iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VI **Month of publication:** June 2022

DOI: https://doi.org/10.22214/ijraset.2022.44833

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

AI Based Reward Mechanism for Fuel Refilling

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Abstract: ***Nowadays petrol pump is operated manually, we require more manpower and it is time consuming process. So, we implemented automatic fuel filling system by using Node MCU. This system can improve the fueling process in order to make it easier, reliable and secure. This system aims at safe and secure fuel delivery, ensuring that the customer gets the equivalent amount of fuel for what they are paying, hence successfully eliminating any sorts of malpractices that might occur at various fuel stations. This project explains the system which is capable of automatic deducing the dispensed amount of petrol from user prepaid card and that deduced amount information and remaining balance of the card is sent to the customer's phone and even that deduce amount information is sent to the android app via web serve. Here we are maintaining each customers petrol dispensed information on the web server which connects all the petrol stations across the country. Based on the usages artificial intelligent program calculates the rewards for each customer and that may reduce the fuel price hike globally due to shortage. Normally in petrol bunks there is a human-to-human interaction. Our project is to overcome this phenomenon by bringing the interaction between human and software. By following mechanism, we can avoid all the errors that a human does and also avoid the cheating activities.***

I. INTRODUCTION

The price of crude oil is nearing its highest level since 2018. The surge in prices has led to record high prices of petrol and diesel in India and the Petroleum Ministry has repeatedly stated that it is speaking to key oil exporting countries to increase the supply of crude and lowering the official selling price for Asia. We examine the causes of high crude oil prices and how India is attempting to tackle them. The price of Brent Crude breached the $85 per barrel mark earlier this week reaching its highest level since 2018 on the back of a sharp increase in global demand as the world economy recovers from the pandemic. Key oil producing countries have kept crude oil supplies on a gradually increasing production schedule despite a sharp increase in global crude oil prices. The price of Brent crude has nearly doubled compared to the price of $42.5 per barrel a year ago. In its latest round of meetings, the OPEC+ group of oil producing countries reaffirmed that they would increase total crude oil supply by only 400,000 barrels per day in November despite a sharp increase in prices. The output of the top oil-producing countries – Saudi Arabia, Russia, Iraq, UAE and Kuwait — would still be about 14 per cent lower than reference levels of production post the increase in November. So as we are and will be in near future dependent on petrol and diesel, we need some business logic that may compensate the rising fuel price. Another aspect that the increase in the number of vehicles in India recently hassled to the congestion & long traffic jams in almost all cities of India. The Petroleum products are one of the valuable & rare creations of the nature. The proper usage & distribution of the petrol is an important task to the people.

Nowadays, most of the fuel station are manually operated which requires two people i.e., one to fill the petrol and other one to collect the cash. Placing the petrol stations in a rural area , is so difficult in order to provide the good facilities according to the customer's need.

The conventional fuel stations have caused many accumulated complication factors, among which one such factor is that the vehicle driver has to pay more money than the amount of dispensed fuel due to lack of small money change with station operator. Older petrol pump systems were not reliable enough. For example, in system with paper recharges, there may be a use of false coupons that are very similar to the original ones. Again, we do not have the actual calculations or the petrol amount that is dispensed on daily or monthly basis either, how many paper recharges are circulating. Therefore, the aim of this project is to provide validation to the customer and automatically regulate the start & stop of the tank value in accordance with the requested user's amount. It is important to address the most common problems. In the proposed system it is the microcontroller-based project which controls the whole assembly of automation of petrol bunk management i.e., smart card, relay, and motor. It also provided the facility of onsite recharge on the completion of transaction money which is withdrew from RFID cards & the balance is shown again on the LCD Display. When the balance in customer account is low, the process will not be carried out and message will be displayed as "Low Balance". All the details of the user's i.e., amount of petrol dispensed is restored in the database when the fuel is dispensed.

II. LITERATURE SURVEY

1) G. Janani proposed a "Petrol Bunk Automation with Prepaid Card using GSM Identification" system which uses a PIC microcontroller, GSM and RFID technology. This system provides the consumers to know, how much amount of petrol has been filled. It also provides accuracy, saves consumers valuable time and avoids misconceptions and arguments with works at the petrol bunk.
2) Priyanka.A. Gaikwad proposed "Automation in Petrol Bunk using RFID and GSM technology" which uses an Arduino Uno controller, GSM and RFID technology. This system increases the fueling process and it prevents unauthorized fueling by providing RFID card to the customers and it is rechargeable. Here, system equipped with a RFID card reader which reads the available amount in the card.
3) Sahana. S. Raoand V. Siddeshwara Prasad. In this proposed design, the authors used RFID and GSM technology for automating the refilling ICACSIS 2019 978-1-7281-5291-2/19/$31.00 c 2019 IEEE 479 system at petrol bunks. The RFID works as a petrol card. While a user wants to refill, he/she must swipe his/her petrol card to the petrol scanner. Then he/she will be asked for password & quantity. If everything goes right and petrol card has enough balance to do the purchase, then fuel filling starts automatically. Once the work is done, felling will stop automatically. A user can reload the card by sending a message to the recharge center GSM module at the bunk. Petrol level and smoke detection are also implemented by this proposed model and if the level of fuel inside the bunk is low, it sends the SMS to the bunk owner.
4) R.Gnanavel P.M. Deepak, B.Praveen Kumar, Jason Bakthakumar --"Computerized Filling station management system" (2016). In the current scenario, replacing the human efforts into automated digitalized mechanism has become a vast growing factor. Human race has become far more independent than they were in the past. Every field has reached their goal of user friendly, in which the actions of a person are controlled by software. However, this is not applied in most of the petrol bunks. Normally, in petrol bunks there is a Human to Human interaction. Our project is to overcome this phenomenon by bringing the interaction between Human and Software. By following this mechanism, we can avoid all the errors that a human does and also avoid the cheating activities that a culprit laborer performs in his work. Our project idea is to make the entire process performed by human laborer in the filling station into automated digitalized mechanism to avoid small errors and cheats that can be performed by the laborer to their owners. Our system consists of RFID READER to be placed in the Filling Station and all the vehicles must be provided with RFID TAGS.

III. OBJECTIVES

The main objective of the proposed system is to introduce the automation in the fuel filling process, to provide cost effectiveness when compared with existing system, to eliminate man power and cost associated with the same, to reduce the time consumption in filling process, to provide 24*7 operation of filling stations and to prevent fuel theft.

1) Real time authentication system
2) Accuracy in the amount of petrol dispensed
3) Providing usage stats to the server

IV. HARDWARE DISCRIPTION

1) *Node MCU:* Node MCU is an open-source LUA based firmware developed for the ESP8266 wifi chip. By exploring functionality with the ESP8266 chip, Node MCU firmware comes with the ESP8266 Development board/kit i.e. Node MCU Development board. Node MCUs an open-source platform, its hardware design is open for edit/modify/build.
2) *RFID Reader:* A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag , which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. RFID is a technology similar in theory to bar codes.
3) *DC Motor:* A *DC* motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy.
4) *Relay:* A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.
5) *Buzzer:* The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is widely used in alarms, computers, printers and other electronic products as sound devices.
6) *LCD:* LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.

V. METHODOLOGY

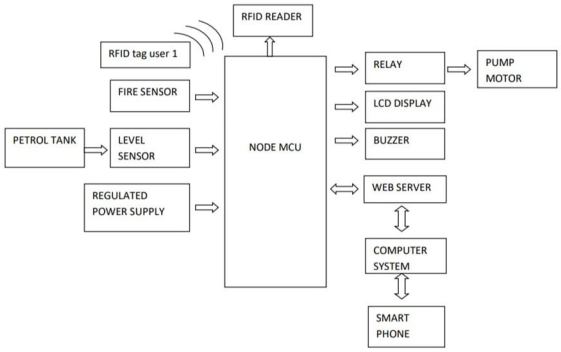
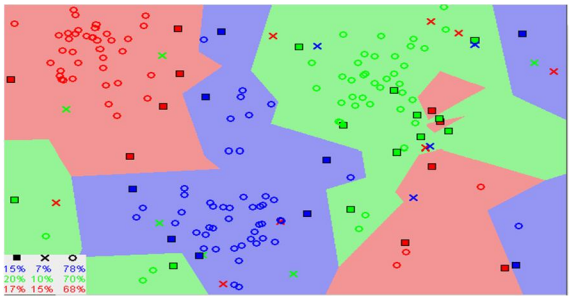


Fig . Proposed system

The block diagram of an RFID based security access control system is shown in fig. The customer who wants to use the unmanned petrol pump will have need to register themselves to corresponding petroleum industry with an initial amount to recharge their balance. The RFID reader (EM-18 Module) is installed at the bunk, when it gets powered & the passive tags(transponder) is brought within the reading range of the reader, the reader scans the data present in the tag with the help of its antenna & compares it with the data present in the microcontroller. So, it checks the number whether it is an authorized card or not, if it is authorized the corresponding information is displayed on LCD display, else invalid card is displayed on the LCD display & the buzzer gets ON. On swapping the RFID card, the authentication of password & available balance amount of user checking is done. If the balance is low the automatic fuel filling process does not start & LCD displayed “Low Balance” & buzzer get ON. If both are fine, the user has to enter the amount of petrol to be dispensed with the help of keypad. The electrical pump is turned ON according to the entered amount fills the tank & automatically turns OFF. The corresponding amount is calculated & deducted from their RFID passive cards. A message of amount of fuel obtained by the user, amount deducted from the customer’s account will be sent to the register mobile number. This system provides the online recharge facility which can be easily accessed by the user’s smart phone, as well as user can recharge through keypad which is install at the petrol station. The system uses the centralized database to allow fuel station to share the same amount of data about vehicles & related balance i.e., the user information will be added to filling station’s server. Additional features of the system are to provide the information regarding the fuel level to the owner i.e., to sense the fuel level available in the tank or not, if low fuel level is detected the alert message is send to the owner cell phone. Also added to that our system Gas sensor & fire sensor is used, if the any gas & fire is deducted the alert message is send to owner's cell phone. In these ways we have secured the system.

VI. ALGORITHM

The k-nearest neighbors (KNN) algorithm is a simple, easy-to-implement supervised machine learning algorithm that can be used to solve both classification and regression problems. The KNN algorithm assumes that similar things exist in close proximity. In other words, similar things are near to each other.



Notice in the image above that most of the time, similar data points are close to each other. The KNN algorithm hinges on this assumption being true enough for the algorithm to be useful. KNN captures the idea of similarity (sometimes called distance, proximity, or closeness) with some mathematics we might have learned in our childhood— calculating the distance between points on a graph. There are other ways of calculating distance, and one way might be preferable depending on the problem we are solving.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

VII. EXPERIMENTAL RESULTS

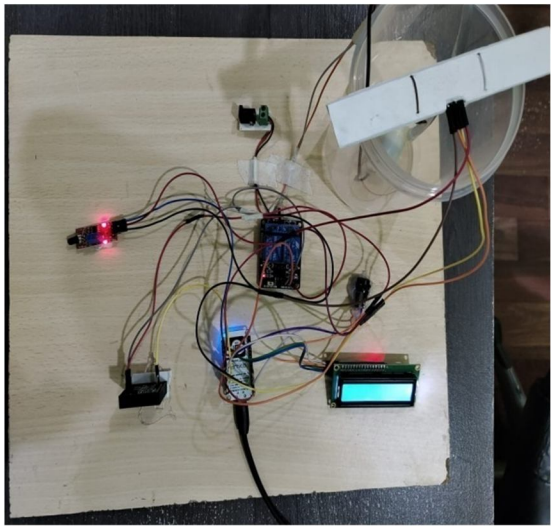


Fig.1 Hardware implementation

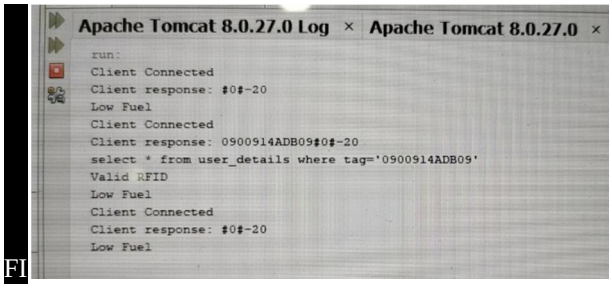


Fig.2 Server Response

The customer can register themselves and collect the RFID tag from the service provider. Service provider updates the tag details and links it with the customer. The customer's details are saved in the mysql database installed in the server machine. The fuel dispense machine is controlled by Node MCU board. Fire sensor and keeps checking if any fire is detected. If detected immediately send the alert. The fuel container has moisture sensor that is used to detect the level of the fuel in the container. If low fuel is detected, send an alert to the server. When the customer wants to refill fuel, goes to the fuel station and scan the RFID tag to the RFID scanner attached with the fuel dispense machine. The Node MCU connected with fuel dispense machine has a wifi module, using which it transfers the scanned tag number to the server. Server once receives the request, check if the tag belongs to a valid customer or not. If it's a valid tag then send an alert to the customer's mobile phone. Customer can authenticate and enter the fuel quantity or the amount. The mobile app sends the details to the server. And server calculates the quantity or price and send instruction to the fuel dispense machine. It then pumps out that quantity of the fuel. User can recharge using the mobile app. He/she can add amount in the wallet using digital payment modes. User have to use this dedicated wallet to refill fuel. The user pattern like quantity and interval are stored in the server for further analysis using machine learning. The machine learning algorithm is used to train the data and to find out the reward to given.

VIII. CONCLUSION

This system connects all the petrol stations of different companies on a single Web server and this web server access is protected by a password and this password is only known to the petrol companies. On this web server we are maintaining the dispensed petrol information and available balance of the costumers. And even this information is sent to the costumer's mobile phone. This system provides the feature of prepaid card recharge facility and it also provides the authority to customers to access the petrol in all the petrol stations across the country through a single RFID card. Another importance of this system is to give the security to the costumers instead of carrying the money every time.

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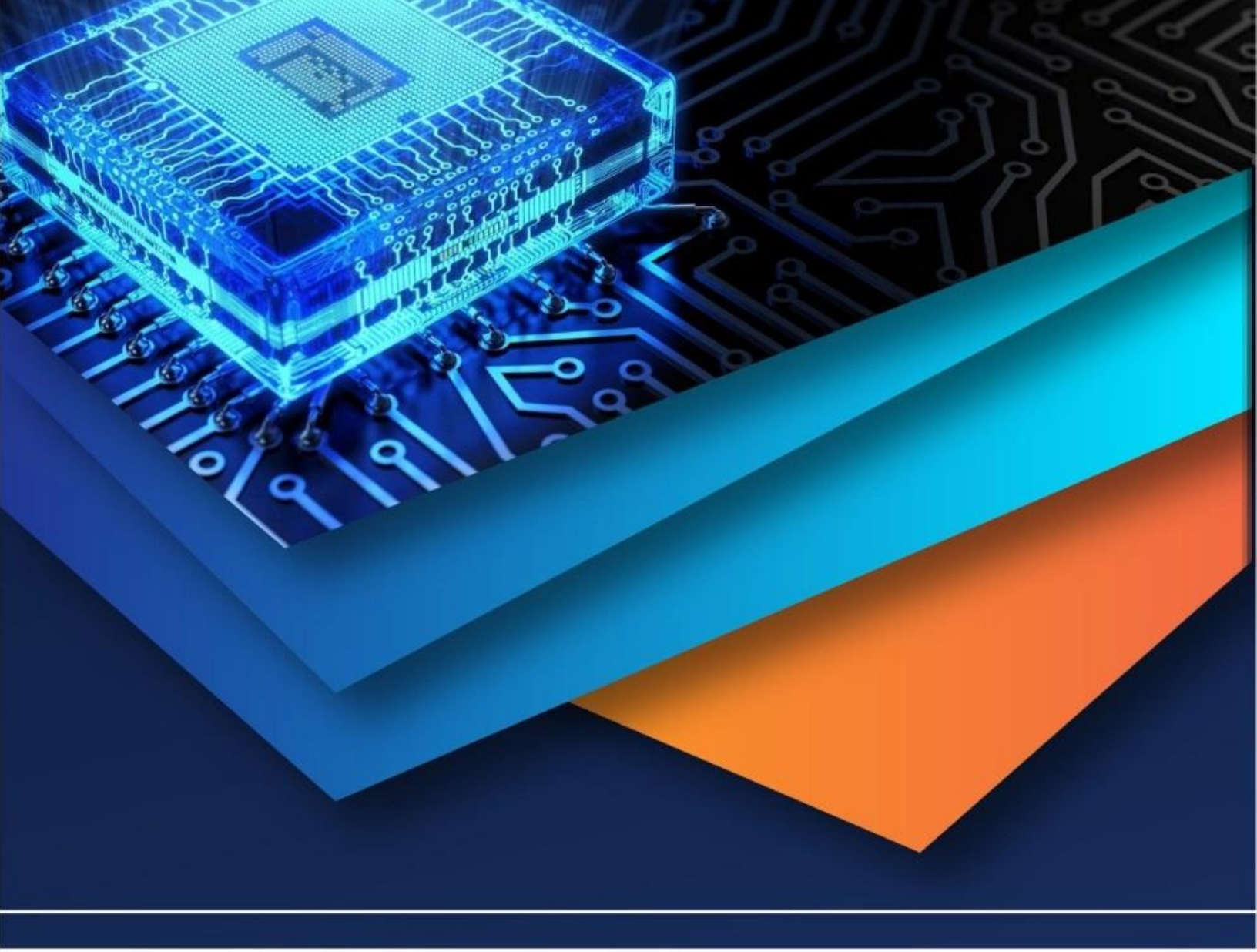

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