

# Automated Fuel Refilling System

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**Abstract**— In current scenario, researchers and developers have come up with various kinds of electronic devices to help mankind. World is experiencing a never-ever boom in automation industry with use of robots and constantly increasing computer intelligence. The fuel refilling station is one such sector. The technology developed till now helps the user and retailer to transfer fuel from cavity tank present underground without any fuzz. The bill generation and transactions are made digital and hassle free payments happen. However, there should be a worker present at all times to supervise the whole process. AFRS (Automated Fuel Refilling System) introduces new feature of automation wherein the user alone can refuel without any dedicated manpower and added benefits with 24/7 working facility, which increases the sales of retailers. This type of automation works in regions where there is lack of manual labour or remote locations which has inappropriate conditions. AFRS provides users an app interface helping them register themselves and procure fuel by bill generation and payment made in the app itself using underlying authentication methods. There is also an ‘Emergency’ feature in the app which enables the user to get emergency fuel of a fixed amount chosen by the retailer by activating AADHAAR biometric authentication which requires only a biometric scan.

**Key words:** AFRS (Automated Fuel Refilling System), Raspberry Pi, User Application, AADHAAR, Biometric Authentication

## I. INTRODUCTION

Fuel Stations have been present from early 1900s in Western part of the world. Advancement in technology has led to development in fuel types, fuel dispensers and payment methods. Currently, E-Cash cards, Electronic chips, E-Wallets, Net-Banking and Card payments are some of the cashless transactions happening in this sector<sup>[1][3]</sup>. Automated Fuel Refilling System (AFRS) is a Raspberry-pi powered technology which provides automation in Fuel Stations incorporated with a simple and cost-efficient locking system. AFRS will use and enhance the technique of automation in the fuel-refilling sector promoting “Cashless, Digital and MAKE IN INDIA”. Our system has a fingerprint scanner which performs biometric authentication being the first step followed by fetching it from an efficient database which is linked to the android application user interface. The application enables a user to register his account credentials onto the database. The user logs into his account, enters the fuel required into the app, finishes the payment and the system gets activated providing him the required fuel.

## II. BLOCK DIAGRAM

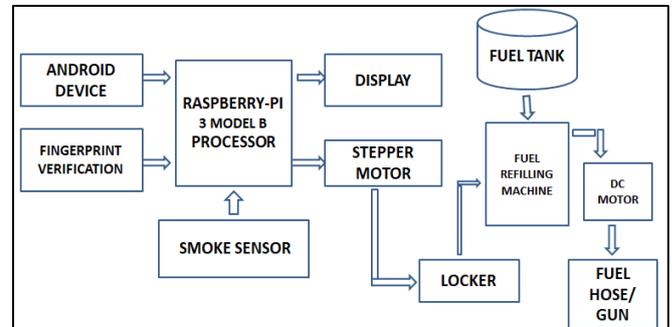


Fig.2.1 Block Diagram of AFRS

## III. WORKING

The kit is powered and connected with every component. The app developed is connected to the kit in background phases. The app enters a screen where it asks the user to either login/Register using his credentials such as name, email-ID, password, contact number, AADHAAR number and Driving License number.

The data entered in application gets stored in database (MySQL database) and validates the user through PHP files whenever he logs in. After Login phase gets completed, the user either should enter the amount of fuel or the quantity of fuel required.

The payment modes are then listed for corresponding bill amount generated such as debit/credit cards, E wallets and net banking. After the payment is completed, kit allows the lock to be opened for the fuel hose-gun and the required amount of fuel flows through it. After the fuel gets filled, the locking system gets reactivated on the fuel hose-gun.

The whole system again goes back to the initial state for next user to use AFRS. There is also an additional option where the emergency fuel mode can be activated. The user needs to be AADHAAR authenticated, to be granted an emergency fuel of 200 Rupees (amount depends on retailer).

The emergency fuel option is provided only once to each customer for some defined amount of time. After successful completion of payment only, emergency fuel can be reactivated for the same customer enhancing the security by ensuring no case of forgery. The kit, in the meantime, asks the user for biometric signature. The kit then verifies the biometric scan with the registered database and authenticates it. The kit allows lock to be opened for the fuel hose-gun and the required amount of fuel flows through it.

## IV. HARDWARE REQUIREMENTS

### A. Raspberry Pi 3 Model B

Raspberry Pi is a credit card sized single board computer developed by the Raspberry Pi foundation. It features a quad-

core 64 bit ARM Cortex A53 clocked at 1.2GHz. It contains 1GB of RAM and supports graphics, provided by Video core IV GPU. It includes an on-board 802.11n Wi-Fi, Bluetooth 4.0 and has 4 USB ports. It has got an option for increasing the storage capacity through a microSD card slot and for display using HDMI port. It includes a 40-pin GPIO header and a composite audio/video output slot [7].

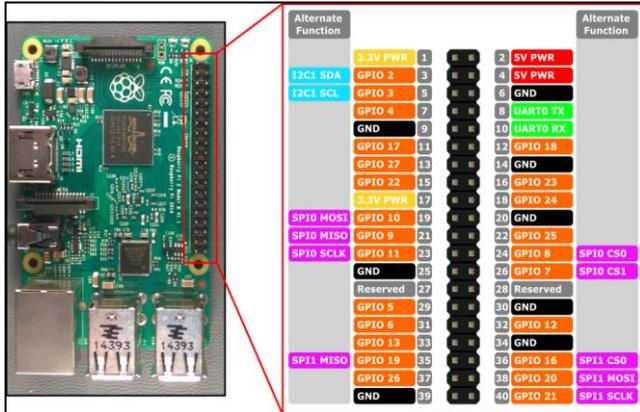


Fig. 4.1: Raspberry Pi- Pinout Diagram

To enable communication with the outside world, the Raspberry Pi has to be programmed with a suitable programming language. These languages include Java, FOTRAN, Pascal, Python, C, C++, etc. Since Raspberry Pi is a credit sized computer that is based on Linux, optimum performance of Raspberry Pi can be achieved if it is therefore operated in this environment. RASPBIAN provides more than a pure OS: it comes with over 35,000 packages, precompiled software bundled in a nice format for easy installation on Raspberry Pi.

**B. GT511C3 Fingerprint Scanner**

The GT-511C3 FPS (fingerprint scanner) is a small embedded module that consists of an optical sensor mounted on a small circuit board. The optical sensor scans a fingerprint and the microcontroller and software provides the modules functionality which automatically processes the scanned fingerprint. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. This module can directly interface with any 3.3V or 5V microcontrollers, but a suitable level converter/serial adapter is required for interfacing with the serial port of a PC. A logic level converter is a mediator so that two devices can communicate which works on different voltage level.



Fig. 4.2: Fingerprint Module Scanner

**C. MQ-2 Smoke Sensor**

The MQ-2 Gas Sensor module detects gas leakage in home and industry. The MQ series of gas sensors use a small heater inside with an electrochemical sensor. They are sensitive to a range of gasses and are used indoors at room temperature. Due to its fast response time and high sensitivity, measurements can be taken as soon as possible. They are useful in gas leakage detection of LPG, propane, methane, alcohol, Hydrogen and smoke.



Fig. 4.3: MQ-2 Smoke Sensor

**V. SOFTWARE SPECIFICATIONS**

**A. Android Studio**

Android studio is the official integrated development environment (IDE) for Google’s Android operating system. It is built on Jet Brains’ IntelliJ IDEA software and designed specifically for Android development [4].

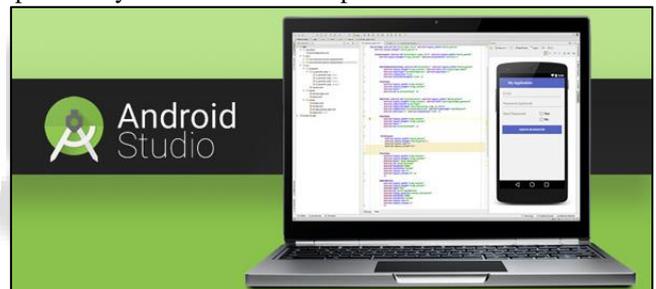


Fig. 5.1 Android Studio

**B. Python**

Python is an interpreted high-level programming language for general-purpose programming. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and as a large and comprehensive standard library [6].

**C. WAMP Server**

WAMP Server refers to a software stack for Microsoft Windows operating system. A web developer can test web pages in a web browser without publishing them by running a local Apache web server.

WAMP server will install Apache, PHP5 and MySQL on Windows platform. It will allow the easy managing of the server.

## VI. RESULTS

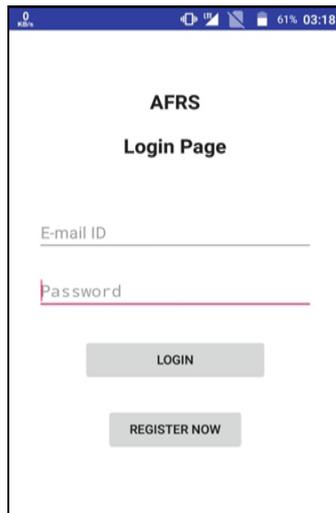


Fig. 6.1: Login page of AFRS

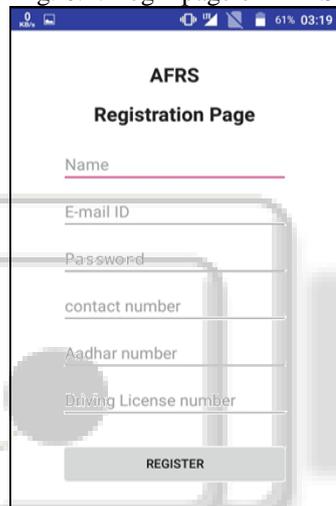


Fig. 6.2: Register Page of AFRS

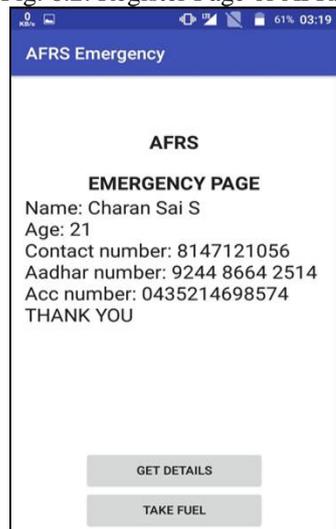


Fig. 6.3: Emergency Situation of AFRS

The emergency situation gets activated when the user authenticates his biometric signature. After that, the fingerprint is compared with the database and identification is done. The fuel filling process gets activated after the fingerprint matching occurs.

## VII. ADVANTAGES

- Automation in the fuel refilling station results in cost – cutting and time-saving.
- The problem of managing the Fuel Station at night time or at remote locations can be overcome.
- This technology alerts if there is any hazardous event happening such as smoke or fire at the Fuel Station.
- This system makes fuel stations to operate 24/7 without any manual labour.
- It also promotes Digital India and the fuel refilling station's database can be used to keep a track of fuel requirements and transfers.

## VIII. CONCLUSION

Automation and Technology has no conclusion. The main dependence of the Fuel Station on man Labour to manage activities is overcome here. The project AFRS helps in promoting the Cashless reforms made by the recent developments of our Government. Robbery/Corruption is culminated through this automation. Our paper promotes the Digital India Campaign and brings awareness to many people.

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