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# RFID Based Petrol System

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## ABSTRACT

**Our world today is undeniably digital and all systems are now a days expected to work at its own, The system automation can assist in our independent lives & this automation is brought into petrol stations by the advanced RFID (Radio Frequency Identification) based technology. This wireless fuel management and easy payment system allows easy access to the vehicle at the petrol stations. This system is designed in a way that it ensures the right grade and quality of fuel dispensed into the vehicle. To ensure the trust worthiness of the petrol bunk or station, this system is designed to have an ultrasonic sensor for monitoring the fuel tank level. The tank level is measured for each & every time when the user uses the petrol bunk for fuel - dispensing. These measured levels are then updated to a website that can be accessed by the owner of the petrol bunk. This is done with the help of IOT technology. The IOT devices keep the owner updated about the fuel tank level. The user can get that information on fuel tank level and the balance amount in his / her RFID card through a LCD Display. Everyone can enjoy this unmanned petrol station which is not so time consuming. This viable and very quick system can be installed anyplace.**

**Key Words: RFID card, LCD Display, IOT**

## INTRODUCTION

The modernized world and its advancement in technology insists us to live an independent life by providing the so called feature, "automation" Now – a – days, most of the existing systems are becoming automated systems. This approach of automation is used for petrol stations in this project, called RFID based Petrol System. This system depends on the Radio Frequency Identification Technology.

The user can get fuel from the petrol station without someone's assistance by using their RFID cards or tags. The RFID tags are those that are given to the users or consumers. These tags are prepaid tags that have some unique identity using which the user can be identified in the petrol stations. This identification is done by the RFID Readers that are kept in the fuel / petrol stations.

When the user get authentication, the pump motor runs and then the petrol is dispensed without the help of any manpower The ultrasonic sensor measures the tank level and this is displayed to the user through a Liquid Crystal Display. The tank level is updated to the owner of the petrol bunk by using the IOT technology. So this system has advantage, that it updates both the owner and the consumer of the petrol bunk about the current status of the fuel tank level.

### Scope of the paper

This paper is about , Designing and Implementing an automated petrol system using RFID technology, and this can be described in other words as a smart petrol system using IOT technology. This petrol system is called smart because it is capable of detecting the petrol dispensed to a consumer's vehicle without the human assistance.

The level of fuel or petrol in the station can be measured and updated to a cloud server. This server is accessible to the owner or the administrator of the petrol station. If the fuel level in the station is low, the owner will get to know about it and then the station is provided with fuel from the main station. By the way, the user is also updated to the status of the tank level, so that the user can ensure that the petrol is dispensed properly as per the amount paid.

Also, the main feature of this automated petrol system is that it facilitates digital or cashless payment. The consumer is able to pay for fuel with the prepaid RFID cards. The other feature is that, this system has an ultrasonic sensor that detects the

petrol tank or fuel tank level & then the status of the tank level is updated to both the owner & user of petrol station.

**Existing System**

Now – a – days, the existing petrol system is provided with the assistance of man power. The automated petrol systems still remain to be just an ideology in India. When it comes to real – time applications, there are some constraints in setting up these petrol stations.

Typical Fuel Stations have a setup which needs the manpower to control & operate them. The user can get fuel for the given money. For payment, the user should have cash or cards with them. There is no assurance that correct delivery of petrol is done in these typical petrol systems.

**Existing System Disadvantages**

- **The Existing Petrol Systems use manpower**
  Human assistance is the essential one to operate and control these petrol systems.
- **The user should possess cash / card**
  For getting fuel from the fuel stations, the user should take money with them or their ATM cards with them to proceed the payment process.
- **No Assurance for correct delivery of fuel**
  There is no assurance given for the correct delivery of petrol. There may be some fraudulent activities that can take place in those systems.
- **Time consuming process**
  It is comparably a time – consuming process that the automated petrol systems.

Today, almost all petrol pumps have a micro controller to control the electrical pump, drive the display, measure the flow & accordingly turn OFF the electric pump. But a person is still required to collect the money. Our paper is designed to eliminate this human interaction so that there is no need of workers to fill the petrol. In this paper petrol bunks are using the petro card system for filling petrol in any vehicle. In this system every user is provided with a smart petro card, with which one can access petrol at the petrol bunks. Before using this card, we have to recharge it.

Whenever we want to fill the tank, then we have to place the Petro card in the card reader, which is interfaced to the microcontroller with serial interfacing. The microcontroller reads the data from the smart card reader and asks how many liters you require, which will be displayed on the LCD screen. Then we have to enter the required number of liters of petrol through keypad which act as an input to the microcontroller. After reading this value the microcontroller will check for the available balance in the smart card, if it is sufficient then the petrol filling process will be started. After filling the required quantity, a buzzer will indicate the process of completion [1].

Traditional methods of monitoring petrol pump in gas station by humans on site are unable to meet the expectations for efficiency, accuracy and cost. Setting up an RFID and ESP8266 based petrol station monitoring system is a good approach to improve monitoring efficiency and to improve management efficiency in stations. Although there are still some problems to be solved for RFID and WIFI technologies, their unique features still make the monitoring system based on them a promising system. The architecture of the RFID as prepaid system and ESP8266 as monitoring system in petrol station is presented in this paper [2].

In Today's world almost all the sectors and industries have been automated. Petroleum industries are not an exception to that. Petrol pumps have been very much automated, they have microcontrollers to monitor the outlet of petrol and display the appropriate amount to the customer. Even though everything is automated, customers have to collect the money and there is a high possibility of human error while handling hard cash. Our Project is designed in such a way that the person need not worry about carrying the cash with himself/herself. A Smart card, which contains an RFID tag is given to the customers and the petrol pump will have an RFID Reader and payment can be made through the RFID Technology without any hard cash or Human interaction. In this way, human errors in calculation can be saved and efficient transactions can be carried out [3].

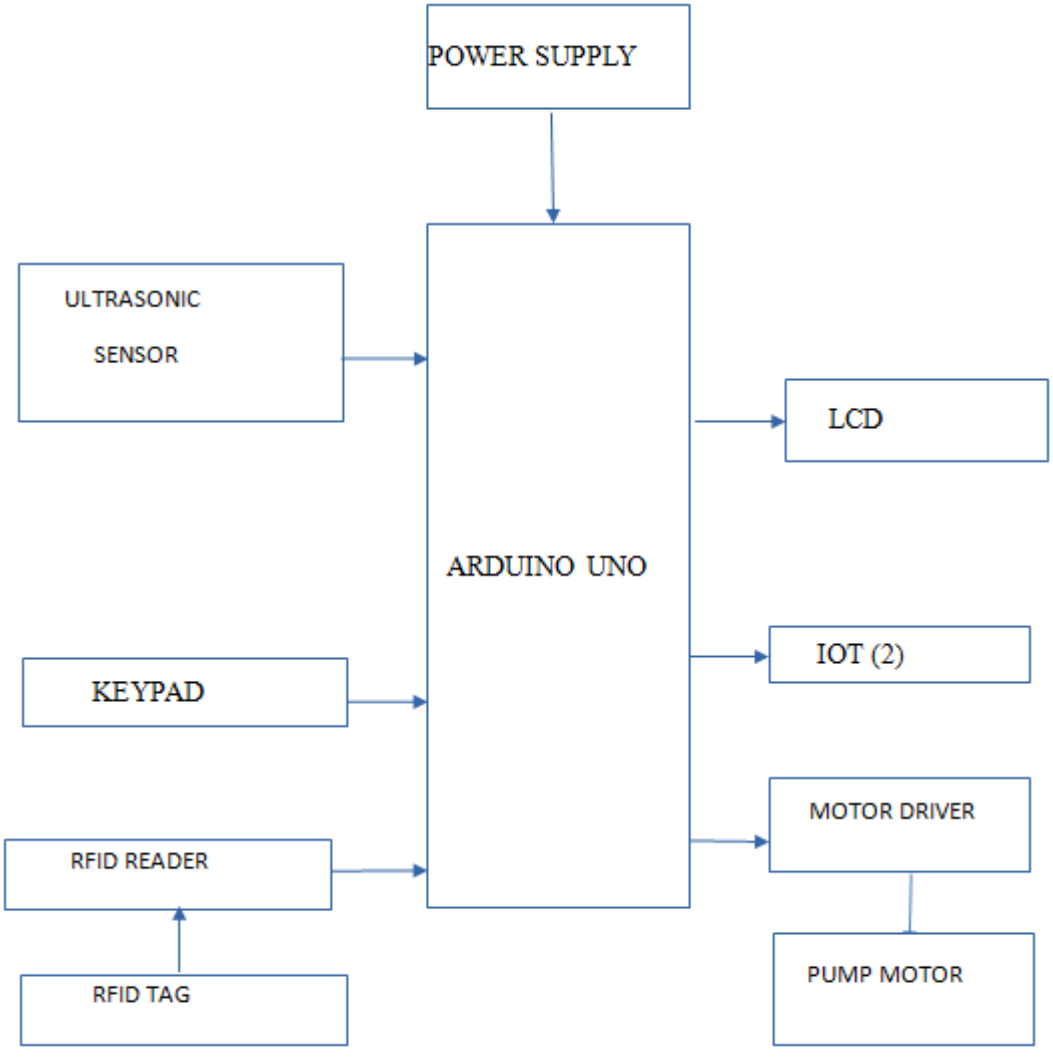
RFID is a versatile and trending technology which is used in many real time applications. In this proposed work, RFID system is a microcontroller-based system that reduces the man power and dispenses the accurate amount of fuel. Also, if the customer tries to swipe the unauthorized card, the RFID system rejects the card. In this way, the system is very secured. For the RFID operation, the frequency of the reader ranges from 125 KHz to 2.4 GHz [4].

Automation plays an important role in 21st century. The principal point of this project is to structure a framework which is prepared to do consequently deducting the measure of the petrol dispensed from user card dependent on RFID innovation and send the data of transaction of petrol and the sum to the proprietor through the Internet of Things (IoT). Liquid dispensing systems are normally found in our day by day life in better places like workplaces, Bus stands, Railway stations, Petrol syphons. Here we are going to display the modern era petrol dispensing system which is intended to be working with a prepaid card utilizing RFID innovation technology. The undertaking primarily points in structuring a prepaid card for petrol bunk framework and furthermore petrol dispensing system utilizing RFID innovation. In current days the petrol stations are worked physically [5].

## RFID BASED PETROL SYSTEM – DESCRIPTION

**Block Diagram**

The Block Diagram of the RFID – Based Petrol System is drawn as,




**Block Diagram Working**

In this system ARDUINO UNO, microcontroller board is used to interface with the sensors and to the communication devices. The LCD is used to update the latest information to the user of petrol bunk. RFID tag is used as a user identification device which is used to for making payments for refueling. Keypad is used to enter the amount for refueling. The pump motor is switched using the motor driver. The ultrasonic sensor is used to measure the level in the fuel station. The trust ability of the bunk can be determined according to the data. The IOT is used to update the information to the webpage for both user and owner of petrol bunk.

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**Modules Name**

**Monitoring**

Monitoring is a process which involves the following steps.

- ✓ Checking
- ✓ Recording
- ✓ Testing something regularly for a period of time.

Monitoring in this system means checking & recording the fuel tank level regularly. In this system, the components used for monitoring and updating are,

- ➢ Ultrasonic sensor
- ➢ Arduino UNO
- ➢ IOT
- ➢ LCD (Liquid Crystal Display)

❖ **PAYMENT PROCESS**

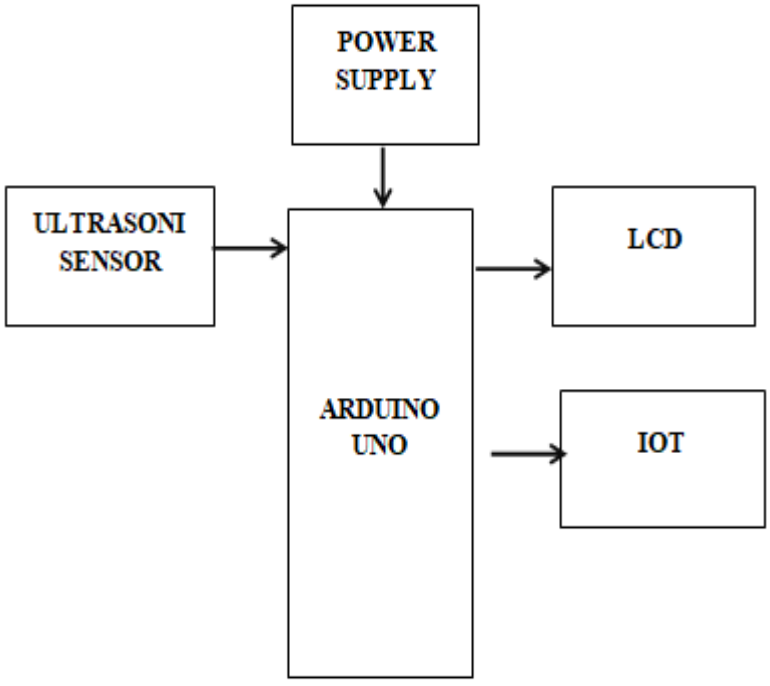
A payment is the process of voluntary, transfer of money or its equivalent or of things of value by one party to another in exchange for goods or services provided by them or to fulfill a legal obligation.

Here, the payment is done for getting fuel in the petrol station. For payment process, the components used are

- RFID tag & reader
- Keypad
- Arduino UNO
- LCD
- Motor driver
- Pump motor.

**MODULE DESCRIPTION**

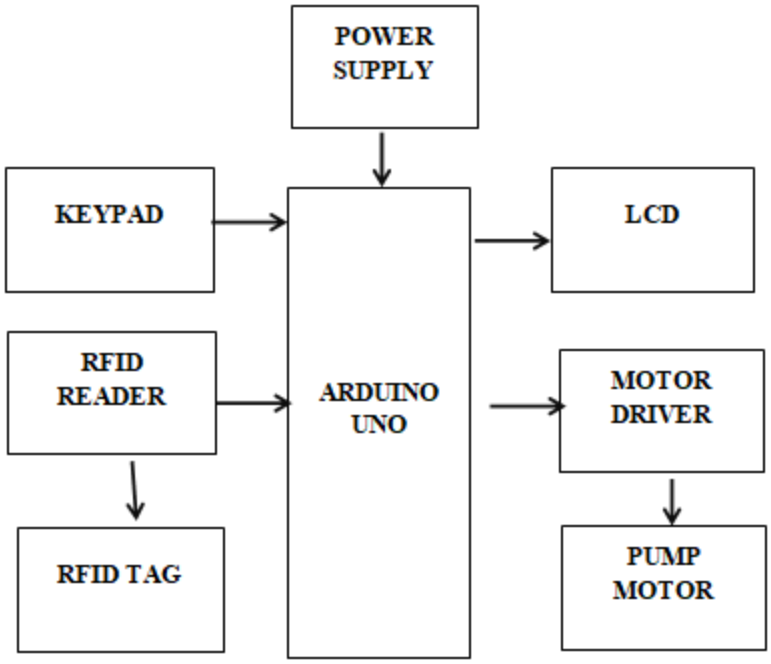
❖ **Monitoring**




In our project we are using Arduino uno micro controller it is brain of our system, in our project we are using ultrasonic sensor for fuel level measurement in petrol bunk, LCD is used display the current status, IOT is used to feed the fuel level in IOT website.

❖ **Payment Process**

In our project we are using Arduino uno micro controller it act as a brain of our system, RFID tag is used as a user identification device which is used to for making payments for refueling. Keypad is used to enter the amount for refueling. LCD is used to display the current status; motor driver is used to control the pump motor.




**Work of Ultra Sonic Sensor and Iot**

In this system, the fuel level measurement is done by the ultrasonic sensor & the measured and recorded data is uploaded to cloud server using the IOT. Let's learn about the working of Ultrasonic Sensor & the IOT equipments.

**ULTRASONIC SENSOR**

**Sound Waves**

Sound is a mechanical wave travelling through the mediums, which may be a solid, or liquid or gas. Sound waves can travel through the mediums with specific velocity depends on the medium of propagation. The sound waves which are having high frequency reflect from boundaries and produces distinctive echo patterns.

Sound waves are having specific frequencies or number of oscillations per second. Humans can detect sounds in a frequency range from about 20Hz to 20 KHz. However the frequency range normally employed in ultrasonic detection is 100 KHz to 50MHz. The velocity of ultrasound at a particular time and temperature is constant in a medium.

**W = C/F (or) W = CT**

Where W = Wave length,
C = Velocity of sound in a medium,
F = Frequency of wave,
T=Time Period.

The most common methods of ultrasonic examination utilize either longitudinal waves or shear waves. The longitudinal wave is a compression wave in which the particle motion is in the same direction of the propagation wave. The shear wave is a wave motion in which the particle motion is perpendicular to the direction of propagation. Ultrasonic detection introduces high frequency sound waves into a test object to obtain information about the object without altering or damaging it in any way. Two values are measured in ultrasonic detection.

The amount of time, taking for the sound to travel through the medium and amplitude of the received signal. Based on velocity and time thickness can be calculated.

**Thickness of material = Material sound velocity X Time of Fight**

**Transducers for Wave Propagation and Particle Detection**

For sending sound waves and receiving echo, ultrasonic sensors, normally called transceivers or transducers will be used. They work on a principle similar to radar that will convert electrical energy into mechanical energy in the form of sound, and vice versa.

The commonly used transducers are contact transducers, angle beam transducers, delay line transducers, immersion transducers, and dual element transducers. Contact transducers are typically used for locating voids and cracks to the outside surface of a part as well as measuring thickness. Angle beam transducers use the principle of reflection and mode conversion to produce refracted shear or longitudinal waves in the test material.

Delay line transducers are single element longitudinal wave transducers used in conjunction with a replaceable delay line. One of the reasons for choosing delay line transducer is that near surface resolution can be improved. The delay allows the element to stop vibrating before a return signal from the reflector can be received.

The major advantages offered by immersion transducers over contact transducers are Uniform coupling reduces sensitivity variations, Reduction in scan time, and increases sensitivity to small reflectors.

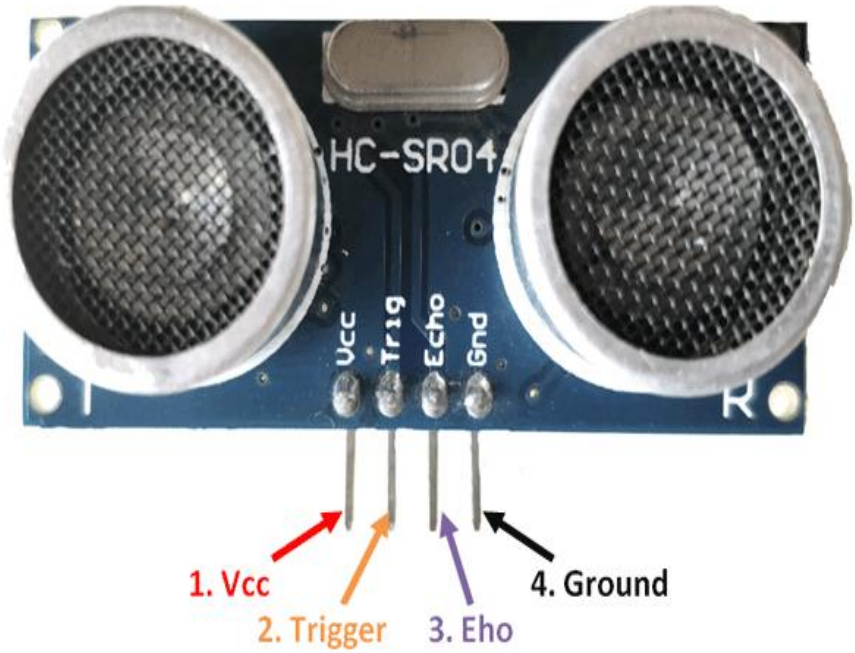
**Work of Ultrasonic Sensor**

Ultrasonic detection is most commonly used in industrial applications to detect hidden tracks, discontinuities in metals, composites, plastics, ceramics, and for water level detection. For this purpose the laws of physics which are indicating the propagation of sound waves through solid materials have been used since ultrasonic sensors using sound instead of light for detection.

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.

An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

High-frequency sound waves reflect from boundaries to produce distinct echo patterns.




When an electrical pulse of high voltage is applied to the ultrasonic transducer it vibrates across a specific spectrum of frequencies and generates a burst of sound waves. Whenever any obstacle comes ahead of the ultrasonic sensor the sound waves will reflect back in the form of echo and generates an electric pulse. It calculates the time taken between sending sound waves and receiving echo. The echo patterns will be compared with the patterns of sound waves to determine detected signal's condition.

**Ultrasonic Sensor Pin Configuration**

| PIN NUMBER | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | Vcc | The Vcc pin powers the sensor, typically with +5V |
| 2 | Trigger | Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave. |
| 3 | Echo | Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor. |
| 4 | Ground | This pin is connected to the Ground of the system. |

**Hc-Sr04 Sensor Features**

- Operating voltage: +5V.
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm.
- Accuracy: 3mm.
- Measuring angle covered: <15°.
- Operating Current: <15Ma.
- Operating Frequency: 40Hz.

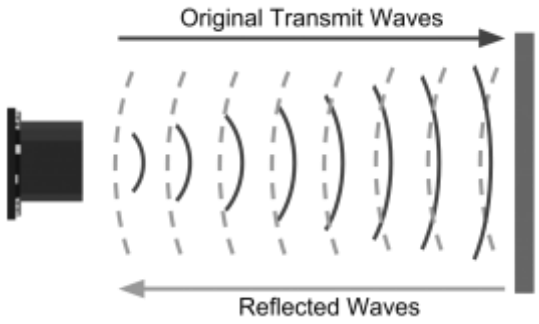
**Hc-Sr04 Ultrasonic Sensor – Working**

As shown above the **HC-SR04 Ultrasonic (US) sensor** is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

**Distance = Speed × Time**

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below.

Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.



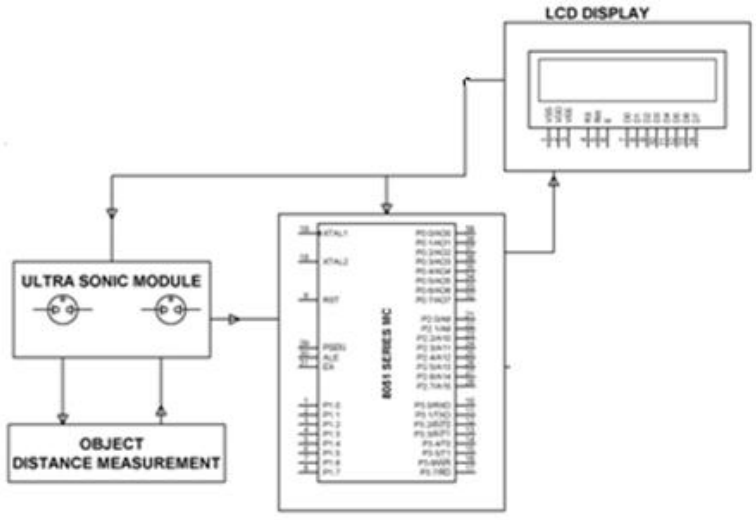

The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

Ultrasound is reliable in any lighting environment and can be used inside or outside. Ultrasonic sensors can handle collision avoidance for a robot, and being moved often, as long as it isn't too fast.

Ultrasonics are so widely used, they can be reliably implemented in grain bin sensing applications, water level sensing, drone applications and sensing cars at your local drive-thru restaurant or bank.

Ultrasonic rangefinders are commonly used as devices to detect a collision.

Ultrasonic sensor module comprises of one transmitter and one receiver. The transmitter can deliver 40 KHz ultrasonic sound while the maximum receiver is designed to accept only 40 KHz sound waves. The receiver ultrasonic sensor that is kept next to the transmitter shall thus be able to receive reflected 40 KHz, once the module faces any obstacle in front. Thus whenever any obstacles come ahead of the ultrasonic module it calculates the time taken from sending the signals to receiving them since time and distance are related for sound waves passing through air medium at 343.2m/sec. Upon receiving the signal MC program while executed displays the data i.e. the distance measured on a LCD interfaced to the microcontroller in cms.




**Ultrasonic Distance Sensor Circuit**

Characteristically, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired.

**How to Use the Hc-Sr04 Ultrasonic Sensor**

**HC-SR04 distance sensor** is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide is universally since it has to be followed irrespective of the type of computational device used.

Power the Sensor using a regulated +5V through the Vcc ad Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. To start the measurement, the trigger pin has to be made high for 10uS and then turned off. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.

The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information the distance is measured as explained in the above heading.

**Applications**

- Used to avoid and detect obstacles with robots like biped robot, obstacle avoider robot, path finding robot etc.
- Used to measure the distance within a wide range of 2cm to 400cm.

**Internet of Things**

The **internet of things** (**IoT**) is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.

**Application Areas**

In the last few years the evolution of markets and applications, and therefore their economic potential and their impact in addressing societal trends and challenges for the next decades has changed dramatically. Societal trends are grouped as: health and wellness, transport and mobility, security and safety, energy and environment, communication and e-society, as presented in Figure 2.15. These trends create significant opportunities in the markets of consumer electronics, automotive electronics, medical applications, communication, etc. The applications in these areas benefit directly by the More-Moore and More-than-Moore semiconductor technologies, communications, networks, and software developments.

a) **Cities**

- Smart Parking
- Structural health
- Noise Urban Maps
- Traffic Congestion
- Smart Lightning
- Waste Management
- Intelligent Transportation Systems
- Environment
- Forest Fire Detection
- Air Pollution
- Landslide and Avalanche Prevention

- Earthquake Early Detection

**b) Water**
- Water Quality
- Water Leakages
- River Floods

**c) Energy Smart Grid, Smart Metering**
- Smart Grid
- Tank level
- Photovoltaic Installations
- Water Flow
- Silos Stock Calculation

**d) Security & Emergencies**
- Perimeter Access Control
- Liquid Presence
- Radiation Levels
- Explosive and Hazardous Gases

**e) Industrial Control**
- M2M Applications
- Indoor Air Quality
- Temperature Monitoring
- Ozone Presence
- Indoor Location
- Vehicle Auto-diagnosis

**f) Agriculture**
- Wine Quality Enhancing
- Green Houses
- Golf Courses
- Meteorological Station Network
- Domestic & Home Automation
- Energy and Water Use
- Remote Control Appliances
- Intrusion Detection Systems
- Art and Goods Preservation

**g) E health**
- Fall Detection
- Medical Fridges
- Sportsmen Care
- Patients Surveillance
- Ultraviolet Radiation

**Esp-12e Basednodemcu**

The ESP8266 is the name of a micro controller designed by Express if Systems. The ESP8266 itself is a self-contained Wi-Fi networking solution offering as a bridge from existing micro controller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect Node MCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

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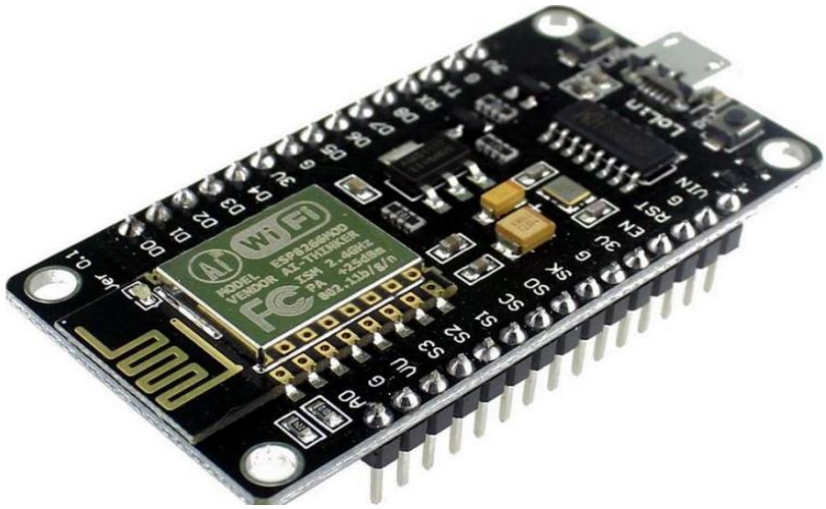
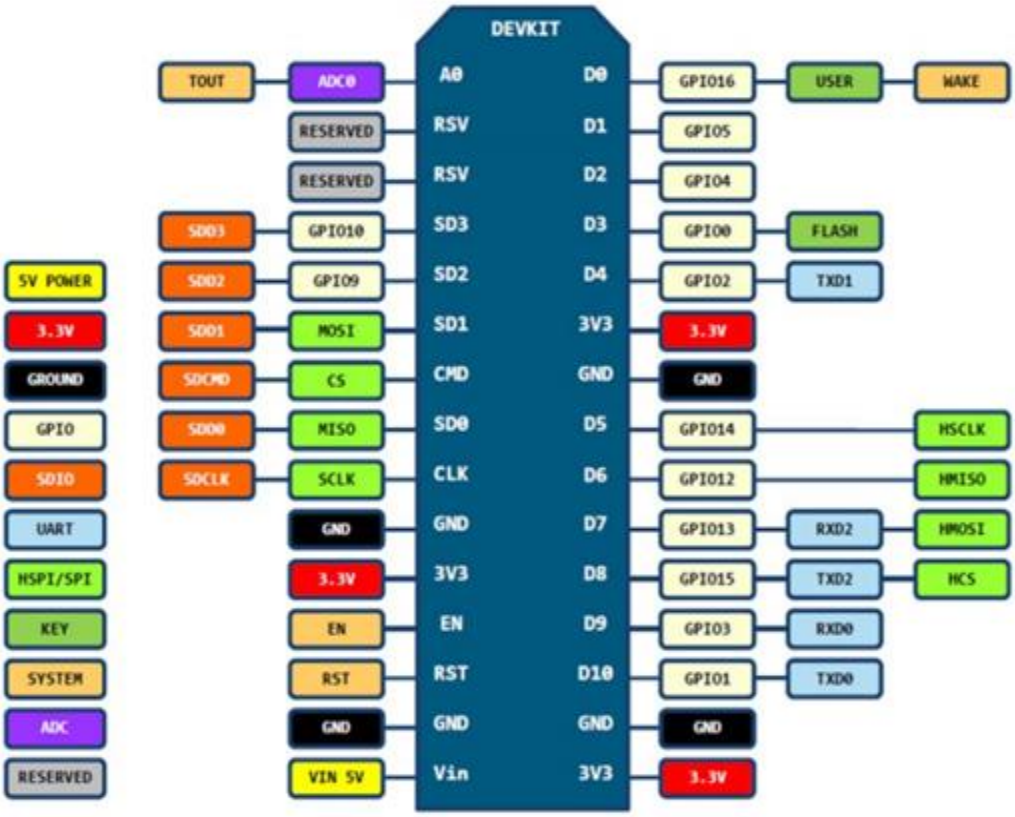


**Esp-12e Basednodemcu**

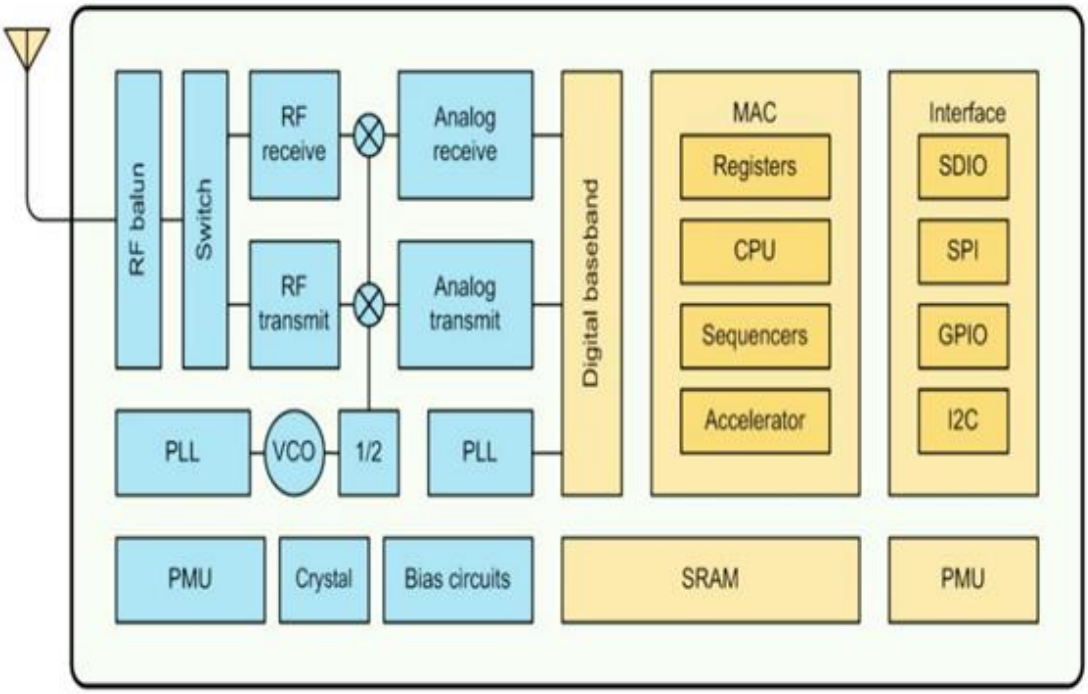
ESP-12E Wi-Fi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultra-low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.



**Nodemcu Pin Configuration**

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated Wi-Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

**Esp-12e Architecture**




**Features**

- 802.11 b/g/n
- Integrated low power 32-bit MCU
- Integrated 10-bit ADC
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- Wi-Fi 2.4 GHz, support WPA/WPA2
- Support STA/AP/STA+AP operation modes
- Support Smart Link Function for both Android and iOS devices
- Support Smart Link Function for both Android and iOS devices
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO
- STBC, 1x1 MIMO, 2x1 MIMO
- A-MPDU & A-MSDU aggregation and 0.4s guard interval
- Deep sleep power < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20dBm output power in 802.11b mode
- Operating temperature range -40C ~ 125C

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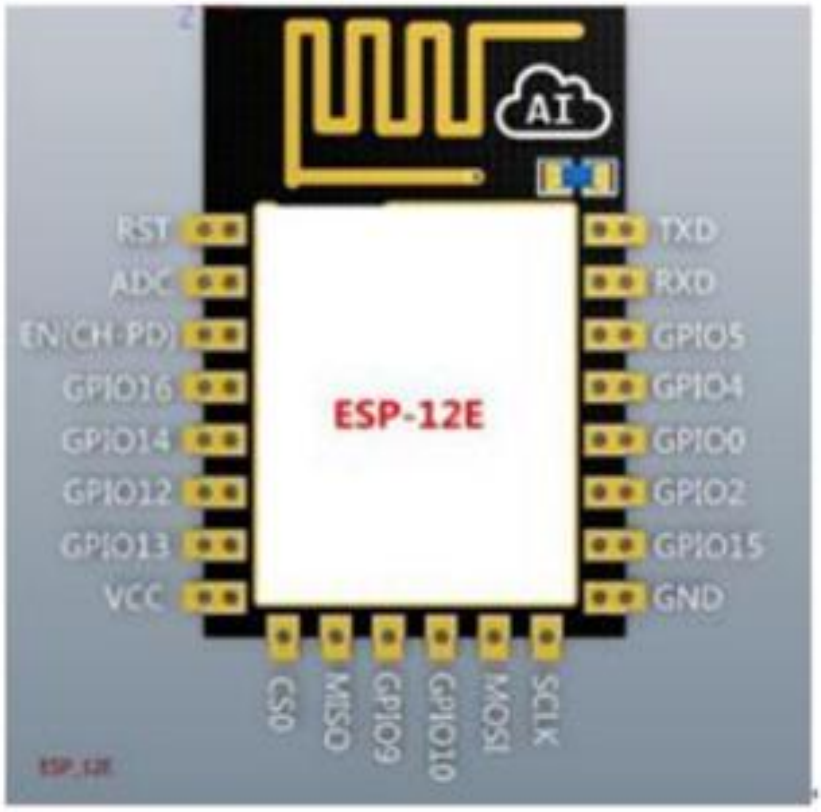


**Esp-12e Pin Configuration**

**Pin Description**

| NO. | Pin Name | Function |
|---|---|---|
| 1 | RST | Reset the module |
| 2 | ADC | A/D Conversion result.Input voltage range 0-1v,scope:0-1024 |
| 3 | EN | Chip enable pin.Active high |
| 4 | IO16 | GPIO16; can be used to wake up the chipset from deep sleep mode. |
| 5 | IO14 | GPIO14; HSPI_CLK |
| 6 | IO12 | GPIO12; HSPI_MISO |
| 7 | IO13 | GPIO13; HSPI_MOSI; UART0_CTS |
| 8 | VCC | 3.3V power supply (VDD) |
| 9 | CS0 | Chip selection |
| 10 | MISO | Salve output Main input |

| | | |
|---|---|---|
| 11 | IO9 | GPIO9 |
| 12 | IO10 | GBIO10 |
| 13 | MOSI | Main output slave input |
| 14 | SCLK | Clock |
| 15 | GND | GND |
| 16 | IO15 | GPIO15; MTDO; HSPICS; UART0_RTS |
| 17 | IO2 | GPIO2; UART1_TXD |
| 18 | IO0 | GPIO0 |
| 19 | IO4 | GPIO4 |
| 20 | IO5 | GPIO5 |
| 21 | RXD | UART0_RXD; GPIO3 |
| 22 | TXD | UART0_TXD; GPIO1 |

**Pin Mode**

| Mode | GPIO15 | GPIO0 | GPIO2 |
|---|---|---|---|
| **UART** | Low | Low | High |
| **Flash Boot** | Low | High | High |

**Receiver Sensitivity**

| Parameters | Min | Typical | Max | Unit |
|---|---|---|---|---|
| Input frequency | 2412 | | 2484 | MHz |
| Input impedance | | 50 | | Ω |
| Input reflection | | | -10 | dB |
| Output power of PA for 72.2Mbps | 15.5 | 16.5 | 17.5 | dBm |
| Output power of PA for 11b mode | 19.5 | 20.5 | 21.5 | dBm |
| Sensitivity | | | | |
| DSSS, 1Mbps | | -98 | | dBm |
| CCK, 11Mbps | | -91 | | dBm |
| 6Mbps (1/2 BPSK) | | -93 | | dBm |
| 54Mbps (3/4 64-QAM) | | -75 | | dBm |
| HT20, MCS7 (65Mbps, 72.2Mbps) | | -72 | | dBm |
| **Adjacent Channel Rejection** | | | | |
| OFDM, 6Mbps | | 37 | | dB |
| OFDM, 54Mbps | | 21 | | dB |
| HT20, MCS0 | | 37 | | dB |
| HT20, MCS7 | | 20 | | dB |

**Functional Descriptions**

**MCU**

ESP8266EX is embedded with Tensilica L106 32-bit micro controller (MCU), which features extra low power consumption and 16-bit RSIC. The CPU clock speed is 80MHz. It can also reach a maximum value of 160MHz. ESP8266EX is often integrated with external sensors and other specific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

**Memory Organization**

**Internal SRAM and ROM**

ESP8266EX Wi-Fi SoC is embedded with memory controller, including SRAM and ROM. MCU can visit the memory units through iBus, dBus, and AHB interfaces. All memory units can be visited upon request, while a memory arbiter will decide the running sequence according to the time when these requests are received by the processor. According to our current version of SDK provided, SRAM space that is available to users is assigned as below:

- RAM size < 36kB, that is to say, when ESP8266EX is working under the station mode and is connected to the router, programmable space accessible to user in heap and data section is around 36kB.)
- There is no programmable ROM in the SoC, therefore, user program must be stored in an external SPI flash.

**External SPI Flash**

This module is mounted with an 4 MB external SPI flash to store user programs. If larger definable storage space is required, a SPI flash with larger memory size is preferred. Theoretically speaking, up to 16 MB memory capacity can be supported. Suggested SPI Flash memory capacity:

- OTA is disabled: the minimum flash memory that can be supported is 512 kB;
- OTA is enabled: the minimum flash memory that can be supported is 1 MB. Several SPI modes can be supported, including Standard SPI, Dual SPI, and Quad SPI.

**Crystal**

Currently, the frequency of crystal oscillators supported includes 40MHz, 26MHz and 24MHz. The accuracy of crystal oscillators applied should be ±10PPM, and the operating temperature range should be between -20°C and 85°C. When

using the downloading tools, please remember to select the right crystal oscillator type. In circuit design, capacitors C1 and C2, which are connected to the earth, are added to the input and output terminals of the crystal oscillator respectively. The values of the two capacitors can be flexible, ranging from 6pF to 22pF, however, the specific capacitive values of C1 and C2 depend on further testing and adjustment on the overall performance of the whole circuit. Normally, the capacitive values of C1 and C2 are within 10pF if the crystal oscillator frequency is 26MHz, while the values of C1 and C2 are 10pF

**Applications**

This RFID based petrol system aims at implementing an automated petrol system. This system facilitates cashless payment by providing prepaid RFID cards. So this system is used to monitor the fueling system of the petrol bunk and the additional feature is that the level of petrol or fuel in the bunk can be measured and updated to a cloud server. So, we can monitor the tank level and upload it using an IOT website.

**Future Enhancement**

With this work carried out, we were able to achieve the main objective using IOT – based smart fuel station system which will help in upgrading the existing petrol station by curbing manpower, capital, cost & time and this system allows smart transactions.

In Future, this system can be enhanced by using AI and visual augmentation. The other enhancement is,

- The system can be installed with a bill printer density checker and quality checker.
- Touch Screen display can be installed to provide a clever interface for the user.

## ADVANTAGES

**Reduce Human Power**
Since, it is an auto guided system, it reduces human work. We can say , almost no human power is needed.

**RFID cards facilitate cashless payments**
The users need not carry cash or money with them to pay for fuel.

**Trustworthiness of the bunk is made known to the user**
The user get to know about the trustworthiness of the petrol bunk by means of IOT technology. IOT Technology updates the fuel tank level to the user, so that the user is given assurance that the petrol is delivered correctly.

**Time – Saving System**
This RFID based automated petrol system consumes less time compared to the usual petrol stations.

## CONCLUSION

It is advisable to recheck things so that we can be free from fear that right things happen. That too, now a days , we are hearing about lot of fraudulent activities. To keep us out of these fraudulent activities, we should be very careful in all situations. Sometimes, we hear about petrol pump fraudulent at many of the petrol stations, we don't get the exact amount of petrol as displayed by the filling machines in the petrol stations.

The amount of petrol we get from the petrol bunk is somewhat less than the actual amount. In this system, we are using an ultrasonic sensor to determine the fuel tank level. The RFID technology helps us with this automated petrol system with which we can get correct amount of petrol using prepaid cards. This system provides the feature of prepaid card – recharge facility and it also provides the authority to the customers to access the petrol in all petrol stations through a single RFID card.

The amount of petrol is measured and updated to a cloud server using IOT technology, thus, the main aim of this proposed work is to deal with all the stated problems by using RFID technology and to determine the trustworthiness of the petrol station.

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