Enhancing Fuel Efficiency with a Smart Fuel Level Indicator: A Modern Approach

Juan Pablo Morales*[1], Carlos Andrés Martínez[2], Luis Felipe Torres[3], Javier Sánchez[4] & Gabriel Rivas[5]
[1,2,3&4] Student, [5]Assistant Professor
[1]Department of Mechanical Engineering
[1]National University of Colombia, Bogotá, Colombia

ABSTRACT
In this digital world, fuel makers are very advanced. Now days, at many petrol pumps we get exact amount of fuel in our vehicle. In this project the existing fuel in gauge technique being used in automobiles. In operating principle of smart and traditional fuel gauge system are compare between two exiting technique base on cost, accuracy and performance. The elimination of float sensor is due to its low accuracy in fuel indication. In our project we have used ultrasonic sensor to display the results of fuel level indication. In this experimental method analysis of our project yielded us satisfactory results over the conventional methods.

Keywords: Liquid crystal display, Ultrasonic sensor, Arduino-uno board, Flow sensor.

INTRODUCTION
If the fuel indicator in the automobile is also made digital it will help to know the exact amount of fuel available in the fuel tank. We are including the amount of fuel in the tank in liters. This value in liters will be in numerical digits. In this project helps to avoid a lot of problems like fuel bunks at fuel station, fuel theft and prevent us from getting into situation where we have to push our vehicle due to assumption of the fuel. In fuel indicator system for the two- wheeler are 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 in terms of bars and not in number or digits like liter or milliliter. So this problem is taken into consideration for our project work of developing the digital (numerical) fuel indicator system for two wheelers which shows exact amount of fuel in terms of liters (L) or milliliters (ml). Hence, we have taken all the constrain into consideration and prepared all the problem stated above and found an appropriate solution toit.

WORKINGSYSTEM
When vehicles ignition is turned ON, the battery will power the arduino board and the sensor. At first, the ultrasonic sensor will measure the duration of the ultrasonic waves transmitted and received between the sensor and surface of the fuel. Now the program uploaded in the arduino board will convert the duration into distance using the formula (distance=duration*0.034/2) and again the distance is converted into liters by trial and error method. Note that the reading now calculated from ultrasonic sensor will not be changed until the reset button is pressed. The reset button should be pressed only when filling up additional fuel into the fuel tank. Now the second output from the flow sensor will be in terms of liters. The modified output from the ultrasonic sensor and the second output from the flow sensor is taken and the difference between these two values gives the final fuel level indication in liters which will be displayed in Liquid Crystal Display fixed near the instrument cluster. The ultrasonic sensor will be positioned inside the fuel tank where the depth ismaximum..

DESIGN AND IMPLIMENTATION:- Component –
1. ARDUINO UNO BOARD:- The Arduino Uno is a microcontroller board based on the AT- mega 328. It has 14 digital input / output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a resetbutton.
2. ULTRASONIC SENSOR:- Active ultrasonic sensor generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiver the echo to determine the distance to anobject.
3. LIQUID CRYSTAL DISPLAY:- LCD screen is an electronic display module and finds a range of application. A 16*2 LCD display is very basic module and is very commonly used in various devices and circuit. These modules are preferred over seven segments.
4. BATTERY:- A 12-volt 7Ah battery is used to give supply to Arduino board, sensor andLCD.

PRINCIPLE AND WORKINGSYSTEM:-
In the vehicle tank using ultrasonic sensor. The ultrasonic sensor has a better accuracy and it is easy to calibrate and interface it with Arduino controller which is used. The ultrasonic sensor sends ultrasonic waves and reflects it back to the receiver unit of the ultrasonic sensor. In this way we can find the level of fuel in the tank if we know

the time required by the ultrasonic sensor to travel. We have used Arduino because it is more reliable than 328 controller.

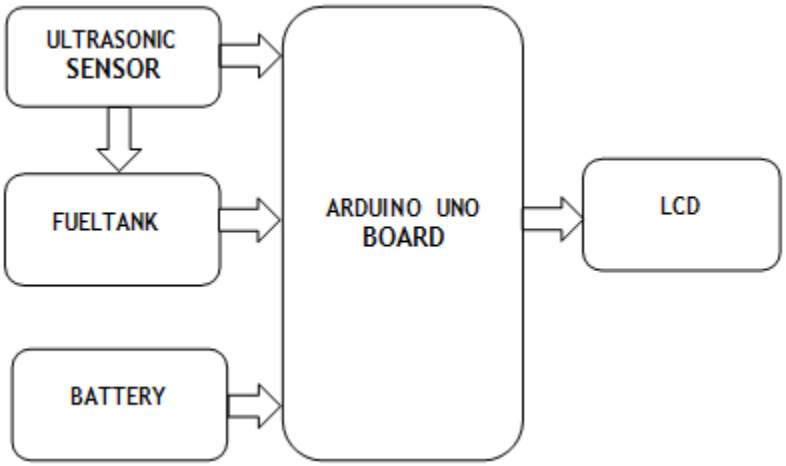

Figure 1: Block diagram of smart fuel indicator

It can help to actively display the exact amount of fuel in a motorbike in real time. It involves the making of the system to provide a more accurate fuel level indicator which is reliable, easy to read and of dependable/compatible overall design. The system comprises of fuel tank, ultrasonic sensor, flow sensor, battery, and arduino board with LCD display. The harmonious interactions of all these connections will yield the best possible results.

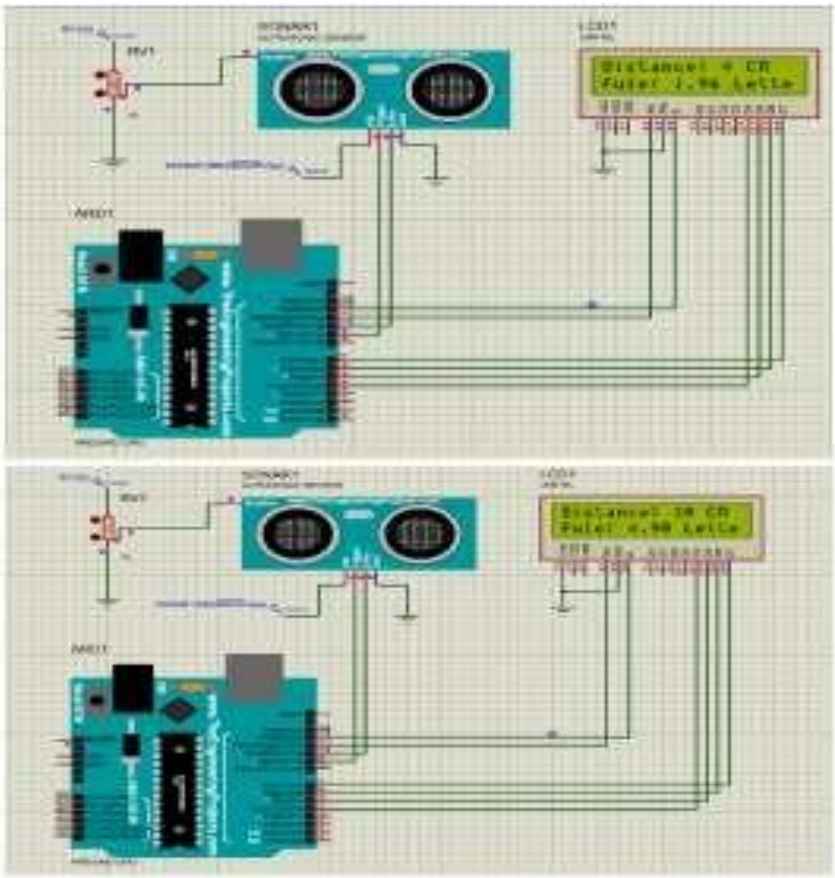

Figure 2 : Simulation of smart fuel indicator with Arduino board and ultrasonic sensor

DISCUSSION AND CONCLUSION

The deployment of flow sensor and ultrasonic sensor in fuel level indicator have yielded satisfactory results over the conventionalfuellevelindicatedto94%withatoleranceof±0.1 liters. This method will yield accurate results while driving on plane surfaces or roads and the accuracy will reduce while driving on slops or hills.

The entire system is more economical and reliable. The system requires less maintenance. As years passes, technology gats updates and different solutions arises for the same problem. And the usage of ultrasonic sensor and flow sensor to digitalize and indicate the fuel level in two wheeler two wheeler is one such up-gradation to this problem.

REFERENCE

1. *Sandeep , S.R Adars, B.S, Rohan Kumar**, " Automatic Monitoring of fuel in Vehicles UsingATMEGA328 Microcontroller".** International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering. Vol. 5, Issue 5, May2016*
2. *A.Avinashkumar, U.Singaravelan, T.V.Premkumar, K.Gnanaprakash**."Digital fuel level indicator in two- wheeler along with distance to zero indicator"** IOSR Journal of Mechanical and Civil Engineering(IOSR-JMCE)*
3. *International Journal of Innovative Research in Science, Engineering and Technology National Conference on Trends in Automotive Parts Systems and Applications (TAPSA-2017)30th& 31st March 2017 Organized by Sri Krishna College of Engineering & Technology, Kuniamuthur, Coimbatore-641008,Tamilnadu, India "**Digital Indication of Fuel Level in Liters in Two Wheelers"***
4. *International Journal of Science, Engineering and Technology Research (IJSETR) Volume 6, Issue 4, April2017, ISSN: 2278 -7798 **"FUEL MONITORING SYSTEM FOR FUELMANAGEMENT"***
5. *Digital fuel level indicator in two-wheeler along with distance to zero indicators, Assistant Professor, Priyadarshini Engineering College/ Anna University, Tamilnadu, India.*