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Raspberry Pi Based RFID Smart Card Refuelling System

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Research Article

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Abstract: The simplicity and advancement of the Raspberry-Pi microcontroller and RFID smart card technology offer comprehensive security and automation in fuel distribution [1]. It is a high-speed fuel dispenser interface that is easy for consumers to use. Our system will provide the user with a password and IRIS detection for secure transactions. The customer needs to wave the smart card at the reader, which shows account details on an LCD supplied by the fuel station. This information assists the fuel company in creating user authentication and managing fuel distribution; without database verification, this fuel dispensing cannot occur. To summarize, we offer a secure fuel distribution system. This project's advancement can provide financial assistance to the industry.

Keywords: Raspberry-Pi; RFID; Password; IRIS; LCD.

INTRODUCTION

This project is primarily intended to introduce a security system for filling petrol at petrol bunks that does not require human involvement. The RFID smart card eliminates the risk of carrying cash at all times and offers a prepaid recharge feature [1].

Many petrol stations nowadays are utilizing the petro card system for refueling vehicles with petrol. This system provides every user with a smart petro card, which allows access to petrol at the petrol bunks. This card needs to be recharged before we can use it. To fill the tank, we need to insert the Petro card into the card reader connected to the microcontroller via serial interfacing [2]. The microcontroller retrieves data from the smartcard reader and inquires about the number of liters you need, which will be shown on the LCD screen. After that, we need to input the necessary number of liters of petrol via the keypad, which serves as an input for the microcontroller. The microcontroller will read this value and then check the smart card for an available balance. If the balance is sufficient, the petrol filling process will begin.

divided petrol pumps; which were unremarkably manual appropriation and relied perfectly on man staunchness that was doing this employment. Currently, the industry is becoming very reliable regarding these matters and is trying to centrally manage all aspects of product generation and distribution. To achieve their goals, businesses are trying to contribute to the emerging development security framework for the secure distribution of items [2]. However, the current petrol conveyance framework has several drawbacks concerning petrol stilling, unauthorized petrol sales by merchants, and the mixing of contaminated and incorrect substances in petrol and other products.

III. BLOCK DIAGRAM

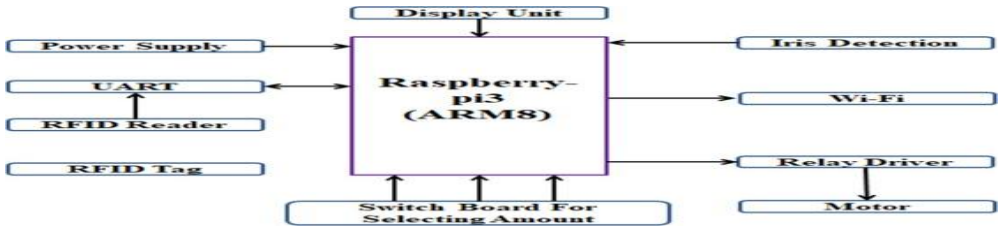


Fig 1. Bunk Unit

I. LITERATURE

In beginning days the petroleum commercial enterprises were conveying petrol using tankers to

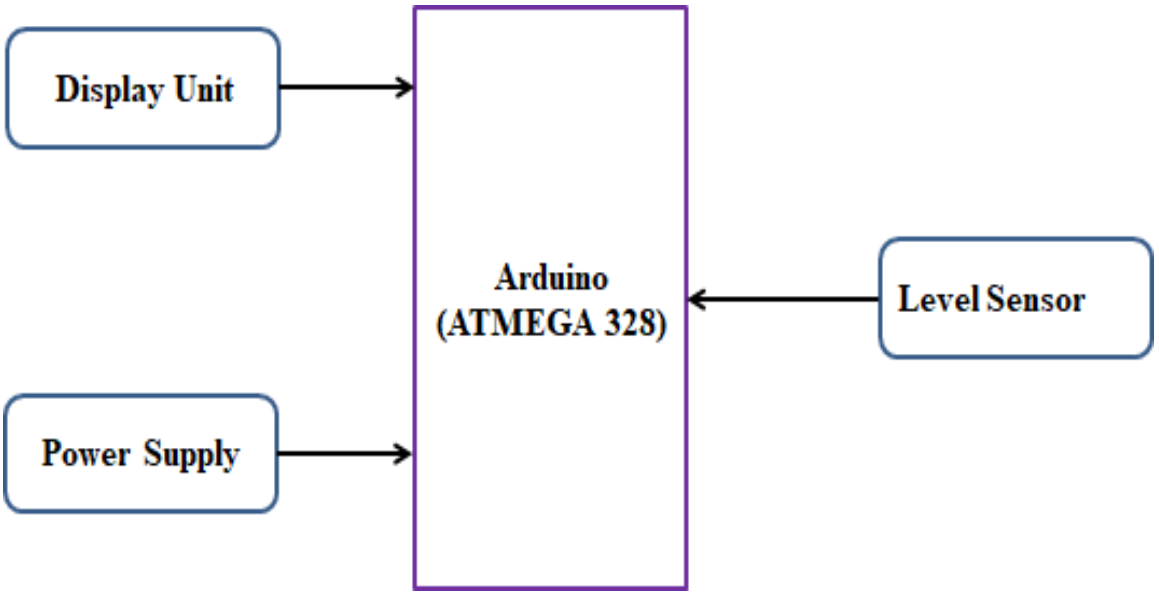


Fig 2. Vehicle Unit

BLOCK DIAGRAM EXPLANATION

A. Bunk Unit

- The microcontroller Raspberry-Pi is a 40pin IC which controls the entire operation of the system in the fuel bunk.
- The LCD display unit is used to display the relevant information to the user.
- The RFID module acts as a prepaid card which holds the user information and balance details to provide access to refill petrol into the vehicle.
- The RFID data is transferred and received through UART communication [4].
- The iris detector will serve the iris of consumer for authentication, suppose if the iris detection isn't authenticated then directly the user will be asked for the unique password to access for the refuelling and a message stating the unauthorized access will be intimated to the card holder to his registered contact number[5] [6].
- When the consumer is authenticated, he will gain access to keypad through which the user can refuel the required quantity upon giving the inputs and the fuel dispensing can be controlled by the relay driver from the valve.
- The fuel dispensing is done through hose pipe[7].

B. Vehicle Unit

- The microcontroller Arduino is a 28pin IC which controls the entire operation of the system in the vehicle tank.
- The LCD display unit is used to display the relevant information to the user such as quantity available in the fuel tank of the vehicle.
- Here we are using hydraulic level sensor which works on the pressure, that is it detects and shows the level of the liquid available or immersed [6].
- The total quantity of the fuel in the tank can be measured by the level indicator and displayed on the displaying unit of the vehicle.
- 5v power supply is applied as an input to the microcontroller to operate it.

IV. FLOWCHART OF THE SYSTEM

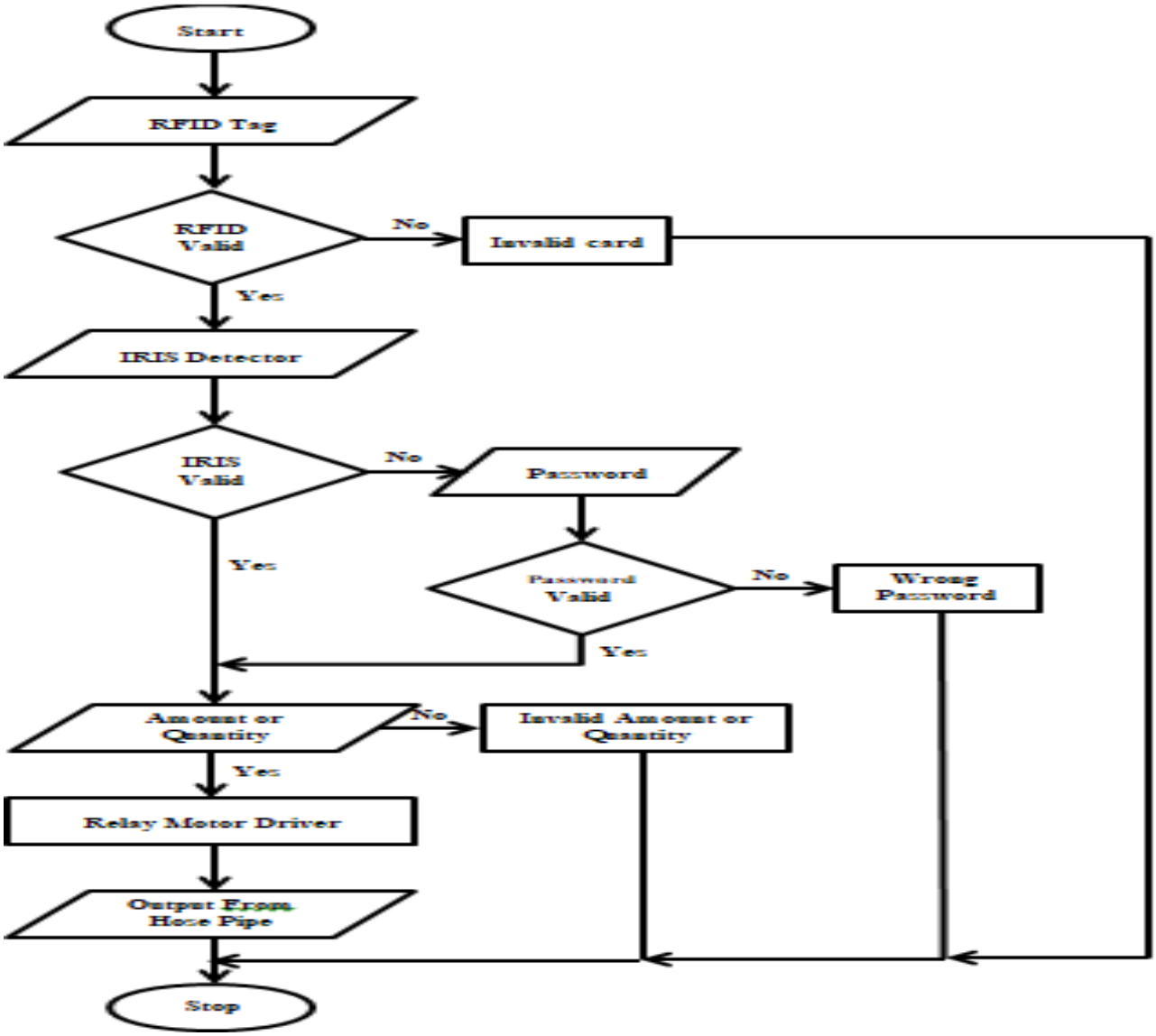


Fig 3. Flowchart of System

V. ALGORITHM

STEP 1: RFID tag with RFID reader. STEP 2: RFID Validation

If Valid-STEP 3.

If not Valid-STEP 10.

STEP 3: Starts detecting IRIS and sends back capture data.

STEP 4: Data will be verify with stored data base.

If Valid-STEP 6.

If Not Valid-STEP 5. STEP 5: Give input password

If Valid-STEP 6.

If Not Valid-STEP 10.

STEP 6: Input Quantity or Amount.

STEP 7: Relay starts to pump fuel through pump motor from fuel tank and dispatch petrol.

STEP 8: Once dispatch is done, it terminate it with message transaction complete.

STEP 9: Transaction Details is stored in web can later check in TCP/IP App.

STEP 10: STOP.

VI. Problem Statement

In current days fuel stations are operated manually. These fuel pumps are time consuming and require more manpower. To place fuel stations in distant area it very costly to provide excellent facility to the consumers all these problem are sorted out by the use of unmanned petrol pump which requires less time to operate and it is effective and can be installed anywhere the customer self-going to avail the services the payment is done by smart card system.

VII. Applications

This technology can be enhanced to implement the same system for milk processing industries while distributing the milk and its products to the market. In day to day life we can see that water distribution in summer is also one of the problems in front of India. So it is possible to keep control on water distribution in particular area. The rationing products like vegetable oil as well as kerosene and its sub products may be securely distributed to the customers using the same system we proposed. Also it is possible to keep record of the distributed products in market which is commercially most important for industries.

A. CORE APPLICATION

Fuel Bunks- The whole concept can be implement in any fuel bunks for dispensing, such as

- Petrol
- Diesel
- LPG

B. CONCEPT APPLICATION

Food Sector-The dispensing concept with IRIS and Password security system can be implement in following,

- Milk
- Water
- Grocery
- Beverages

Bank Sector - Security system and IOT concept can be implement in bank sector for,

- ATM
- Pass Book Entry

Company Sector - This concept can be implement for signing -in and signing- off in company or in institutions,

- Employee
- Student

RESULT

This system utilizes a Raspberry Pi, the fastest processor currently on the market. As a result, our project operates more efficiently and consumes less time in comparison to other processors. The waved RFID card's details are read using an RFID reader. We utilized an LCD display to show the amount, and a keypad for entering the amount and PIN. A relay driver with a motor facilitates fuel dispensing from the tank. Fuel bunks utilizing our technology can operate continuously without the need for human intervention. This project will feature a centralized server that maintains a database of customer information, such as Customer Name and Card No. After the cash payment, the petrol balance can be augmented; it will be reduced based on card usage for fuel purchases.

Conclusion

The suggested automatic fuel station removes the need for a human operator at petrol pumps for payment transactions and eliminates any manual handling of pumping system adjustments. The sole prerequisite is that every customer must first register with the online payment system and save their identity using face detection. The system can be efficiently realized in urban areas by minimizing time expenditure, and in rural areas by reducing the system's costs.

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