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Real Time Fuel Monitoring System in Fuel Filling Stations

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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 thereof. The same is true for fuel tanks in fuel station. Still now most of the fuel stations fuel monitoring is done manually. This proposed system helps to monitor and measure the fuel level in the fuel tank in fuel station in accurate manner. The fuel level of the tank is measured by ultrasonic sensor and it is converted to volumetric equivalent in litres with the aid of tank volume equation programmed in the microcontroller. The ultrasonic sensor is placed in the side of the with the vacuum tube consists ball. The movement of ball which is sensed by the sensor indicates the fuel level inside the tank. This information will be updated on the cloud using an android application. This can be viewed by the manager in the fuel station. In addition to that temperature of the tank surface, density, pressure of the fuel inside the tank is also determined by the sensors and software used. The developed fuel level measuring system can be deployed for using in fuel stations to get information about the quality of the fuel in the tank.

KEYWORDS: Raspberry pi development board, Ultrasonic Sensor, temperature sensor.

I.INTRODUCTION

The existing fuel indicates system in fuel tank showing approximate status of fuel level, not presenting the quantity in numerical. This system referred shows the fuel level in numerical form by using LCD. This proposed design will be helpful to control the flow of the fuel in the vehicle, and continuously displays the fuel left. This is done by controlling the fuel usage with the help of units placed in the fuel tank and when the fuel tank gets empty an indication is given. Based on raspberry pi development of this design is done and to indicate the fuel that is present in the vehicle LCD display is used as output unit.

II.EXISTING AND PROPOSED SYSTEM

The existing project consist of a special type of sensor which is float type sensor in which the value of resistance is varied based liquid level. The variable resistance from the float sensor is converted into an equivalent voltage through the voltage converter circuit. This voltage signal is amplified by passing the voltage signal to the amplifier. Then the amplified signal from the float sensor is converted to a digital signal through Analog to Digital Converter (ADC). The digitised signal from the ADC is given to the PIC microcontroller.

The sending unit consists of ultrasonic sensors fixed at the surface of the fuel tank according to the dimensions of the tank. Fuel levels are sensed by the sensors and are sent to the Raspberry Pi Microcontroller and the average fuel level is calculated. The Calculations of level of volume remaining in the tanker depend upon the dimensions of the tank. For Example, A rectangular tanks volume depends on its length, width and height whereas the volume of a cylindrical tank depends on the diameter of its base and height of the body. The data is then displayed in the display system in the fuel station through the wifi.

III.BLOCK DIAGRAM

The sending unit consists of ultrasonic sensors fixed at the surface of the fuel tank according to the dimensions of the tank. Fuel levels are sensed by the sensors and are sent to the Raspberry Pi Microcontroller and the average fuel level is calculated. The Calculations of level of volume remaining in the tanker depend upon the dimensions of the tank. For Example, A rectangular tanks volume depends on its length, width and height whereas the volume of a cylindrical tank depends on the diameter of its base and height of the body. The data is then displayed in the display system in the fuel station through the wifi.

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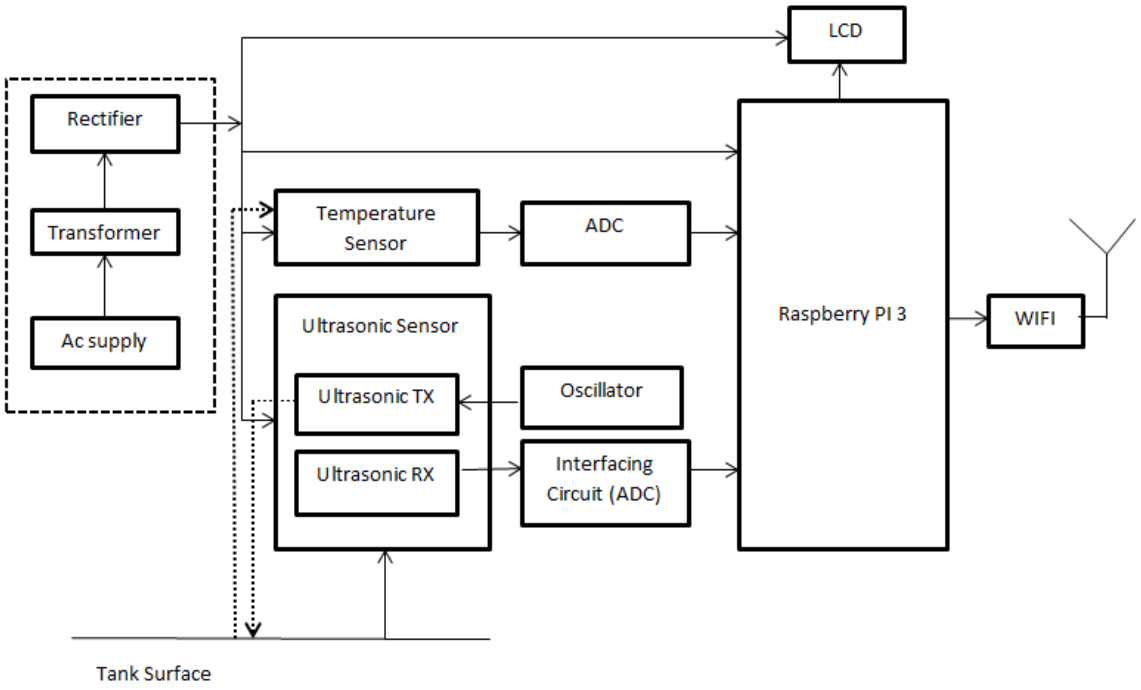

Fig 1: Block Diagram

IV.HARDWARE REQUIREMENTS

A.RASPBERRY PI

The Raspberry Pi is a credit-card sized computer that plugs into your TV and a keyboard, which can be used for many of the things that your average does - spread sheets, word- processing, games and it also plays high definition video. The Raspberry Pi charitable foundation wants to see the device being used by kids all over the world to learn programming and electronics.

Pi was introduced as an educational gadget to be used for prototyping by hobbyists and for those who want to learn more about programming. It certainly cannot be a substitute for our day to day Linux, Mac or Windows PC.

Pi is based on a Broadcom SoC (System of Chip) with an ARM processor [~700 MHz], a GPU and 256 to 512 MB RAM. The boot media is an SD card [which is not included], and the SD card can also be used for persisting data. Now that you know that the RAM and processing power are not nearly close to the powerhouse machines you might have at home, these Pi's can be used as a Cheap computer for some basic functions, especially for experiments and education. The Pi comes in three Configurations and we will discuss the specifications of those in the coming sections. The cost of a Pi is around $35 for a B Model and is available through many online and physical stores.

B.TEMPERATURE SENSOR:

A temperature sensor(thermistor) is a type of resistor which the resistance of sensor varies with the temperature. Thermistor are used in inrush current limiters, temperature sensors, self-resetting over current protectors, and self-regulating heating elements.Thermistors and RTD is not same they differ in the material used. In the thermistor generally a ceramic or polymer is used, while RTDs use pure metals. The response of temperature is also different. RTDs used in larger temperature ranges, the thermistors used within limited temperature[usually −90°C to 130 °C]to achieve a higher precision.

C.ULTERASONIC SENSOR:

The ultrasonic sensor circuit is designed to find the distance of the object which uses the ultrasonic waves.The 40 KHz frequency signal is generated by microcontroller12F675.This frequency signal is passed to level logic converter (MAX232) to convert to TTL output pulse to +12v and -12v pulse. Then this pulse is transmitted through ultrasonic transmitter.

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The ultrasonic wave is transmitted from ultrasonic transmitter in the air and touches the nearest object and reflected from the object which is received by the ultrasonic receiver. The received signal is passed to amplifier.Here the received weak signals are amplified. After this amplification, the amplified wave is amplified in order to change the wave range is above 6v by passing the wave from the amplifier to zero adjustment amplifier. Then the output is given to comparator in order to the signal is converted into corresponding square wave signal. Thesquare wave signal is passed to input of the microcontroller. Here the microcontroller compares the time between the transmitted signal and received signal and produces the corresponding pulse output which is equal to distance of the object. Then the pulse signal is given to input of BC547 transistor.

D.WIFI

A Wi-Fi is used to connect the device, such as a personalcomputer, video game console, smartphone or digital audio playerto the Internetwithin range of a wirelessnetwork connected to the Internet. The coverage of interconnectedaccess points called hotspots consist an area as small as a few rooms or as large as many square miles. Coverage of larger area will depend on a group of access points with overlapping. As of 2008 more than 300 Wi-Fi (Muni-Fi) projects had been created. Asof 2010 the CzechRepublic had more than 1000 Wi-Fi based wireless Internetserviceproviders. Line modem or acable modem and a Wi-Fi access point, often set up in homes and other buildings, provide Internet access and internetworking to all devices tuned into them, wirelessly or via cable.

V. SOFTWATE TOOLS

A. PYTHON

Python is a high-level, interpreted scripting language developed in the late 1980s by Guido van Rossum at the National Research Institute for Mathematics and Computer Science in the Netherlands. The initial version was published at the alt. sources newsgroup in 1991, and version 1.0 was released in 1994.

B. PCB DESIGNING

Design and fabrication of Printed circuit boards.

Printed circuit boards form the core of electronic equipment in domestic and industrial. it is mainly used for computers, process control, telecommunications and instrumentation.

i. MANUFACTURING

ii. SOFTWARE

- ✓ MICROSIM.

iii. PANELISATION

iv. DRILLING

v. PLATING

vi. ETCHING

vii. SOLDERMASK

viii. HOT AIR LEVELLING

VI.WORKING METHODOLOGY

In this proposed method the ultrasonic sensor that is fixed with the vaccum tube with the float like a ball in the side of the tank. This float moves based on the fuel inside the tank. The sensor senses the float in the tube. Once the sensor senses, the ultrasonic wave is reflected to the ultrasonic receiver in the sensor. The time between the ultrasonic wave sent and received is used to calculate the distance between the sensor and float. From this distance the fuel in the tank is calculated using the volume of the tank. This is done in the program that is dumped in the Raspberry Pi. At the same time, the temperature in the tank also measured using the temperature sensor.

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Here the microcontroller is the flash type reprogrammable microcontroller in which we have already programmed. Now the microcontroller displays the corresponding liquid level on the LCD display. Alarm used for indicating the low level.

The voltage value of 7V is kept as base value. When voltage is minimum than 7V the boost convertor come into action which boost the voltage to the value of 15V. When the voltage rises over 15V the buck convertors come into action which reduces the voltage into a voltage of 15V. Thus, the voltage of 15V is used to charge the battery, this comes from the sources of solar and wind. This battery is connected to invertors which convert the dc charge into ac charge which is given to load. The load used here is CFL bulb. Based on the availability, it will automatically Charge the battery using the availability of the sources.

VII. RESULTS AND DISCUSSION

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 our project and we 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 litres. This value in litres will be in numerical digits (ex: 1.2, 1.3 and 1.4). This project mainly concentrates about the indication of fuel level in two- wheeler tanks. Various other features like the temperature in the tank also to be found. This project helps to avoid a lot of problems like human error while measuring the fuel level, fuel theft. Nowadays the fuel indicator system for the fuel tank 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 numbers or digits like Litre or Millilitre.

So, this problem is taken into consideration for our project work of developing the digital (numeric) fuel indicator system for fuel tank which shows exact amount of fuel in terms of Litres(L) or Millilitres (ml). In this project we first surveyed the existing fuel indicator systems and fuel tanks of different fuel stations. During this survey we examined that the shape of the fuel tanks is in irregular fashion. But due to irregular shape of the tanks there were many complexities arising for the installation of electronics kit and level sensors which are used for calibration of fuel amount. Hence, we have taken all the constraints into consideration and prepared a project to address all the problems stated above and found an appropriate solution to it.

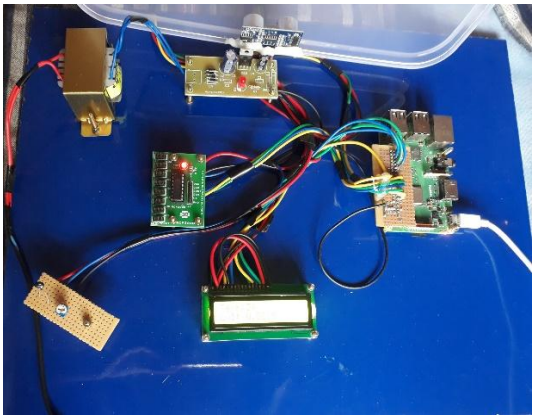

Fig 2. Circuit connection

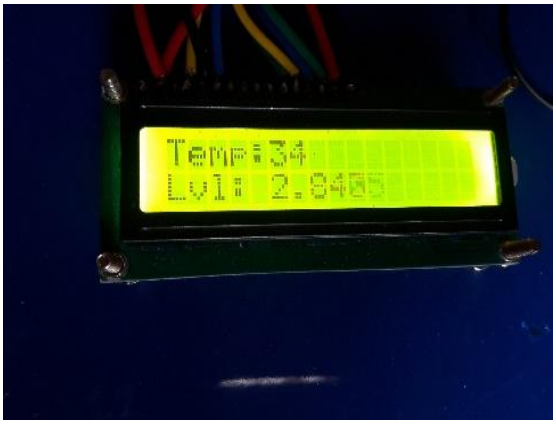

Fig 3. Output in LCD

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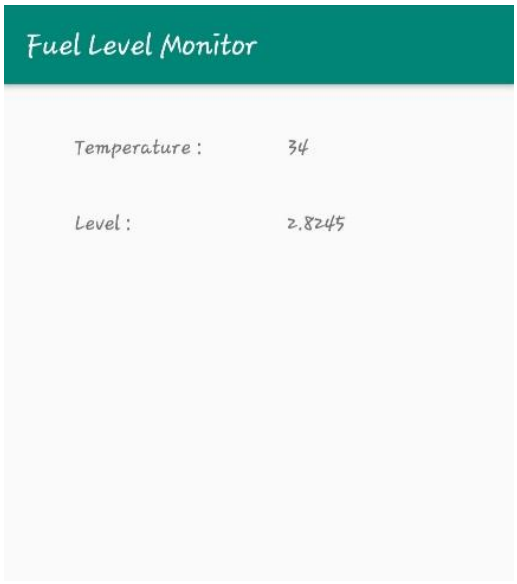

. Fig 4. Output in Android Application.

VIII. CONCLUSION

In order to overcome manual fuel measuring difficulties, this proposal can be used to measure the fuel consumption in fuel filling stations by indicating fuel level. Here we conclude that the system is used to identify the level of the fuel present in the fuel tank and also the system predict the volume of the fuel present inside the fuel tank and further the notification of the fuel level will be send to the fuel station owners through an android application connected with IoT even if they are far away, for such case this proposal might be very useful.

IX. FUTURE SCOPE

The future scope of this project is in the proposed system we can able to measure the fuel level in the tank of the fuel station by using the controllers. From this system we can avoid the errors done by person who take a measure the fuel manually. It can also use to measure the fuel level in the tank of the vehicles.

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