Automated Fuel Dispensing and Electric Vehicle Charging System Using RFID Technology and Arduino Integration

S. Sreenath Kashyap

Assistant Professor, Department of Electronics and Communication Engineering,

Marwadi Education Foundation's Group of Institutions, Rajkot, Gujarat, India.

ABSTRACT

RFID-enabled fuel dispensers and electric vehicle charging stations facilitate the development and enhancement of automated petrol pump systems employing RFID technology. Traditional gasoline pumps require manual operation, obliging vehicle owners to interact with an attendant. Integrating automation into this process allows vehicle owners to conserve time and reduce maintenance costs. Multi-purpose gasoline dispensers and electric vehicle charging stations provide a convenient and comprehensive option for obtaining both energy and fuel at one area. To achieve this, this article recommend the implementation of a petrol pump automation system that use RFID technology. An Arduino microcontroller will interface with an RFID reader (EM-18) via UART ports. A relay connected to an Arduino digital pin will regulate the functionality of either an AC pump or a DC electric vehicle charging station. The Arduino digital pins will interface with a keyboard. Initially, users will scan their RFID card and enter a password. Following successful login, the system will request the user to provide the desired quantity and choose the type of gasoline or electricity. Thereafter, the petrol pump or EV charging station will be engaged and commence the distribution of fuel or electricity. The designated sum will be deducted from the user's RFID card. In the case of an invalid card, incorrect password, or insufficient funds, an audible alert will sound, and all pertinent system information will be shown on a 16x2 LCD panel.

Keywords: RFID technology, Arduino, EV charging stations, Fuel Dispenser, LCD, Buzzer

1. INTRODUCTION

The distribution of fuel to a large number of automobiles at fuel stations has resulted in numerous issues in India. The driver of the car is required to make a cash payment for the fuel, and they may need to pay an amount greater than the actual cost of the fuel due to the unavailability of small denominations of currency with the operator of the fuel station. The purpose of the RFID-based Automated Petrol Pump is to minimize human labor by creating an automated system that use RFID technology to guide and execute tasks in a sequential manner. The project utilizes several components including an 8051 Microcontroller, RFID tags, a Power supply, an LCD, a Motor driver, and an RFID reader. Petroleum products are highly prized and scarce natural creations. Ensuring the correct utilization and allocation of these goods is crucial for their survival. A fuel station is a facility that sells fuel and lubricants through fuel dispensers, which are used to pump gasoline, Diesel, kerosene, etc. into vehicles and calculate the cost of the product. The introduction of radio frequency technology has revolutionized the traditional methods of data collection. RFID tags offer advantages over standard bar codes, magnetic cards, and IC cards. Upon scanning the card with the RFID reader, the system prompts for a 4-digit

password. If an incorrect password is entered more than twice, an alert is triggered. Upon entering the correct password, the system prompts the user to input the desired amount and displays the current balance. Upon inputting the desired quantity, the engine initiates and the gasoline is transferred into the fuel tank via the fuel dispenser. The project utilizes several components including an 8051 Microcontroller, RFID tags, a Power supply, an LCD, a Motor driver, and an RFID reader. The distribution of fuel to the large fleet of automobiles at fuel stations has resulted in numerous challenges in India. RFID stands for Radio Frequency Identification, a technology used for automatic identification. RFID technology enables the non-contact retrieval and storage of data on RFID tags. A typical RFID system comprises RFID tags, RFID readers, and a database management system. The tags might be either passive or active. The RFID reader retrieves the data stored on these tags using its antenna. The RFID reader operates within a frequency range of 125KHZ to 2.4GHZ.

2. PROPOSED SYSTEM

The main aim of the project is to design a system that is capable of automatically deducting the amount of petrol dispensed from a user card based on RFID technology. Liquid dispensing systems are quite commonly found in our daily lives in different places like offices, Bus stands, Railway stations, and Petrol pumps. Here we are going to present a modern-era petrol dispensing system that is meant to be operated with a prepaid card using RFID technology. The project mainly aims to design a prepaid card for a petrol bunk system and also a petrol dispensing system using RFID technology. In current days the petrol stations are operated manually. These petrol pumps are time-consuming and require more manpower. To place petrol stations in distant areas is very costly to provide excellent facilities to the consumers. All these problems are sorted out by the use of an unmanned power pump which requires less time to operate it is effective and can be installed anywhere. The customer self-going to avail the service has to make the payment by electronic clearing system.

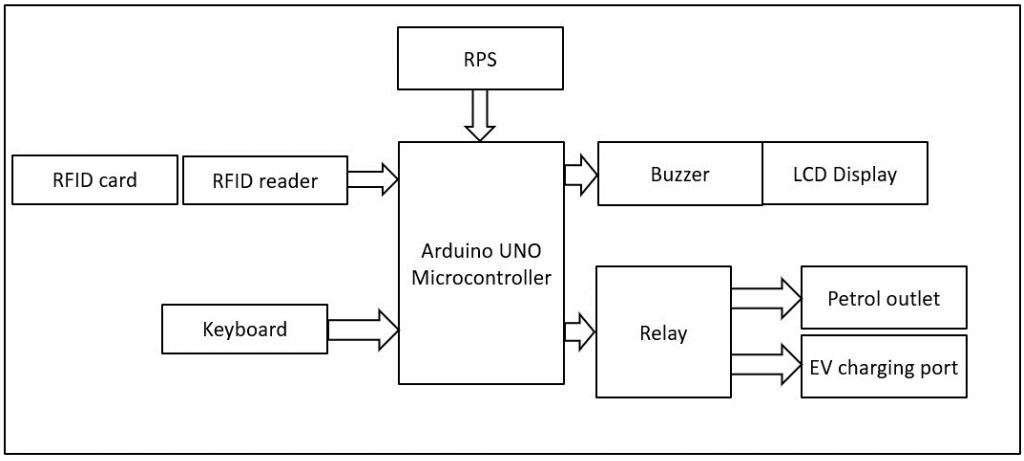

Figure:1 Block Diagram

Working

AC pump/ DC EV charge station operated by relay which is connected to Arduino digital pin. Keypad connected to Arduino digital pins. In this project initially, we have to swipe the RFID

card, if the card is a valid card it will ask for your choice of fuel or EV. After selecting the required type, we need to enter the password. The password we have set is 1234. If the entered password is correct it will ask for the amount. Initially we have recharged our card with Rs.500. After entering the amount, the balance amount will be displayed on the LCD. Finally, the petrol pump or EV charge machine will be ON and fuel or electricity will be dispensed. The entered amount will be reduced from the RFID Card. For an invalid card, incorrect password, or insufficient amount the buzzer will be activated. This information will be displayed on a 16x2LCD display.

3. RESULTS

Figure 4: Result

The above shows the hardware implementation of our proposed system.

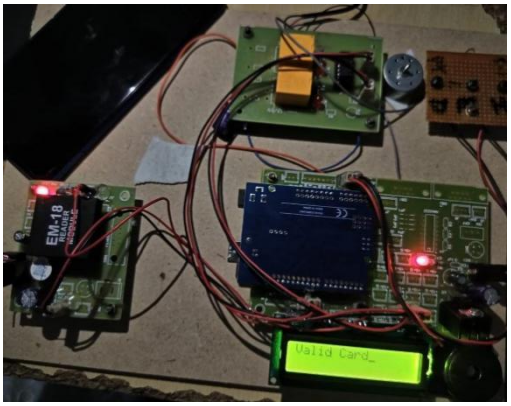

Figure 5: Validation of card

The above shows the validation of our card

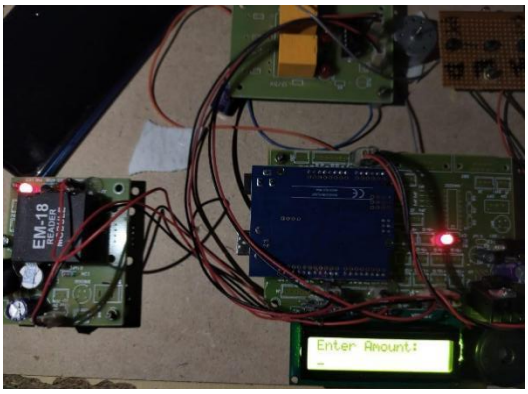

Figure 6: Enter the Amount

The above shows the next step to enter the amount

Figure 7: Charging of mobile

As we cannot charge a vehicle we have used a mobile charging port to display the same.

4. CONCLUSION AND FUTURE SCOPE

This project is meant for security systems whose access is only for respected authorities. Using a microcontroller, the petrol pump is equipped with a smart card reader/write. At the Petrol Pump, the driver swaps the card and the smart card reader reads the amount in the card and will display it on the LCD. The driver then enters the quantity of petrol that has to be filled using a keypad. The corresponding amount is calculated & deducted from his petro card. The electrical pump is then turned ON according to the entered amount, fills the tank and automatically turns OFF. Our electronic system performed as expected. We were able to implement all the functions specified in our proposal. The biggest hurdle we had to overcome with this project was interfacing the microcontroller with the hardware components. We feel that this electronic system is very marketable because it is easy to use, comparatively inexpensive due to low power consumption, and highly reliable. By using this project one can design a secure system. For filling petrol to vehicles at the petrol bunks using Smart Card based

Accessing System.In future mobile app integration is possible along with Car wash integration. This can also be integrated with all the renewable resources.

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