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Advancement In Accuracy Of Automotive Sensing

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Abstract

The objective of this paper is advancement in accuracy of digital fuel indicator and in tail light system. Hence because of the arduino is used advancement in number of automotive sensing systems can be implemented. Because of arduino, device consist of two systems. To eliminate the conventional fuel level indication in two wheelers which uses float sensor to indicate the fuel level. The elimination of float sensor is due to its low accuracy in fuel indication. In this competitive world, everyone strives for greater accuracy than the previously proposed ones. In order to increase the accuracy, we have used ultrasonic sensor and load cell sensor to display the results of fuel level indication. For advancement in braking is to replace the conventional braking lights of the two wheelers by gradually color changing braking lights. The conventional braking lights glow only in single color during any situation. For e.g. if the brake is pressed just to slow down the vehicle then the brake lights glow at same intensity as when the brake lights are pressed for stopping the vehicle in emergency situation. In advanced tail light system tail light system shows three different colors according to braking pressure intensity i.e. for low intensity it shows yellow color for moderate intensity it shows orange color & for high intensity it shows red color.

*Keywords— Precise fuel measurement, rear light detection, ultrasonic measurement, load cell, digital fuel indicator***.**

I. INTRODUCTION

For indication of fuel level, two major sensor are used to find the duration of ultrasonic waves transmitted and received between the sensor and the surface of fuel. The result are received by arduino board and the arduino programming converts the duration into distance. This distance is again converted into liters. Other is the load cell amplifier which is used to measured actual weight of fuel. This output from the load cell amplifier is given to the HX711 load cell amplifier. This data is then display on LCD/LED display. the other part of project is consist of 12V LED strip which glows in different colors according to the pressure applied on brakes which is measured by piezoelectric transducer.

Fig .1 Conventional fuel indicator.

Fig .2 Advanced fuel indicator

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Conventional fuel indicator does not give value in terms of numerical i.e., 1lt,2lt,3lit, etc in two wheelers. So to eliminate the use of conventional fuel indicator because of its low accuracy, digital fuel indicator used. it gives exact amount of fuel present in tank.

Similarly in conventional brakes the tail light glows only in single colour in any condition of braking pressure. To avoid this and to obtain greater accuracy we used piezoelectric sensor for smart brakes which glows up in different colour according to different pressure intensity.

II. LITERATURE SURVEY

Fuel Measurement using Load cell publish in International Journal Of Engineering and Technology by [1] Raveena A, Deepa R in 2017.Fuel measurement using load cell with arduino is less costly and the system does not have any complexity. It can be implemented with other microcontroller and also it can be implement on other type of vehicle they suggest by interfacing GPS(Global Positioning System) module with arduino then it will indicate the vehicle position with the help of satellites.

Advanced Digital Fuel Meter and Electronically Controlled Devices published in International Journal Of Engineering and Technology Enhancement and Emerging Engineering Research by [2]Elumangandla Surrender and Poreddy Prashanth.They concluded that their project gives the indication of parameter like fuel level and battery percentage. They also implemented battery level indicator which indicate the remaining amount of charging present in battery.

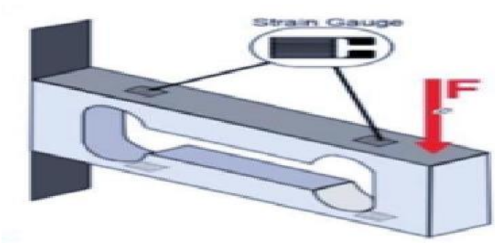
Design Of LED-Edge lit bar for automotive tail light application published in SPIE-2013 by [3]jhy-cheng- yu. Study illustrate the design procedure for an automotive tail light using edge lit LEDs. They proposed effective solution to fulfil the design requirement of lighting efficiency and uniformity. V cuts are selected as the coupling features to divert the light source By adjusting the lead angles of V cuts, the illuminance peak is aligned to the axial illuminance intensity to enhance the lighting efficiency.

Modified Type Intelligent Digital fuel Indicator System published in International Conference On Advances in Engineering and Technology by [4]Nitin Jade, Pranjal Shrimali,Arun Patel, Sagar Gupta in 2014. It gives the idea about digitise fuel indicator and the by present amount of fuel in tank how much the vehicle will covered the distance in K.M. In their case three basic part of fuel gauge are use (ECU+CPU+MODULER) for sensing.

III. ADVANCEMENT IN FUEL INDICATOR

Conventional fuel indicator does not give value in terms of numerical i.e., 1lt,2lt,3lit. etc in two wheelers. So to eliminate the use of conventional fuel indicator because of its low accuracy, digital fuel indicator used. it gives exact amount of fuel present in tank. To monitor the level of fuel present in tank and automatically display the information through LCD Display. Ultrasonic sensor and load cell plays a important role in digital fuel indicator. Load cell gives the exact weight of fuel. Following Components are use for advancement in fuel indicator.

A) Load Cell- Load cell is a sensor which convert the load into electronic signal in the form of frequency, voltage, current depending upon the type of load cell and circuitry used.



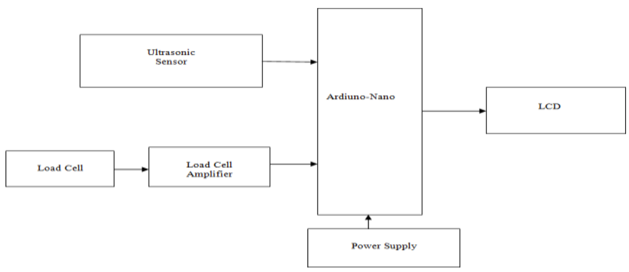


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Fig .3 Load Cell

Fig .4 Block diagram for advanced digital fuel indicator

When the load is applied on the load cell then it will deflect as shown in below. It creates strain due to different forces are applied on them. Following images shows deformation under various load condition.

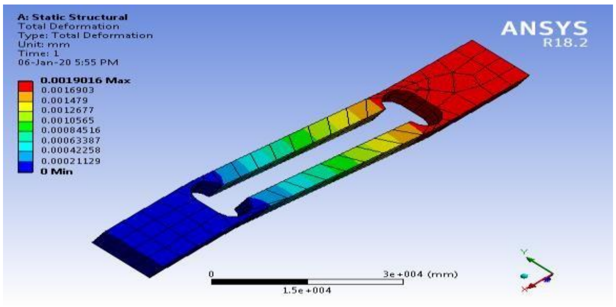

Fig .5 Ansys analysis I

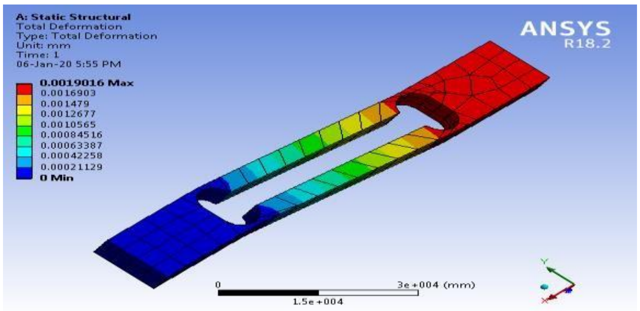

Fig .6 Ansys Analysis II

B) Arduino-Nano- All inputs and outputs are connected to this arduino nano AT mega 328P is a 8 bit AVR family microcontroller. Operating Voltage for microcontroller is 5V. It consist of Six analog pin and 14 input/output pins. Serial pins Rx, Tx used to receive and transmit TTL serial data. AREF is used to provide reference voltage for input voltage. arduino programming converts the duration into distance. This distance is again converted into liters.

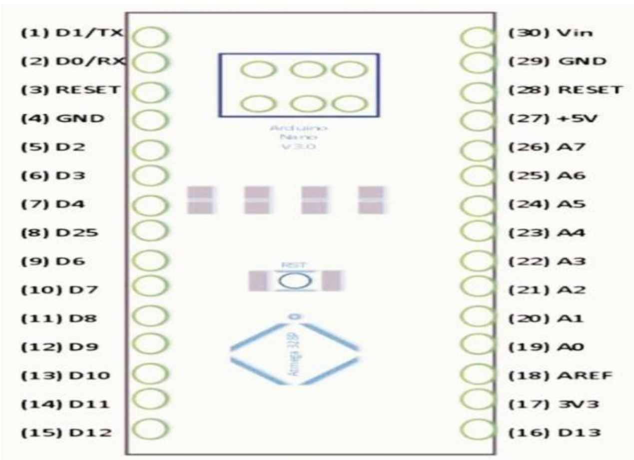

Fig 7 Pin diagram For arduino nano

C) Ultrasonic sensor- Ultrasonic sensors are used to indicate the percentage level of fuel present inside the tank. Ultrasonic sensor uses ultrasonic sound wave to measure the distance from the fuel level inside tank. Which is converted into percentage value which is shown on LCD display.

Table .1 Ultrasonic sensor readings

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Sr. No.	Fuel in liters inside tank (Lit)	Distance measured by Ultrasonic sensor (cm)	Percentage value (%)
1.	0	30	0
2.	0.62	28.12	6.25
3.	1	27	10
4.	1.25	26.25	12.5
5.	2.5	22.5	25
6.	3	21	30
7.	4	18	40
8.	5	15	50
9.	7.5	7.5	75
10.	1 0	0	100

IV. ADVANCEMENT IN TAIL LIGHT SYSTEM

Conventional tail light system , when rider applies brakes only the red color light is illuminated. Which does not shows the intensity by which the rider is applying brakes it causes accidents .

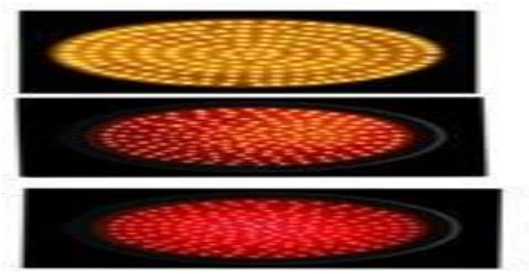

Fig .7 Conventional tail light system

Fig .8 Advanced Tail light system

Advanced tail light system uses Piezoelectric sensor to sense the intensity at which the brakes once applied accordingly different colours as shown in RGB/LED. Piezoelectric sensor consist of quartz crystal which have property of generating voltage when load is applied on them. The generated voltage is directly proportional to the load. this voltage calibrated to illuminated different colours over the RGB LED.

Table .2 Braking conditions

Color Name	Color	Breaking Pressure
Yellow		Low
Orange		Medium
Red		High

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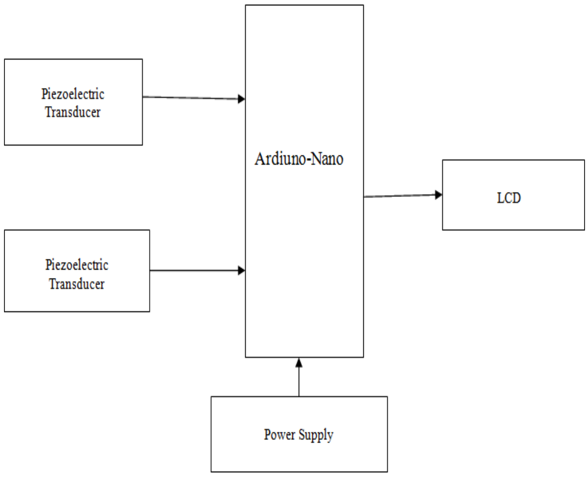

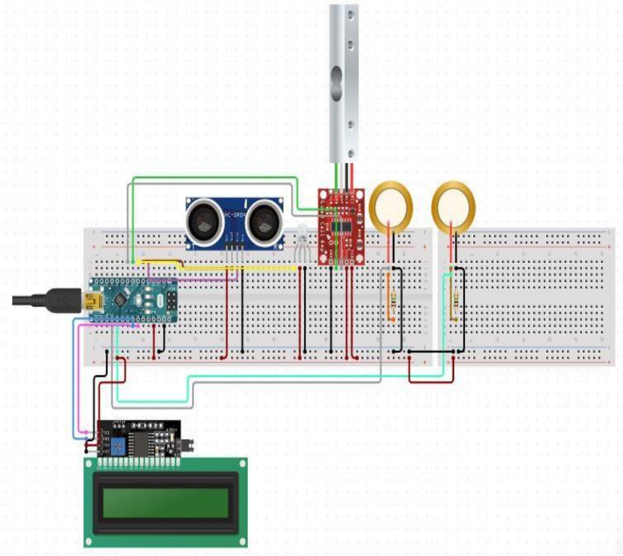

Fig .9 Block diagram of Advanced tail light system   Fig .10 System architecture

V. ALGORITHM

Fuel Indicator -

Input: trig, echo, weight Output: percent fuel, load fuel Notation:
trig: trigger from ultrasonic sensor echo: echo from ultrasonic sensor weight: weight of fuel
percent fuel: percentage of fuel load fuel: load of fuel Algorithm:
print percent fuel according to trig and echo signal print load fuel according to load on load cell strain gauge

Tail light :

Input: pres Output: r, g, b Notation:
pres: Pressure on piezoelectric transducer r: Signal to red pin of RGB LED
g: Signal to green pin of RGB LED b: Signal to blue pin of RGB LED
Algorithm:
if pres> threshold3 then set colour == red
else if threshold3 >pres> threshold2 then set colour == orange
else if threshold2 >pres> threshold1 then set colour == yellow
else if pres = 0 then set no color

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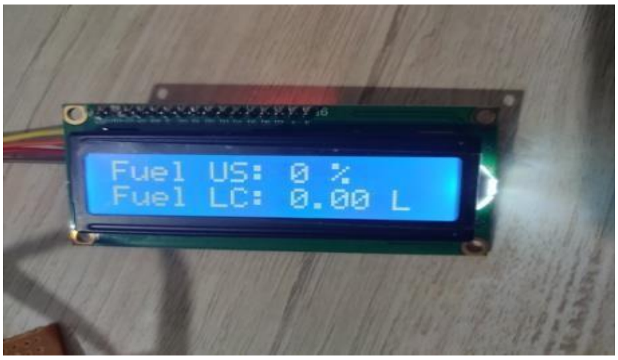
VI- PERFORMANCE TESTING

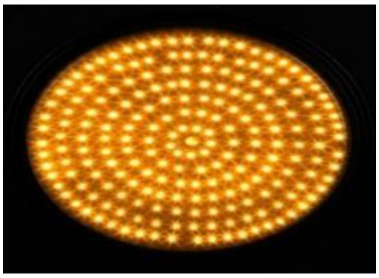
After the prototype is ready many test were conducted on fuel indicator and tail light system. Testing was conducted by pouring different amount of fuel in fuel tank and the results recorded



as per following

Fig .11 When fuel tank is empty Fig .12 When eight liters of fuel is poured

Testing of tail light system is done by Applying different braking conditions-



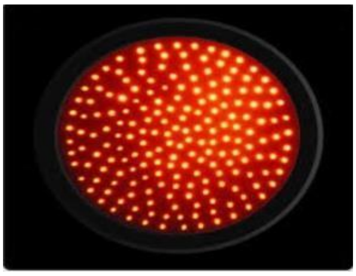


Fig .13 When break intensity is low Fig .14 When break intensity is moderate Fig .15 When break intensity is high

VII CONCLUSIONS

Since all the component used in this system are easily available and the system errors can be easily fixed using proper measure, hence the system can be implemented properly. It will solve the problem of analog fuel indication and also solve the issue of improper braking system. It improves safety regarding brake lights.

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