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IoT based Automated Fuel Station using RFID

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Abstract - *The security challenges being encountered in many places today by means of controlling access in order to secure the premises. All fuel stations that are functioning today have a controlling unit to perform the tasks like managing the electrical pump, drive the display, measure the flow & accordingly turn off the electrical pump. But still the man power is required to monitor the fuel dispensation and collection of money. The objective of our project is to present an IoT based Automated Fuel Station using RFID. RFID reader will be installed at the fuel station. Every customer is provided with a unique RFID Card. On tapping the RFID Cards on the RFID reader, the user will be asked to enter the price of the fuel against the quantity of fuel needed. We would create a cloud database in which we maintain the information of the customers. The deduced amount & remaining balance amount of every RFID Card is updated on the Firebase database using Esp 8266 Wi-Fi module Technology.*

Key Words: **Automated Fuel Station, RFID, IoT, Firebase database, Wi-Fi.**

1.INTRODUCTION

The Petroleum products are one of the valuable & rare creations of the nature. The proper usage & distribution of the fuel is an important task to the people. The 21st century is also known as the internet age due to increase in the use of internet. Considering the automated fuel station, the customers are given an RFID card, where the customer can access the fuel at the fuel station using that RFID card.

The RFID tag exchanges information with RFID reader using radio waves. Almost every RFID Tags have two parts namely, Antenna and Integrated Circuit (IC). Antenna is used for receiving radio frequency waves and IC is used for processing and storing data. RFID reader is a device which used to gather information from RFID tag which is used to identify the individual. Radio waves are used by RFID reader to read data from the tags. RFID tag receives signal from reader via antenna and get charged. Then the charged tag sends the response to antenna. Antenna transfers the data to the reader. Finally, the reader reads and follows the necessary instructions. The microcontroller processes the information read from the RFID reader and updates it in the cloud database using Wifi module which will be connected to the internet. Firebase, Thingspeak, etc can be used as the main database and manage the synchronization of data sent from the microcontroller.

2. Literature Survey

In [1] & [2], When the RFID card/tag comes in the range of RFID reader, then the reader reads the RFID card number and it sends to the Arduino uno microcontroller. The microcontroller verifies whether the card is authorised or not. If the RFID card is authorised then the microcontroller gives the access to the customer to type the amount of the fuel using keypad which is displayed on the LCD screen. When the customer enters the amount, then the microcontroller checks for the balance and if it is sufficient, the pump turns ON and it stops at a particular time and the remaining balance is sent to the customer to phone via GSM module (i.e, SIM800) and sends the information to the web server via Wi-Fi module (i.e, NodeMCU ESP 8266). Suppose if the available balance is less, then the customer has to recharge it in the fuel station or else it displays as insufficient balance on the LCD screen.

In [3], they have designed a website for transaction. Here the customer has to login to the website and after getting logged in, he gets an access to the fuel station. The website allows the user to the page where he can enter the amount needed to fill the fuel. The amount gets deducted in the wallet and gets a random code. Now the user having the random code can go to the fuel station. Here the user has to enter the mobile number and the random code given by the website. The fuel system verifies the code and mobile number. If it matches, then the system will release exact amount of fuel which is requested by the user. In this system they have used embedded system for fuel pump and MySQL database for website.

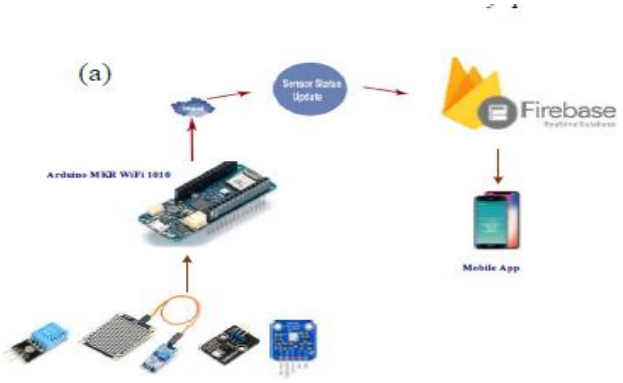
The paper [4] was aimed at designing RFID based attendance system. The system architecture comprises of Arduino, EM-18 RFIR reader module, RTC & LCD Display. The main microntroller used here is Arduino uno.

Arduino uno is interfaced with RFID Reader to read the data from RFID Card. Real Time Clock (RTC) Module DS3231 is used to display the current time and date on the LCD as well as arriving and leaving time of the users. Here

they have made an attendance system which runs using RFID cards and they upload the data to web server using XAMPP software using MySQL. The front end of the software(App) is developed using the Tinder Module in Python.

The paper [5] illustrates Wireless Sensor Network (WSN) for flood monitoring in the areas which are frequently affected by floods and alerts the people who lives there. Initially, ESP8266 is interfaced with ultrasonic sensor which will detect the flood level. Then, it will display the data on the LCD screen. The data will be transmitted to Blynk application via wireless communication and it will also be displayed in the application. Additionally, the data will be stored in a database called CSV database. This data is used to alert the local administration to undertake the necessary action once the critical level is reached and turns on LED and Buzzer.

Paper [6] provides information for designing and developing an economical weather station based on Arduino MKR microcontroller board for real-time weather data collection for better crop production. A weather station reads the weather data such as temperature, humidity, moisture, and rain level and this data is sent to Firebase database and then to an Android app using which farmers can access the most accurate and relevant weather information.



Firebase acts as the main database and manages the synchronization of data from the Microcontroller Client and Android application. The microcontroller will access the data from the sensors and send data to Firebase database through wi-fi since the MKR WIFI 1010 has both wifi and bluetooth modules. The update of weather data can be view in the channel on Android Apk once a minute. The receiving data also saved in the Firebase real-time database so, retrieved data can be continuously analysed by the users.

In [7], It is a biometric payment system which avoids any mechanical operation. This biometric payment system makes the transactions digitalized and removes the need of cards and passwords. When the customer wants to use the service of this automated fuel system, he has to first place finger on the fingerprint scanner device. The information is then compared with the stored data and if it matches then an acknowledgment will be sent to the Microcontroller and it will also be displayed on LCD screen. Then the system will prompt the user to enter the price in rupees for the desired fuel dispensation. Once the amount is entered, the equivalent fuel transfer takes place, which is controlled by the microcontroller and at the same time the amount is also deducted from the user account.

In [8], The system contains two units: Vehicle Unit & Pump Unit. The vehicle unit consists of a button, when this button is pressed a connection is established between two units and the account of the vehicles will be verified. On the LCD screen the updated price of the fuel will be displayed. Customers have option to input the price or quantity of the fuel needed. If the value entered by the customer is the quantity of the fuel the machine will automatically convert the quantity to the corresponding price and it will verify whether the account is having sufficient balance. If adequate balance is maintained in the account, suitable price of the fuel will be deducted and fuel pumping process starts, otherwise the "LOW BALANCE" message will be displayed on the LCD screen. Here magnetic flow sensor is used to measure the rate of flow and confirms whether the correct quantity of fuel is dispensed according to the price entered. Whenever any leakage in the gas or increase in temperature alert message will send to the authority through GSM modem.

In [9], The proposed system includes the RFID & GSM technology which creates a secure system by providing the unique identification number to each customer and also provides the recharge facility through online. The keypad is used to type the price and the pin number. The system verifies whether the card is authorized or not. The system can connect to all the fuel station of different companies on a single web server & this web server access is protected by a password & this password is only known to the fuel companies. The RFID system dispenses the accurate amount of fuel which reduces the misuse of fuel. Additionally, this system can also detect fire and gas at the fuel station by employing various sensors and alert messages will be sent to the owner's mobile phone through which he can take safety measures & save thousands of lives.

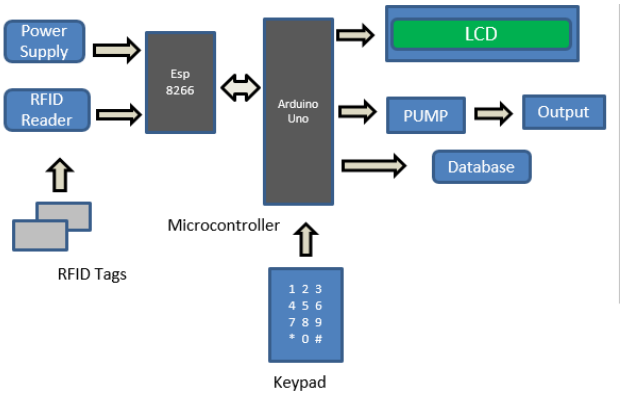
In [10], it proposes to install an intelligent tracking device on every vehicle. The proposed system will have RFID readers at the roads, that will read all the RFID tags attached on vehicles coming towards the junction. It creates new ways of traffic prediction to reduce the influence of lane closure and designs the control flow of Intelligent Lane Merge Control System (ILMCS) with its techniques, and constructs traffic information collection system, traffic information process and Decision System

and Traffic information release system of ILMCS. The system identifies traffic states by analysing real-time data collected by traffic detectors (RFID readers) and then adopts adaptive lane merge control strategies by analysing the extent of traffic.

In [11], the paper aims at designing an Automatic Medicine Dispenser (AMD), which works based on the integration of medcare mobile application with the Firebase Cloud Database and the Arduino Uno microcontroller. The user selects the type and quantity of pill or liquid medicine that has to be dispensed by using the medcare app. This selection is sent from the app to the Firebase server where it is stored in the respective user's database. This value is then send to the Arduino via the node mcu and the values are stored in an array. When it is time to take the medicine, the device can either be designed to release the pre-measured dose by using servo motor to dispense the pill or the centrifugal pump to pump out the required amount of liquid medicine into a small compartment. After the dispensation is done, buzzer will be activated to alert the user to take the medicine. An ultrasonic sensor is used to detect the presence of the pill or liquid and hence can be used to notify the care taker in the medcare app that the patient has missed the medication.

As in the previous paper [11], this paper [12] also demonstrates the interfacing and working of mobile application (ThinkView), Thingspeak Cloud Server and Arduino Uno Microcontroller. The system is designed to make use of wireless sensor network communication for Precision Agriculture. The benefit in this system is to continuously evaluate various differentiated factors for yield and location. This agricultural system is accurate in both areas such as in the transportation of soil, fertilizer and in the area of its commodity territories and etc. The sensor network (Sensors like Tilt sensor, IR sensor, Moisture sensor, Humidity sensor etc.) used in different sections updates the parameter data in the cloud through a Wi-fi communication module and the same can also accessed through the ThinkView application. Wifi communication module sends data to a thingspeak server depending upon the behaviour of sensors interfaced with Arduino uno microcontroller. The data can be retrieved from thingspeak server to make the required analysis.

3. Methodology



In this project, each customer will be having a unique RFID card. Abbreviation for RFID is "radio-frequency identification". RFID tags are encoded with digital data within it. The RFID reader circuit generates majestic signal to read the majestic number from the RFID tag. When customer tap this card on the reader, the reader reads that majestic number and transmits the corresponding signal to microcontroller.

The keypad is used to input the fuel quantity. When the user enters the desired quantity on the keypad, based on the time calculations made for dispensation for the fuel, the microcontroller activates the relay driver which in turn activates the motor pump for that particular time period. The fuel quantity and its appropriate price are displayed on the LCD screen. At last, the balance of the user will get updated in the database.

4. Hardware Requirements

a. ArduinoATmega328: Arduino Uno Microcontroller board based on the Microchip ATmega328P. The board has 14 digital I/O pins, 6 analog I/O pins and is programmable with the Arduino IDE, via type B USB cable. It can be Powered by the USB cable or external 9V battery.
b. NodeMCU (Wi-Fi Module): It provides the internet connection. The design was initially based on the ESP-12 module of the ESP8266, widely used in IoT applications.
c. RFID tags & Reader: RFID is a wireless technology it is based on electromagnetic field that uses radio signals to track the objects, identify & capture automatically. The MFRC522 RFID reader designed 13.56MHz frequency. The passive RFID Tags do not require any external power source.
d. LCD: The proposed system used 16*2 LCD is a display unit. The LCD has two registers namely command and data.

e. Keypad: The 4x4 matrix keypad is used as input in a project.
f. The keys of each row (R1-R4) and column (L1-L4) are connected through the pins.
g. Relay: In our proposed system we used Single Channel Relay.
h. DC Motor: In this model we used 12V DC motor. It can take up to 120 liters per hour with a very low current consumption of 220 mA.

5. Software Requirements

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. It supports the programming languages C and C++.

Conclusion

RFID & IoT System is a versatile technology. The proposed system is a smart approach of modernizing the current automatic fuel dispensing from the fuel pump. The system can connect to all the fuel station of different companies on a signal web server & this web server access is only known to the fuel companies. The RFID system dispenses the accurate amount of fuel which reduces the misuse of fuel & it also reduces the man power. Hence the proposed system is lot more automotive compared to the present fuel dispensing system & is able to provide the best customer service.

REFERENCES

[1] Saptami T, Seema D, Snehal D, Vidya A, Sagar B, "Multipurpose Self-Fuel Dispensing Automated Framework Utilizing RFID Prepaid Cards", International Research Journal of Engineering and Technology(IRJET), August-2020.

[2] Rakesh, Veeresh Pujari, Baswaraj Gadgay, "RFID BASED PREPAID CARD FOR FUEL STATION USING WEB SERVER", International Research Journal of Engineering and Technology(IRJET),July-2018.

[3] Nitesh Ghone, Sanjay Chilwarkar, Rahul Padwal, Prof. Vinita Bhandiwad," IoT based Automated fuel system",International Journal of Trend in Scientific Research and Development (IJTSRD),Mar-April-2018.

[4] B. Nandhakumar, K. Naveen kumar, M. Vijay, A. Sriram "RFID Based Attendance System using IoT", International Journal of Modern Science and Technology, 2020;5(3):90-93.

[5] Mahanijah Md Kamal, Nur Anum Zuraimi Md Noar, Aqil Muhammad Sabri "Development of Detection and Flood Monitoring Via Blynk Apps", Indonesian Journal of Electrical Engineering and Computer Science Vol. 10, No. 1, April 2018

[6] Zaw Lin Oo , Theint Win Lai , Su Mon Ko , Aung Moe"IoT based Weather Monitoring System Using Firebase Real Time Database with Mobile Application", International Symposium on Environmental-Life Science and Nanoscales Technology 2019 (ISENT2019) 27th – 28thDecember2019

[7]. Prof. A.R. Kaushik, Kori Preeti Omprakash, Kedare Monika Gautam "Automated Fuel Station", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE),2018

[8] Nitha C Velayudhan, Raseena K R, Rashidha M H, Risvana M P, Sreemol C V, "Automatic Fuel Filling System", IJARCCE, Vol.8, Issue 3, March 2019

[9] Gazala Anjum, Dr. Baswaraj Gadgay, Basavaraj Patil, "Automated Digital Fuel Pump using Arduino ATmega2560", IJRASET, Volume 7, Issue IX, Sep 2019

[10] Veera Boopathy E "Traffic lane controller using RFID and IoT", Computer Science and Information Technologies, May 2020

[11] Jyothis Philip, Feba Mary Abraham, Ken Kurian Giboy, B J Feslina, Teena Rajan "Automatic Medicine Dispenser using IoT", International Journal of Engineering Research & Technology (IJERT), August-2020

[12] Swaraj C M, K M Sowmyashree "IOT based Smart Agriculture Monitoring and Irrigation System", International Journal of Engineering Research & Technology (IJERT), NCETESFT Conference Proceedings, 2020

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