Ultrasonic Liquid Level Detector Using Microcontroller

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Abstract

Fuel is one of the most important and recent crises in present situation. Though the people are working on to find out the alternative way to provide a better renewable energy source, the hike and need for coal and petroleum never stops. The transmission of petroleum and its products takes place only through the highways by means of tanker Lorries. Since the total quantity of the petroleum reduces as a result of carelessness and selling it to get more money, there exist a gap between the sender and the receiver. To avoid all those mischievous, our system provides a secured and compact device that can measure the amount of liquid in the container and transmits to sender as well as the receiver to avoid further chaos.

Keywords: ***Liquid level, transmission of data, Microcontroller, device etc.***

1. Introduction

The fluid level estimation takes a shot at utilizing closeness sensor. Ultrasound is the most generally and less expensive sensor utilized nearly. Ultrasonic sensors work likewise as radar and sonar. Ultrasonic handsets (including a ton of an ultrasonic transmitter and authority) convert essentials into ultrasound. They make high repeat sound waves and evaluate the resolution which is gotten back by the sensor. The time interval between sending the sign and tolerating the resolution (time-of-flight, TOF) is resolved to choose the partition to a thing. The properties of the ultrasound signal are interesting for use in indoor arranging systems (IPS). Ultrasonic advancement has a couple of good conditions, including high sign sufficiency, high repeat, high affect the ability and a high invading power. The sensors are definitely not hard to use and safe during action for near to things, individuals, or material

2. Literature Review

Fuel burglary by taking limited quantity of the fluid inside the tank frequently occurs in the fuel conveying tankers. To vanquish this issue, scarcely any associations use ATG (Automatic Tanks Gauge) yet it just figures the liquid volume in the administration station not in the oil tank.[1] To register the liquid volume inside the tank, a fluid speed sensor that is embedded in the oil tap can be used. This procedure can be completed if the spillage starts from the oil tap. In any case, in case it begins from the other opening, this technique won't a triumph.[2]. The other methodology is using a fuel level sensor inside the oil tanker and GPS sensor to screen the oil tanker. The checking result is starting at now alluring by using maps, yet the fuel sensor will fail if the oil tanker is on the tilted street.[3] To overcome the insult, a fuel level sensor mounted on the fuel tanker with an arm on floater can be used. In any case, this approach can have less accuracy since it

simply has 1 sensor. It moreover just sends the OK data in a plain trek so it's hard for the customer to screen the zone and the fuel volume.

2.1 Ultrasonic Sensor

Ultrasonic sensor is electronic gadget that change the electrical vitality into mechanical vitality as ultrasonic sound waves. Ultrasonic sensors are most generally utilized because of its effortlessness and minimal effort. The sensor comprises of a progression of ultrasonic transmitter and recipient. The precision of the deliberate separation is reliant on the division between the ultrasonic transmitter and recipient [4][5]. Case of ultrasonic utilization is separation estimation of an article in the way of an individual, gear, or a vehicle, stationary or moving is utilized in countless applications, for example, automated development control, vehicle control, daze man's strolling stick, clinical applications, paired gas blend division, and so on [6][7][8]. This device is utilized to gauge the ultrasonic waves. Ultrasonic waves are mechanical waves which have the trademark longitudinal and commonly have a recurrence over 20 kHz. Ultrasonic waves can engender through the strong, fluid or gas. Ultrasonic waves will be rushes of vitality proliferation and mechanical energy that spread through the third component as the cooperation with the particle and the idea of the medium latency way [9].

2.2 Arduino

The Arduino incorporated advancement condition (IDE) is a cross-stage application written in Java. Arduino programs are written in C or C++ [10]. The Arduino Uno Boards are transferred with explicit projects that empower them to play out their necessary activity [11]. Arduino is adaptable (offers an assortment of sources of info, interface, and yield), cheap, and can speak with programming running on your PC [12].

2.3 GPS

GPS (Global Positioning System) is a radio-based route framework that gives data about the directions of the position, speed, and time to clients around the world. The utilization of GPS satellite administration can't. Clients just need a GPS beneficiary to decide the directions of the

area. The exactness of the area arranges to rely upon the sort of GPS collector. GPS comprises of three sections: satellites circling the Earth (The GPS satellites circle the earth two times per day), control and checking stations on Earth, and the GPS receiver [13]. Case of GPS executions are: land vehicle route [14], human action [15], and following framework [16][17].

GPS yield information group is characterized by the NMEA (National Marine Electronics Association). Case of GPS information is '\$ GPGGA, 061 648, 0.276513, S, 112.791692, E, 1, 09, 0.8, 70.0, M, 1.5, M, * 5E'.

2.4 GPS/GPRS/GSM Shield

GPS / GSM / GPRS Shield version 3.0 is a product of DF Robot. The shield supports Quad-band GSM / GPRS frequency at 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz the shield is also equipped with a GPS antenna for satellite navigation purposes which enable system to send data location over GSM networks [19][20]. This shield needs specific command called AT command.

2.5 Bluetooth Module HC 05 & HC 06

Bluetooth innovation has been considered as a modest, solid, and forces the productive substitution of links for associating electronic gadgets in a short-range [18][19]. Bluetooth is an extraordinary convention for remote correspondence since it's fit for transmitting information at almost 1MB/s while devouring 1/100th of the intensity of Wi-Fi [20].

HC 05 and HC 06 are a Bluetooth module that is perfect with the Arduino microcontroller. This module fills in as a module on Arduino. It goes about as the media information beneficiary or sender through the air (remote). The two modules utilize the AT order.

3. Objective of the project:

The essential point of view of our system is to identify fluid level volume watching using an ultrasonic sensor and Arduino microcontroller. The structure sorts out:

• Initially, the ultrasonic sensor identifies and sends information as for the stature of the fluid to the microcontroller.

• Then the Bluetooth modules send data from the sensors to the Arduino microcontroller.

• Arduino Microcontroller is used to figure the liquid volume.

• Furthermore, GPS/GPRS/GSM Shield module used to get the area of the vehicle and sent the data to the customer Server. The flow diagram of Bluetooth module is shown in fig.1.
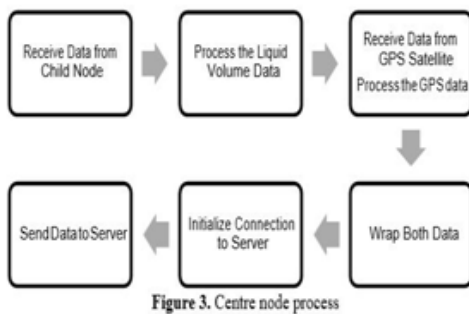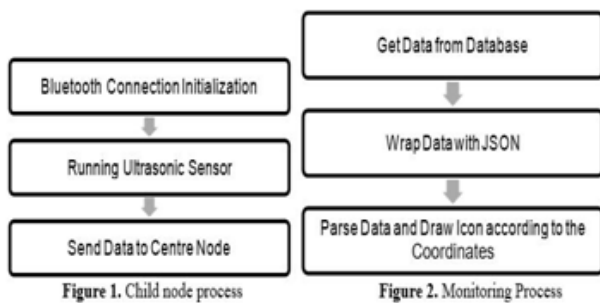

Figure 1. Child node process

Figure 2. Monitoring Process

Figure 3. Centre node process

Fig.1. Flow chart of Bluetooth module.

4. Proposed System

4.1 Design

In the proposed procedure the structure can calculate the fuel volume even in a tilted road with more precise than past methods. The advantage of this structure is the customer doesn't have to request the data. The structure will send the data regularly to the server, save it on the database, and demonstrated the record in the customer's program in a visual way. This structure uses ultrasonic sensors to screen the fluid stature, Bluetooth modules to send data from the sensors to the Arduino microcontroller, Arduino microcontroller

to calculate the liquid volume, GPS/GPRS/GSM Shield module to get the longitude and longitudinal area of the vehicle and send it to the Server. From the server, the data will be readied and the yield is appeared in a web program. It will show a guide and exhibit the area of the oil tank and the liquid volume.

4.2 Methodology:

This exploration makes a checking arrangement of fluid volume inside the fuel tank by joining a few segments: Ultrasonic sensors, Arduino microcontroller, Bluetooth module and GSM/GPRS/GPS Shield v3.0. These parts are intended to frame a straightforward remote system for getting fluid volume information in the tank and get the area of the tank. The framework sends the information to the server, prepared by the server, and show by means of electronic application.

To screen a fuel tank, the vehicle, limit, the course, and the liquid volume should be enrolled before it leaves the base. For whatever time that the vehicle has not accomplished the objective, the portions which are embedded in the vehicle will continually send liquid volume data and vehicle region data at standard interims. In the web application, the vehicle image will incessantly move as demonstrated by the bearings of the watched vehicle. The vehicle images contained information fair and square of the volume of the tank on the checked vehicle. This structure uses leaflet.js API for representation of the guide and the vehicle in the program. The ultrasonic sensor used to get the significance of the liquid in the tank. To grow data authenticity, this structure uses ultrasonic sensors. Making a blended structure between those sensors is significant, so we set up a little framework remote using the Bluetooth module as a method of correspondence between centers. An additional GPS/GSM/GPRS Shield module is required to get region data and send it to the server. The structure designing in figure 1 shows that there are three hub center points to distinguish liquid level data in the tank. These three-hub center points are placed in different pieces of the tankers, the main hub center point set decisively at the point of convergence of gravity of the tanker, this center point, used to

calculate the volume of liquid when the tanker is moving in normal road.2nd and third hub center point - these center points are put on the opposite edges of the tanker, these are used to get the data related to the volume of liquid in the tanker when the tanker is moving in the tilted road since the center point 2 and 3 are put on the opposite sides hence at whatever point a tilt happens any of the center points will be under the liquid so the other center will by and by process the volume of the liquid nearby the node1. By using this system, we can register the volume of the liquid in all regards adequately. While the center dispensed to sensor data from the kid center points (second and third) gets area data from the GPS and transmits the data to a server. Customers can screen the liquid volume by methods for an electronic application, so it will in general be seen wherever and at whatever point. Information transferring methodology can be found in figure 2.
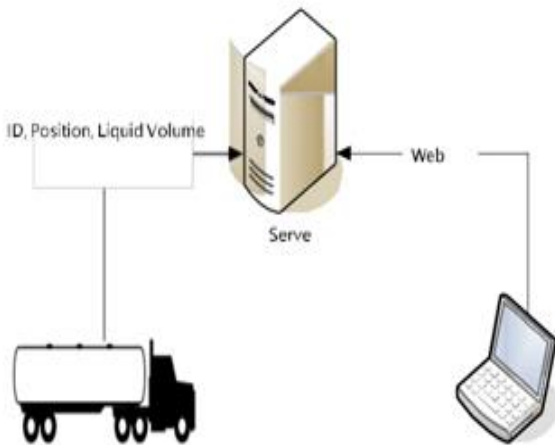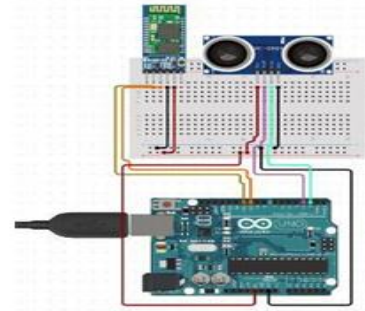
width x length = 48.5 x 32.7 x 65.4 cm and the fluid tallness = 15 cm.

(a)

(b)

Fig.3. Child Node: (a) Diagram; (b) Implementation

(a)

(b)

Fig. 4. Centre Node: (a) Diagram; (b) Implementation

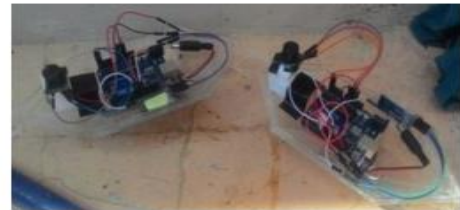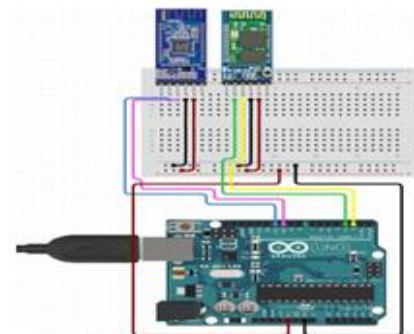

Fig.2. Information transferring methodology

5. Implementation

Child hub comprises of Ultrasonic sensor, Bluetooth module (HC 05), and Arduino microcontroller. The focus hub comprises Bluetooth module (HC 06), GPS/GSM/GPRS Shield module, and Arduino microcontroller. Execution of parts kid hub and focus hub can be found in Figure 3 and Figure 4 for the outline (figure 3.a and figure 4.a) and furthermore the usage (figure 3.b and figure 4.b). Server determination has Intel Core i3 processor, 4 GB RAM, 64-piece Windows Operation System. The tank model is a case compartment with stature x

6. Conclusion:

From the exploration we can reach inferences as follows:

- This framework that comprises of ultrasonic sensors, Arduino microcontroller, GSM/GPRS/GPS Shield modules and Bluetooth module can screen the fluid volume inside tank and distinguish the spillage by means of online application ceaselessly.

- This framework can be utilized to figure the volume of fluid even in the tilted street with high exactness.

References

[1] Husni M, Djanali S, Ciptaningtyas H T, Wicaksono H 2014 *Aplikasi Pemantauan Pendistribusian Bahan Bakar Minyak Menggunakan GPS pada Perangkat Android dan Sensor Kecepatan Air Berbasis Mikrokontroler Arduino* Proc. Seminar Nasional Teknologi Terapan - SNTT 2014 (Yogyakarta, Indonesia, 15 November 2014) ISBN: 978-602-1159-06-4.

[2] Sachin S A and Kokate R D 2012 *Fuel Monitoring and Vehicle Tracking Using GPS, GSM, and MSP430F149* J. International Journal of Advances in Engineering & Technology – IJAET vol. 4, Issue 1, pp 571-578.

[3] Daniel O G, Dayo O and Anne O O 2011 *Monitoring and Controlling Fuel Level of Remote Tanks Using Aplicom 12 GSM Module* J. Asian Research Publishing Network – ARPN vol. 6, No. 1, January 2011 pp 56-60.

[4] Obikoya G D 2014 *Design, construction, and implementation of a remote fuel-level monitoring system* J. EURASIP Journal on Wireless Communication and Engineering 2014:76.

[5] Shrivastava A K, Verma A and Singh S P 2009 *Effect of Variation of Separation Between the Ultrasonic Transmitter and Receiver on The Accuracy of Distance Measurement* J. International Journal of Computer science & Information Technology (IJCSIT), Vol 1, No 2, November 2009 pp 19-28.

[6] Shrivastava A K, Verma A, and Singh S P 2010 *Distance Measurement of an Object or Obstacle by Ultrasound Sensors using P89C51RD2* J. International Journal of Computer Theory and Engineering, Vol. 2, No. 1 February, 2010 pp 64-68.

[7] Bates R, Battistin M, Berry S, et.al 2014 *Implementation of Ultrasonic Sensing for High Resolution Measurement of Binary Gas Mixture Fractions* J. Sensors, Vol. 14 pp 11260-11276.

[8] Tahir M B and Abdullah M 2012 Distance *Measuring (Hurdle detection System) for Safe Environment in Vehicles through Ultrasonic Rays* J. Global Journal of researches in engineering Automotive engineering Vol.12(1) Ver.1 February 2012 pp 15-21.

[9] Carullo A and Parvis M *an Ultrasonic Sensor for Distance Measurement in Automotive application* J. Sensor Vol. 1(2) August 2011 pp 145.

[10] Anusha D, Sarma P M, and SandhyaRani M N 2013 *Appliance Remote Control Using Arduino J.* International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol. 2(4) July 2013 pp. 35-41.

[11] Purkayastha A, Prasad A D, Bora A, Et Al. 2014 *Hand Gestures Controlled Robotic Arm* J. Journal of International Academic Research for Multidisciplinary Vol. 2(4) May 2014 pp. 234- 240.

[12] Kumar P and Kumar P 2013 *Arduino Based Wireless Intrusion Detection Using IR Sensor and GSM* J. International Journal of Computer Science and Mobile Computing - IJCSMC Vol. 2(5) May 2013 pp 417-424. J. Ahamed S S R 2009 *Technological Strategy Of Using Global Positioning*

System: An Analysis International Journal of Engineering Science and Technology Vol.1(1) 2009 pp 8-16.

[13] Abbot E and Powell D 1999 *Land-Vehicle Navigation Using GPS* Proc. IEEE Vol. 87 (1) January 1999 pp 145-162.

[14] Spek S V D, Schaick J V, Bois P D, et al. 2009 *Sensing Human Activity: GPS Tracking* J. Sensors No. 9 pp. 3033-3055.

[15] Al-Khedher M A 2011 *Hybrid GPS-GSM Localization of Automobile Tracking System* J. International Journal of Computer Science & Information Technology (IJCSIT) Vol 3 (6) December 2011 pp. 75-85.

[16] Verma P and Bhatia J S 2013 *Design And Development Of GPS-GSM Based Tracking System With Googlemap Based Monitoring* J. International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol. 3(3) June 2013 pp. 33-40.

[18] Selvapriya C, Sathya P S2, Abdulrahim M, et al. 2013 *LPG Leakage Monitoring and Multilevel Alerting System* J. International Journal Of Engineering Sciences & Research Technology - IJESRT Vol. 2(11) November 2013 pp. 3287-3290.

[19] Zaghloul M S 2014 *GSM-GPRS Arduino Shield (GS-001) with SIM 900 chip module in wireless data transmission system for data acquisition and control of power induction furnace* J. International Journal of Scientific & Engineering Research - IJSER Vol. 5(4) April 2014 pp. 776-780.

[20] Libellium*CookingHacks*https://www.cooking -hacks.com/projects/arduino-realtime-gps- gprs- vehicle-tracking Accessed March 2015.