analog to digital value depends on the clock source.

V. MICROCONTROLLER

The microcontroller is a compact integrated circuit chip that performs a specific operation that is embedded in a system. A microcontroller receives temporary information that is stored in its data memory and then it uses the input-output signal to perform the specified operation. Arduino UNO is the main component or source of the microcontroller board that consists of ATmega328P microcontroller. This board mainly consists of sets of analog and digital output or input pins that are interrelated with various other circuits. The microcontroller board consists of 14 digital Input/output pins that have 6 PWM output and in analog, it has 6 I/O pins. This board is programmable with Arduino IDE USB type B cable and this USB cable has voltage range between 7 and 20 volts. There are other similar boards such as Arduino Nano and Leonardo microcontroller. The ATmega328P which consists of the bootloader to upload new programs without any usage of external hardware devices.

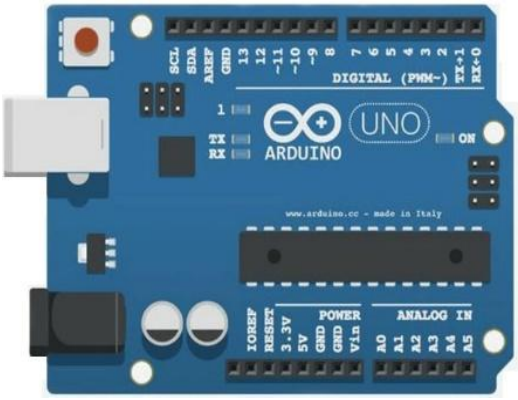

Fig:2 Arduino UNO ATMega328P

VI. LIQUID CRYSTAL DISPLAY

Liquid Crystal Display is a type of plane panel display which works on liquid crystals as a primary form of operation. LED have a large varying set of uses for consumers, as they are found in much electronic equipment. LCDs are important none in terms of the technology they replaced, which include a light-emitting diode (LED) and gas-plasma displays. LCDs area unit allowed displays to be a lot of diluent than electron beam tube (CRT) technology. LCDs consume low power than a diode and gas-display displays as a result of their work on the principle of obstruction lightweight instead of emitting it. Wherever associate diode emits lightweight, the liquid crystals in associate LCD produces a picture employing a backlight.

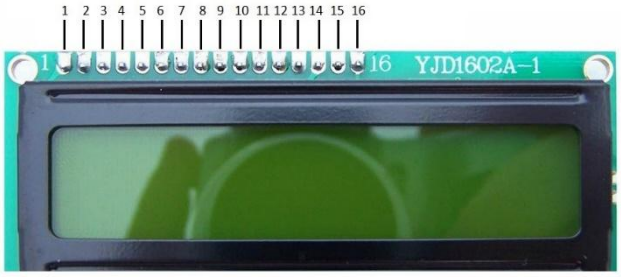

Fig:3 16x2 LCD Display

A show is created of various pixels. The standard of a show usually refers to the number of pixels; for instance, a 4K show is created of 3840 x2160 or 4096x2160 pixels. A picture element is created of 3 subpixels; a red, blue and green, commonly known as RGB. Once the subpixels in an exceedingly picture element modification color mixtures, a distinct color may be made. With all the pixels on a show operating along, the show will build various completely different colors. Once the pixels area unit quickly switched on and off, an image is made. The method a picture element is controlled is completely different in every sort of display, LED, alphanumeric display, and newer styles of displays all management pixels otherwise. LCDs area unit created with either a passive matrix or a full of life matrix show grid. The active matrix is additionally called a skinny film electronic transistor (TFT) display. The passive matrix alphanumeric display includes a grid of conductors with pixels set at every intersection within the grid.

VII. WORKING PRINCIPLE

The float sensor is placed inside the two-wheeler fuel tank. The LCD, 12V Lead-acid battery, ADC, and float sensor are connected to the Arduino UNO ATmega328P. The power is supplied to the Arduino board and the ADC and the float sensor using jumper wires. When the fuel is added to the fuel tank via the inlet of the fuel tank, the float sensor rises above its mean position. When the float of the float sensor rises above the voltage is induced inside the float sensor coil windings. Float sensor senses the level of fuel present inside the fuel tank and sends the generated analog voltage signal to the ADC. The ADC converts the analog voltage signal created by the float sensor into digital values. The digital signal which is converted by the ADC is sent to the Arduino UNO ATmega328P. The program which is suitable for the execution of the setup is uploaded on the Arduino board. The program receives input from the ADC and the program is run. After the compiling of the program, the input values are executed and the output is validated. The output which is generated by the program is displayed to the user using a 16x2 LCD display unit. The above procedure is repeated as a loop in the program as when the fuel is added to the fuel tank and also when fuel is directed out to the engine via fuel knob.

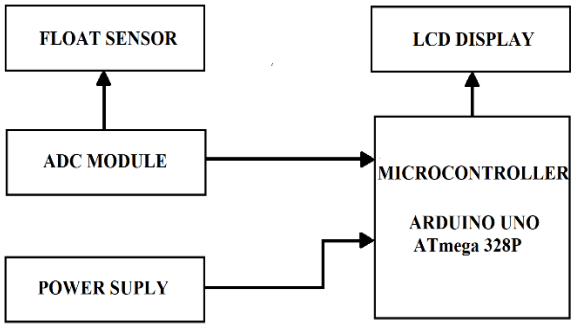

Fig:4 Block Diagram

RESULT

The result displaying the accurate values of the setup. The experimental results are taken using petrol as the inlet fuel which is majorly used in two-wheeler motor vehicles.

SI. NO.	ACTUAL INLET VOLUME (1)(L)	LCD VALUE (2)(L)	DIFFERENCE (1±2) (mL)	SI. NO.	ACTUAL INLET VOLUME (1)(L)	LCD VALUE (2)(L)	DIFFERENCE (1±2) (mL)
1.	2.000	2.090	90	13.	8.000	8.019	19
2.	2.500	2.582	82	14.	8.500	8.519	19
3.	3.000	3.010	10	15.	9.000	9.009	09
4.	3.500	3.511	11	16.	9.500	9.515	15
5.	4.000	4.030	30	17.	10.000	10.017	17
6.	4.500	4.518	18	18.	10.500	10.516	16
7.	5.000	5.059	59	19.	11.000	11.020	20
8.	5.500	5.515	15	20.	11.500	11.513	13
9.	6.000	6.008	08	21.	12.000	12.027	27
10.	6.500	6.519	19	22.	12.500	12.550	50
11.	7.000	7.005	05	23.	13.000	13.020	20
12.	7.500	7.512	12				

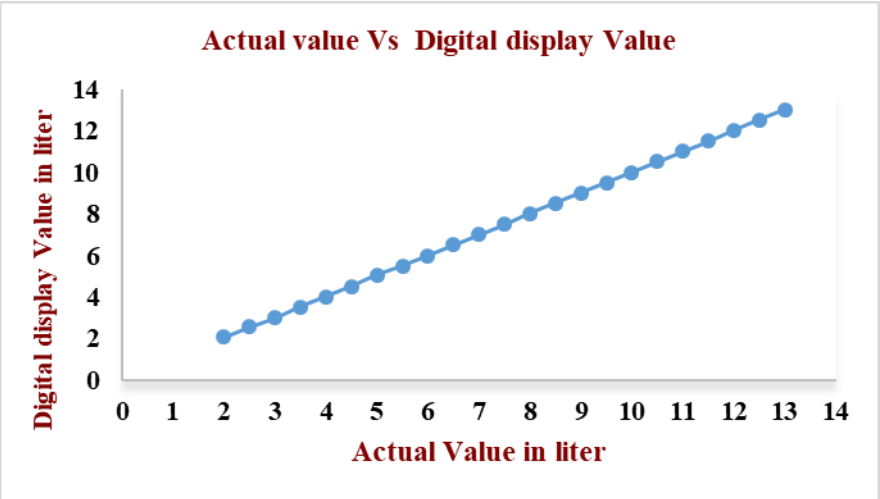

Fig:5 Model Setup for Digital Fuel

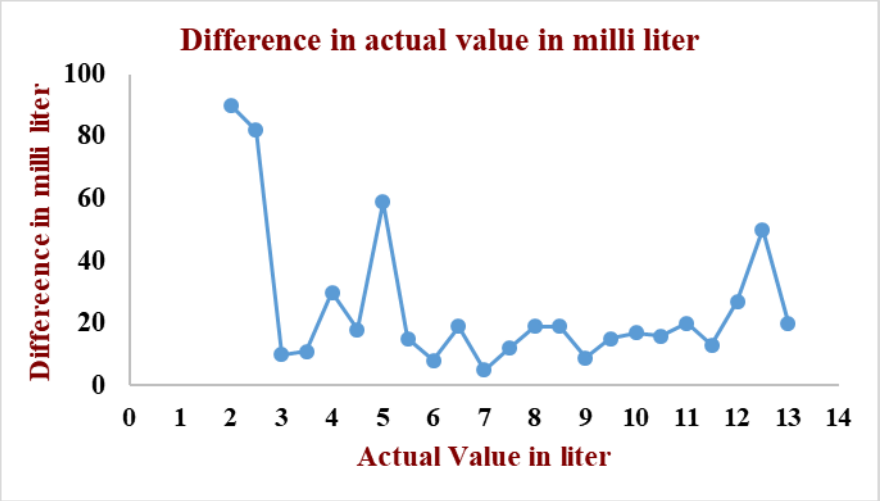

Fig: 6 Model Setup for Digital Fuel

VIII MODEL

Fig 7 Model Setup for Digital Fuel Level Indicator System for Two Wheeler Vehicles

The fig. 5 shows the deviation in actual value to display vale and fig. 6 shows the difference in actual value in milliliter. The experimental set up is shown in fig. 7.

VIII. CONCLUSION

The "Digital Fuel Level Indicator System for Two Wheeler Vehicles" indicates the quantity of the fuel in the fuel tank in the form of numerical values more accurately than the analog fuel level indicators. Thus, with this system, the user can now be able to judge how much distance can be traveled with the fuel indicated in the fuel tank. This can reduce the fuel theft which normally occurs in two-wheeler vehicles. It could also detect the amount of fuel injected in the gas stations inside the fuel tank and to reduce the fraudulent activities carried out by some of the gas stations.

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