



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 6, June 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512



9940 572 462



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Smart Automated Petrol Pump System Using RFID Prepaid Card, IOT Billing and Machine Learning Based Security

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ABSTRACT: In this fast-paced world automation plays an important role. The objective of this project is to set up a framework which is prepared to do consequently deducting the amount of the petrol dispensed from user's RFID prepaid card and send the bill of petrol dispensed to the user through the Internet of Things (IoT). Liquid dispensing systems are usually found in our everyday life in better places like workplaces, Bus stands, Railway stations, Petrol syphons. Here this project is going to illustrate the modern era petrol dispensing system which is intended to be working with a prepaid card utilizing RFID based embedded systems technology, Image processing based security system and Internet of Things based Billing system. The system can improve the fueling process so as to make it much easier, secure and reliable. The system also eliminates human interaction and avoids the situation of black selling when there is no serviceman. Moreover, the image processing techniques are used as an additional feature for helmet detection for two wheeler riders. In addition, as per safety measures an alcohol sensor is fixed to detect the user's alcohol consumption before the smart card reading.

KEYWORDS: RFID prepaid card, IOT billing, Node MCU, Arduino Code, Blynk App, Helmet detection, Alcohol Sensor, Machine learning.

I. INTRODUCTION

Today practically all petrol pumps have a controlling unit to play out the undertakings like dealing with the electrical pump, drive the presentation and measure the stream and respectively turning off the electrical pump. Yet at the same time, an individual is required to gather the cash and have a perception over the accumulation and dissemination of petroleum at every petrol pump. This venture goes for structuring a framework to wipe out this human interaction as that there is no requirement for laborers to fill the petroleum and watch every oil bunk independently. In this framework, all drivers have a smart prepaid card and the bill is send to user mobile application through IOT [1]. IOT is employed to send the deducted bill amount of dispensed petrol to user's mobile application. IOT Based system is controlled using Arduino Mega, which is a microcontroller board [8].

To place fuel stations in distant area it very costly to supply excellent facility to the consumers all these problem are sorted out by the utilization of unmanned petrol pump which requires less time to work and it is effective and may be installed anywhere the customer self-going to avail the services the payment is completed by electronic clearing system [3].

This petrol pump system consists of microcontroller (Either Arduino or PIC 16F877A) along with Raspberry Pi or Node MCU module for IOT Communication, Camera for Image processing, RFID module, LCD display, Keypad, Start Switch, Temperature sensor LM35, buzzer, motor driver circuit and pump. This framework will decrease labour and can spare time. The client will simply enter the price from keypad and vehicle will be loaded up with petroleum. RFID based robotized petrol pump is to decrease human work and build up an auto-guided mechanism and to actualize the undertaking task successively by utilizing RFID innovation. These frameworks are very dependable and less tedious gadgets [1].

II. RELATED WORK

Over time, a number of researchers have proposed different types of designs to automate fuel filling system. One of the notable works is [2]. In this proposed design, the authors used RFID and GSM technology for automating the refilling system at petrol bunks. The simple and proper use of microcontroller and GSM technology provides a total security and atomization in the distribution of fuel [3]. It has easily operated smart phone system and GUI. The RFID works as a petro card. While a user wants to refill, he/she must swipe his/her petro card to the petro scanner. Then the person will be asked for password & quantity. If the password is correct and petro card has enough balance to do the purchase, then fuel filling starts automatically. Once the work is done, felling will stop automatically. Petrol level and smoke detection are also implemented by this proposed model [2].

Another notable work [4] is done by Rakesh, Veeresh Pujari and Baswaraj Gadgay The user must swipe the RFID to the petrol bunk's scanner. Then he/she will be asked for password and quantity of fuel. If everything goes error free, fuel will be dispensed automatically. They used the GSM technology for sending a notification to the user informing about the latest transaction. They have also implemented a web server to store the data of users. This server is accessible by any petrol pump around the world. Server is not accessible by any user. [4]

Another paper indicates a design in which a system will be capable to trace a vehicle's petrol refill amount, cost & time then notifies the vehicle's owner about the refill as well using a mobile application. This system is to avoid dishonesty of pump laborers & car drivers toward the car owners and provide a secure fuel monitoring method with low labor cost [5]. Another paper proposes an automated system for fuel pumps which aims at safe and secure fuel delivery, ensuring that the customer gets the equivalent amount of fuel for what he or she has paid, hence successfully eliminating any sorts of fraud or malpractices that might occur at a fuel pump station [6].

One paper mainly aims to come up with a postpaid card for fuel bunk system and fuel dispensing system with RFID technology. This will be helpful for common man in his busy scheduled life and avoids fuel theft in fuel filling stations [7].

III. METHODOLOGY

In this project, the one customer having the RFID smart card enters the petrol pump; the reader at the pump unit reads the RFID information including vehicle number, user phone number, password and balance amount, which will be processed by the microcontroller. When RFID reader, reads the unique card it asks for the 3-digit password. Once the driver enters the password in keypad and if it is wrong password an alarm will be turned ON. If it is right, a welcome message will be displayed in the LCD along with the balance in the prepaid card. Then the user can enter the amount through keypad. Once the amount is entered which will be processed by the microcontroller and the microcontroller controls the petrol dispensing pump through a driver circuit, in accordance with the amount. The user can starts the fueling by pressing the start switch. Then motor starts and petrol gets filled in the petrol tank from the fuel dispenser. After fuel dispensing the bill amount will be send to user mobile number through IoT Communication. The amount will be automatically reduced from the prepaid RFID card. As a security temperature sensor is used to detect Fire in the petrol pump.

A camera is used to detect the Helmet of two wheelers, so that only by entering the petrol pump wearing helmet will be activating the automatic petrol unit for two wheelers. Image processing based machine learning techniques are used for helmet detection.

IoT is employed in our system with Arduino Code and Node MCU controller with Blynk app. ArduinoDroid is an open source platform as a combination of software and hardware and Blynk server is used to control the communications between smart phone and hardware. Moreover machine learning Technique is used in our system with CNN. Convolutional Neural networks is used for image extraction.

IV. EXPERIMENTAL RESULTS

Figures show the experimental results, hardware and software parts.

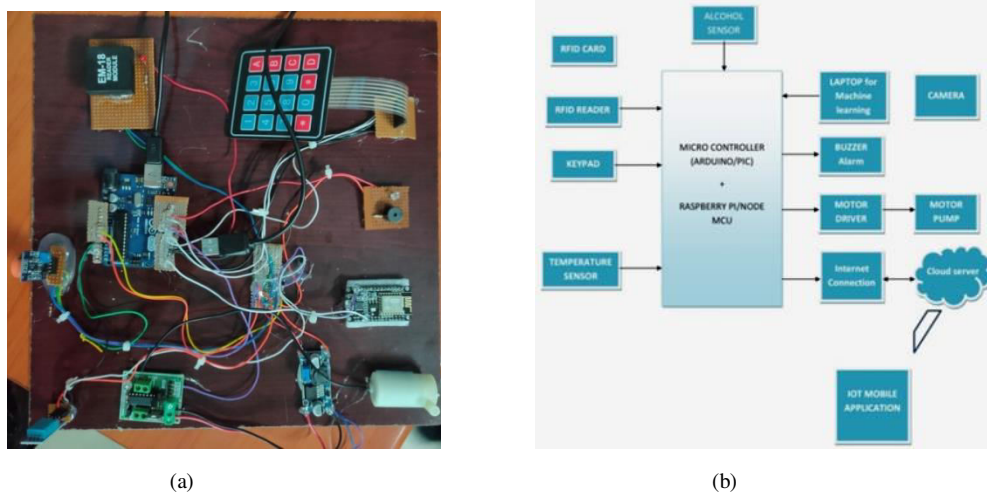


Fig. 1 Model of smart automated petrol pump system using RFID prepaid card (a) Hardware design (b) Block diagram

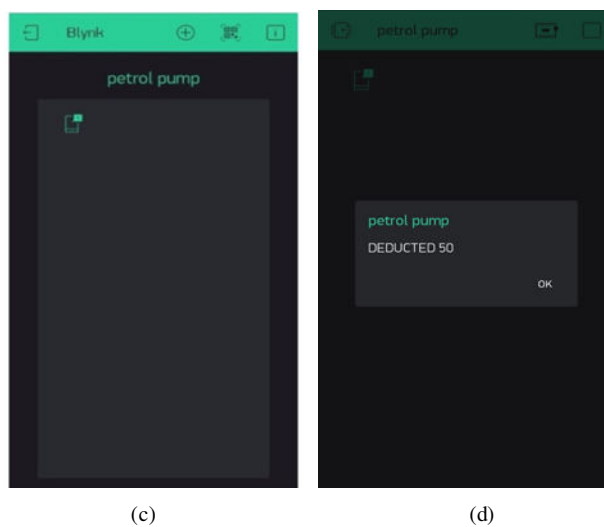


Fig. 2 Software used for IOT billing, (c) Blynk App (d) Deducted amount sent to Blynk app

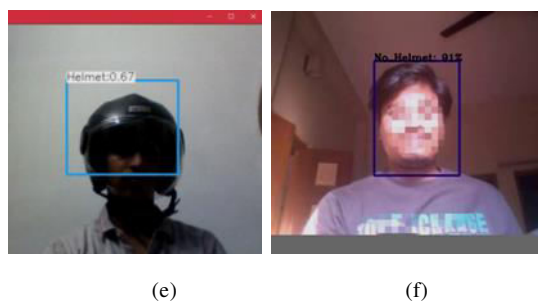


Fig. 3 Helmet Detection using machine learning , (e) Helmet is detected (f) without wearing helmet



V. CONCLUSION

RFID framework is a tractable innovation. This framework is utilized as a part of numerous application and ongoing application. Though RFID technology is being used in many sectors of security field, our system includes mobile application and automated fuel disposal pump with RFID technology which makes the system more efficient, secure and user friendly [4]. Here, RFID framework apportions the exact measure of fuel which diminishes the abuse of the fuel. What's more, it additionally lessens the labour. Furthermore, if the client tries to swipe with the unapproved card, the RFID framework rejects the card. Along these lines the framework is so secured [6].

As a part of ensuring safety, temperature sensors are used to detect Fire in the petrol pump. The proposed system is IOT based billing system along with helmet detection and additional feature is alcohol detection.

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