

SMART FUEL DISPENSING SYSTEM USING RFID TECHNOLOGY AND GSM

K. Raja, Mohan Reddim, G. Sairam Sumanth, S.Suhasini

Department of Electronics and Communication Engineering

SRM Institute of Science and Technology, Chennai, Tamil Nadu, India

kr5276@srmist.edu.in, mz7025@srmist.edu.in, gz5404@srmist.edu.in, suhasins@srmist.edu.in

Abstract: This paper discusses the fuel dispensing system and how a user might make use of RFID technology in today's fuel stations. The suggested approach ensures that the fuelling process runs smoothly. Making it simpler and more secure, the system operates similarly to that of a debit card, but instead of a debit card, a separate card (RFID tag) will be used by the user which can be recharged with money. In the bunk, the consumer swipes his or her card on the RFID reader. It's a reader with passive tags. It reads the information present in the card and cross-checks information present in the microcontroller. In the fuel station, the user has to enter the amount of fuel he/she needs and the appropriate money will be debited from the person's card and a message will be sent to his/her

mobile phone with the assistance of the GSM module which is integrated to an Arduino board. In Fuel stations, the workload for humans is reduced and no additional manpower is required to fill fuel. Through this project, it is possible to achieve the dream of digital fuel stations. It avoids the involvement of manual labour and also averts the use of carrying money around in people's wallets, which will reduce the risk of it being stolen by someone. This technology is applicable in many different fields. It is reliable, economical, and efficient.

Key-Words: RFID, GSM, Microcontroller, Arduino

I. INTRODUCTION

Radiofrequency identification (RFID) is a method of transmitting data wirelessly using an electromagnetic field. RFID

systems typically consist of three main components: (i) tags, (ii) readers and their antennas, and (iii) middleware applications integrated into the host system. [1] Three types of tags were used in RFID Technology; they are active, passive, and semi-active. And we are using a passive tag without an internal power supply tag. One of the most important creations of nature is fuel. Due to the increasing number of automobiles being used for transportation, it is the most commonly used commodity today. Currently, fuel stations are run by hand. In this case, providing consumer service necessitated more persons and time [2, 3]. Since the station operator does not have a little change, the vehicle driver must pay for fuel with cash and may have to pay more than the amount of fuel provided. It also has a few more flaws, such as fuel theft, fraudulent gasoline sales, transaction robbery, and so on. Therefore, to overcome those problems we have developed a Smart petrol pump based-on RFID technology and a GSM module. By using automatic fuel, we can reduce a lot of traffic and save time. An RFID card will be issued to the customer. No need for station staff, instead, an RFID card reader is available. [4-5]

Customers can scan and enter their details after entering; they need to select an option for the fuel process. This technology will improve the fuelling cycle by making it more simple, efficient, and stable. This system aims to supply fuel efficiently and reliably, which means that the consumer receives the same amount of fuel for the same amount of money, effectively avoiding any sort of fuel station fraud. We used in this project RFID tags, GSM modules, RFID readers, LED, relays, and motor various special components [4-5]. This mission helps to reduce manual labour, increase visibility, and improve the user experience.

II.RELATED WORK

In [1], the main goal of the project is to design a system such as the amount of fuel can be automatically debited. Issuance of a user card based on RFID technology. Liquid gas pumps are widely used in our daily lives in various places such as offices, bus stops, railroads, and so on. Gasoline station, here, we will introduce the latest gasoline dispenser of the era. Comes with a prepaid card that uses RFID technology. The is also a dispenser with RFID technology. At present days

fuel station is currently manually operated these are time-consuming and require more people. It is very difficult to build a gas station in a remote area. Providing excellent facilities to consumers is costly. Use unmanned energy to solve all these problems. An effective pump with a short operating time Can be installed anywhere. Customers who want to use the service on their own will have to pay electronically to the clearing system.

In [2] The current scenario replaces human effort Became huge with an automated and digitized mechanism Growth factor. Mankind has become much more independent than before. In each field Achieved the goal of ease of use. People are controlled by software. However, this is not the case Used at most gas stations. Usually, at a gas station, there is a person-to-person interaction. Our project is to Overcome this phenomenon by bringing about interactions Between humans and software. Through this mechanism below we can avoid people and avoiding people fraudulent activity that plays a worker in his job. Our project ideas are to make the entire process of human worker in gasoline station automatic digitized mechanism for small mistakes fraud that can be done

by their workers-by-workers to Owner. Gasoline station consists of RFID Readers and for all vehicles' people swipe their card RFID Card.

In [3] the main goal of the project is to design an automatic fuel dispensing system using IOT technology, RFID, and web application development and users will contain login details to access their login. To check the balance of the card the person and also recharge their card in the online portal of the petrol bunk website which is built by IoT technology. With this project, we were able to save a significant amount of money and time. It has also made several safety precautions, and this project is user-friendly.

1.1. RFID System

Radio frequency identification is a general term used to describe a system that uses radio waves to wirelessly transmit the identity of an object or person in the form of a unique serial number [6-7]. The RFID system according to in Figure 1 consists of the following elements:

- An integrated circuit (microchip) containing data of the identified element [8].

- Antenna for transmitting signals between the reader and RFID tags. Reader will transmit the information to the microcontroller and start the further process of the system [9-10].

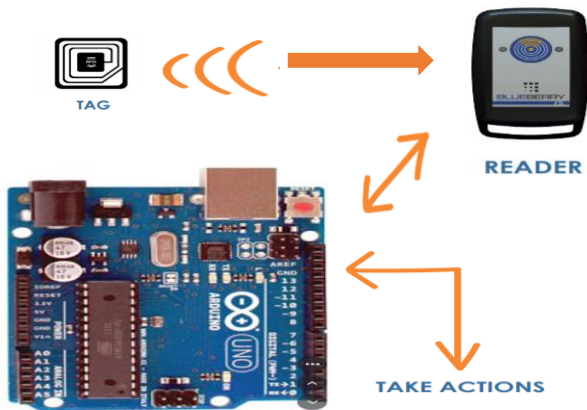


Fig1: RFID System

III.METHODLOGY

RFID cards, also known as fuel cards, can be issued to all users. This should be checked when entering the fuel station. [11] The fuel station has an RFID card reader that can display the initialization via the LCD and GSM units. If all techniques are displayed and maintained as planned, the user will notice that the device is working. Go to the next step. "On the LCD screen, the user is ready to swipe the RFID card. This will display the RFID card password. The password will be displayed here. The user has entered the wrong password. [12-13] LCD is displayed with the message invalid password. And the buzzer blows

sound. Next, the person must re-enter the correct password. If the password is correct, the device can proceed to the next step and display a message on the LCD. The LCD shows the charging and refueling options. Also, the easiest is to choose the one you need from these options. [14] Suppose the buyer decides to start this method and wants a reasonable amount. When the amount is reached, Box indicates the stability of the account, and after loading Box will be able to receive Messages. [15] If you selected an Opportunity fuel modem enter the quantity and the modem will start entering the quantity. The engine will start and petrol will come out. Next, after refueling, the registered mobile phone number will be sent from GSM and the physical condition will be notified on the LCD screen.

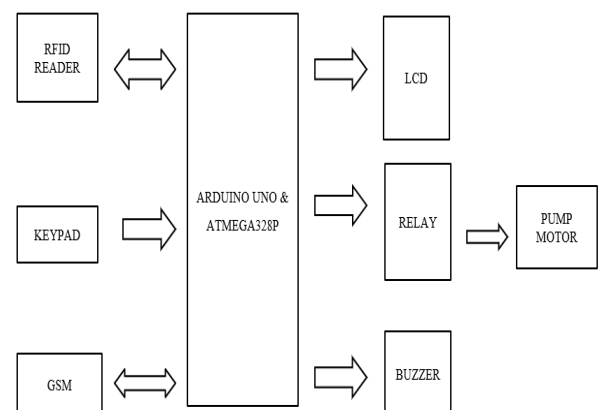


Fig2: Proposed Block Diagram

After sending a message to the buyer, the motor pump will be activated and will start fuelling the vehicle via the hose or gun attached to the pump. [16] When the engine reaches the number of litres entered in the user, the pump connected to the engine is mechanically shut down to prevent petrol/diesel from flowing through the way. If the RFID card is not constant, or if the number of litres entered does not reach, a message may be displayed on the LCD the fig 3 shows a flow chart that describes the entire fuelling operation and the appropriate actions taken by the system during the presence of the vehicle in the fuel station [17].

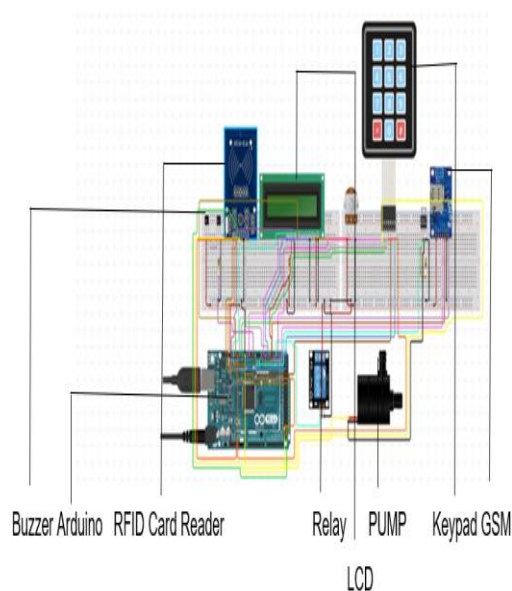


Fig3: Schematic Representation of Proposed System

Correct magnetic rates are encoded on all RFID cards. When the customer swipes the RFID card over the RFID

reader, a magnetic indicator is generated to validate the box. [18] The antenna used for scanning now scans box stats and today's stats. These statistics are evaluated and compared to the responsible support. If the datasets match, the microcontroller receives the corresponding display. This microcontroller can be set up and programmed using embedded C code to complete transactions in stages. The microcontroller is the complete control unit of the system. The GSM module we used will give us the information by sending transaction data through SMS to the registered customer phones. GSM modules act as a bridge between the system and the customer [19]

3.1 Fuel Dispensing System of Methodology

When a customer wants to dispatch gasoline. The Customer must provide the RFID card at that moment. If the RFID card is recognised, the customer selects "Fuel Mode." The LCD Display prompts you to enter the required gasoline quantity. The confirm option appears on the LCD display if the balance is sufficient. After that, an SMS is delivered to the customer's mobile phone and the pump motor is turned

on. Fuel eventually saves data to the computer.

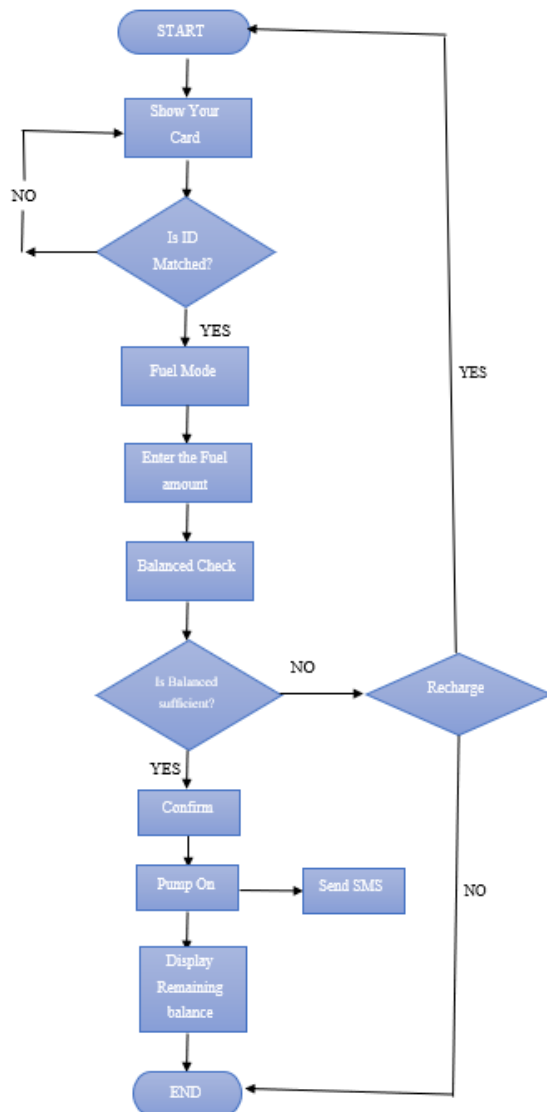


Fig 4: Flow chart of Fuel dispensing system

III.SOFTWARE REQUIREMENT

3.1 Arduino IDE

The Arduino IDE tool is being used to run the code and simulate the outcomes of our software side of the project, as well as to communicate the working model of the code to the Arduino Board.



Fig 5: Arduino IDE

IV HARDWARE IMPLEMENTATION

Below, we have included the hardware model of the RFID Based Smart Fuel Dispensing System

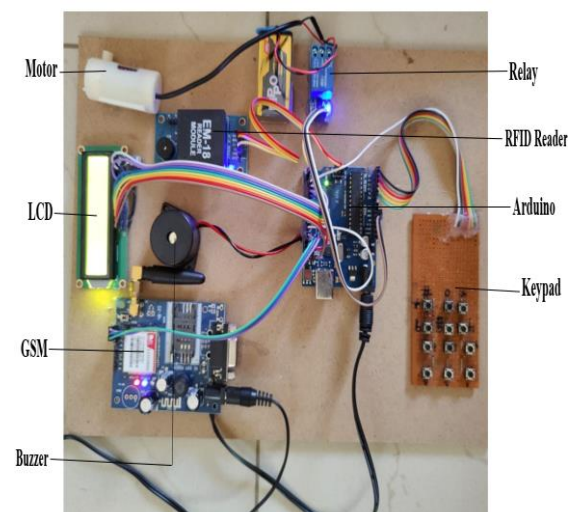


Fig 5: Hardware Model of RFID Based Automated Petrol Pump System

4.1. Result Analysis for Authorized person

Firstly, authorized persons should carry their RFID cards. Then LCD represents that" Show Your Card" Which is indicated in Figure 6.



Fig 6: RFID Card using Entry

4.2 Password Protection

Figure 7 shows that the user is required to enter the password to start the system.

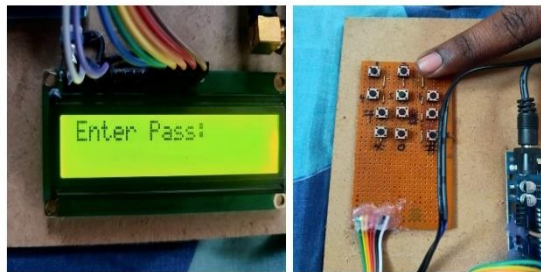


Fig 7: User Password input via Keypad

4.3 Recharge Mode

Fig 8 shows the options after the correct password has been entered. It shows two options. If user selects option '1' it asks the amount to be entered in order to recharge the card.



Fig 8: Recharge Money Process

After recharging the amount, the system will again ask the user to show

his card and enter the password, after which the LCD will display the remaining amount present in the user's card.

4.4 Fuel Mode

Fig 9 shows, If the user has selected the Fuel Mode, then the system will ask the user to enter the amount for which the fuel needs to be dispensed. The user will also receive a message regarding the amount he selected for the fuel dispensing. After the fuel has been dispensed the LCD will display the remaining amount on his card and the user will also receive a message on his phone regarding the same.



Fig 9: Processing of fuel refill

Fig 10 shows the amount of fuel that is present in the card after the fuel has been dispersed. This operation is repeated one after another user after another, with the same procedure being followed each time.



Fig 10: Final Available Balance

V. Conclusion

The RFID and GSM systems are used to control the smart fuel station control system that has been proposed. The use of RFID in this system ensures that the correct amount of fuel is dispensed, decreasing the possibility of fuel being misused. It also reduces the number of staff. If a customer attempts to swipe with an unauthorized card, the RFID system rejects the card and informs the customer of this. As a result, the system is extremely secure.

VI. REFERENCES

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