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Development of Radio Frequency Identification Tags (RFID) Based Petrol Pump Automation System for Enhanced Performance

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ABSTRACT

Everything has been digitized. In many existing systems, almost all petrol pumps 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 a person is required to collect the money and there is card to access petrol at different petrol stations of different petrol companies across the country and here, we are connecting all these petrol stations using single web server This web server access is secured by a password which is known only to the petrol companies. Whenever we want to fill the tank from the fuel dispenser, we just have to place the RFID card near the RFID reader

Keywords: RFID, Microcontroller, Dispensing system, Automated Petrol Pump system.

INTRODUCTION

Petroleum is the foremost and mainstay of modern civilization. It is one of the nature's rare and valuable creation. Its formation takes millions of years which insist proper utilization of the resource. In present scenario, fuel stations are operated manually which consist a controlling unit to perform various tasks. The present manual fuel stations consume more time and requires substantial man power. Moreover, it is prone to malpractices and higher probability of human initiated errors. These limitations restrict installation of fuel stations in distant areas. The main aim of this paper is to deal with all stated problems by developing an automated petrol dispensing system using RFID technology. Such a system enables a user to use a RFID based prepaid card to access petrol at fuel stations. Whenever the user wants to fill the tank from the fuel dispenser, user has to enter the amount first And then place the RFID card near the RFID reader. The Arduino Uno manages to read the data from the RFID reader and perform action according to the customer requirements as well as the amount deducted from the users card's Proposed system Implementation of RFID technology has changed the operation of conventional fuel dispensers. The practical implementation of the system is done by oil products distribution company. This technology can be enhanced to implement the same system for petrol processing industries while distributing the petrol 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.

BLOCK DIAGRAM
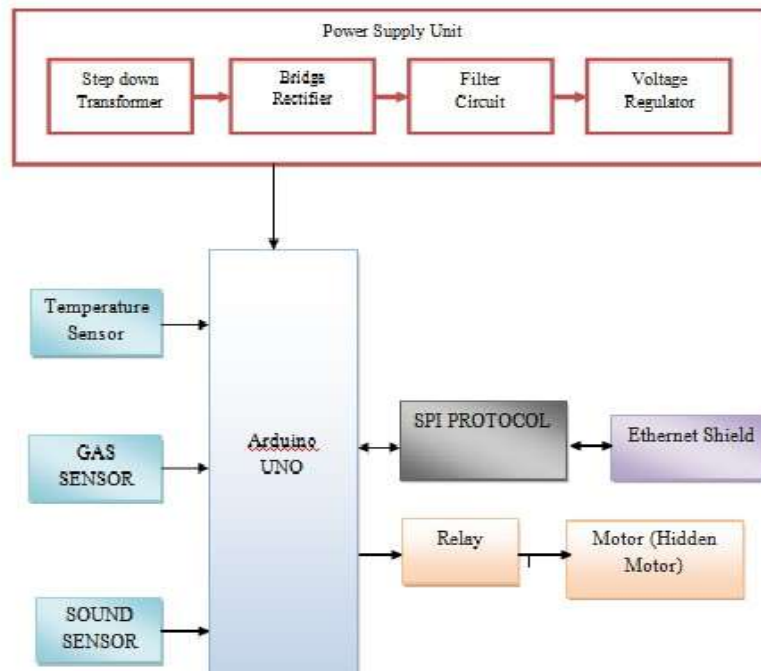
BLOCK DIAGRAM DESCRIPTION

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units. **Components used**

(230/12V) TRANFOMER Transformer

The potential transformer will step down the power supply voltage (0-230V) to (06V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC, rest of the circuits will give only RMS output. **Bridge rectifier**

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current f. **IC voltage regulators**

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

- For ICs, microcontroller, LCD --------- 5 volts

- For alarm circuit, op-amp, relay circuits ---------- 12 volts

ARDUINO UNO

Arduino interface boards provide the engineers, artists, designers, hobbyists and anyone who tinker with technology with a low-cost, easy-to-use technology to create their creative, interactive objects, useful projects etc., A whole new breed of projects can now be built that can be controlled from a computer. Atmega 16U2 replace the 8U2.• "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards. Summary Microcontroller ATmega328

Operating Voltage 5V

Input Voltage (recommended) 7-12V

Input Voltage (limits) 6-20V

Digital I/O Pins 14 (of which 6 provide PWM output)

Analog Input Pins 6

DC Current per I/O Pin 40 mA

DC Current for 3.3V Pin 50 mA

Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader

SRAM 2 KB (ATmega328)

EEPROM 1 KB (ATmega328) Clock Speed 16 MHz

AUTOMATIC (SOFTWARE) RESET

 Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload. This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following halfsecond or so, the bootloader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data. The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

Capacitors:

        A capacitor is a crucial component that, like inductors, is crucial for the charging and discharging processes of converters. Capacitor ratings are created by analysing and resolving the design equation of converters for zeta. It also changes depending on the input and output needed for a certain application. In a boost converter, a capacitor is linked in parallel with the load to maintain constant load current. The inductor stores energy, the diode creates a short circuit, the capacitor discharges to produce the necessary load current ($I_c=-I_o$), and the voltage across the capacitor (which is the voltage across the output) lowers when the power electronic switch is on. Without the capacitor, the load current would have been zero while the switch was on. Also, the capacitor charges and its voltage rises once more during the switch's off period. Moreover, the capacitor smooths out the output voltage sag. Here, we use a 33mF capacitor on the output side and two (C1&C2) 2200uF 63V electrolytic capacitors for input side charging

Microcontroller

Microcontroller can be described as a computer embedded on a rather small circuit board.To describe the function of a microcontroller more precisely,it is a single chip that can perform various calculations and tasks,and send/receive signals from other devices via the available pins. Precisely what tasks and communication with the world it does, is what is governed by what instructions we give to the Microcontroller. It is this job of telling the chip what to do, is what we refer to as programming on it.

However, the uC by itself, cannot accomplish much; it needs several external inputs: power, for one; a steady clock signal, for another. Also, the job of programming it has to be accomplished by an external circuit. So typically, a uC is used along with a circuit which provides these things to it; this combination is called a microcontroller board. The Arduino Uno that you have recieved, is one such microcontroller board. The actual microcontroller at its heart is the chip called **Atmega328**. The advantages that Arduino offers over other microcontroller boards are largely in terms of reliability of the circuit hardware as well as the ease of programming and using it.

NODUMCU

The NodeMCU (*N*ode *M*icro*C*ontroller *U*nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

SOUND SENSOR

nowadays, a lot of Security events are initiated due to some sort of sound which includes gunshots, aggressive behavior, breaking the glass. But cameras with inbuilt sound exposure facilities can add huge value to the security system. Because they give an alert automatically when real and potential incidents occur. Then immediately they activate quick and appropriate actions to reduce the consequences. This article discusses an overview of the sound sensor module.

SOUND SENSOR

Thermometers

Thermometers are the most common temperature sensors encountered in simple, everyday measurements of temperature. Two examples of thermometers are the Filled System and Bimetal thermometers.

Gas Sensor

(MQ3) module is useful for gas leakage detection (in home and industry). It is suitable for detecting Alcohol, Benzine, CH4, Hexane, LPG, CO. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible.

RFID MODULE

The RFID stands for Radio Frequency Identification. This module uses electromagnetic waves in radio frequency to transfer data (read/write). It can read/write all types of Transponders (RFID card tags and key fob tags) which haveing 1KB memory and compatible with 13.56 MHz frequency.

DC MOTOR:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

LCD DISPLAY

This is the first interfacing example for the Parallel Port. We will start with something simple. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if no all Parallel Ports. It however doesn't show the use of the Status Port as an input. A 16 Character x 2 Line LCD Modules to the Parallel Port. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required running them is on board.

CONCLUSION

The above mentioned model proposes to remove all the shortcomings of the manually operated petrol pumps by replacing them with automated ones. RFID is a versatile technology , easy to use and it can be efficiently used in this real time application. The proposed model consists of certain goals like ensuring right amount of fuel dispensed, removing all human errors by the use of RFID cards and ensuring customer's trust for a fair sale of the product [9]. These automated fuel stations provide a lot more advantages as they reduces man power with the automated self service. With this simple technology in use, any person can easily access for fuel at Fuel Stations. Apart from this all ,these systems are less time consuming compared to the traditional ones. The technology proposed is very cost efficient and has low power consumption as well, which sets the major benchmark in today's scenario.

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