Industrial Vending Machine

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***Abstract*- This paper introduces design of automatic vending machine system by using RFID technique to make an automation in cash pay, information display with selection of industry based product and collection of them at output site. This is a new innovative application having individual consumer interface with lack of human interface for sale. We want to use RFID with Arduino Microcontroller. User will scan RFID at provision in system after the affirmation will get inform the products and can make selection from variation. Here paper provides system provides small scale industrial products at output site. There are three parts; first one is to scan RFID for cashless payment. Second one is the programming unit will be executed by Arduino. And final step is to display information, collection of product at output and information transfer to server. RFID is approaching toward many domains in public sector. Here paper provides interface of RFID With small scale industrial products like particularly nuts, bolts, bracket components etc.**

***Index terms*- Arduino, Power Supply, RFID, LCD Display, Keypad, DC Motor, Wi-Fi Module**

INTRODUCTION

Automatic vending machine is automation device is a need at present situation to set selling system of any product by this way. Actually it has wide application domain range in public sector. It has applications specialized in food domain like snacks, Eatables, Chocolates etc. Things at present i.e. evolving now very rapidly. Many changes like revolution that has come into existence in conventional system that has changed towards automation. Automation with reduction in work time is need at present. We can't neglect that so that's why here we have to think in this vending machine domain like an innovation on previous system. Industrial small scale products are available in market like hardware components nuts, bolts, Bracket components, Washers etc. Vending machine can make automation at that interface and can provide selection of variation in product for consumer. RFID approach is a secure approach to reduce manpower. Radio frequency identification technology it gives self-identification so that is more capable than anyone. Also expenses can reduce in this system. Vending machine system can efficiently at almost of small scale buying and selling interface of humans. Industrial domains have wide range of products so this proposed system we can apply to most of retailer location having small volume with bulky quantity components. RFID is approaching toward many domain in public sector, here paper provides interface of RFID with small scale industrial products like particularly nuts, bolts, bracket and components etc.

LITERATURE SURVEY

In Automatic Chocolate Vending Machine by using Arduino-Uno, Prof.S.S.Desai, Sayali Maruti Jadhav, Priya Shivaji Patil, Giri Neeta Sambhaji Conducted that, the Arduino based vending machine that sales different types of chocolates from machine. Once the RFID is to be reached then user can select the product after card is scanned and collect the product at output unit.[1]

RFID Technology: Beyond Cash-Based Methods in Vending Machine Aneeqa Ramzan, Saad Rehman, Aqib Perwaiz in RFID Technology: Beyond Cash-Based Methods in Vending Machine conducted the Cashless & secure payment system in vending machine by using RFID Technology. This paper characterizes the design implementation and employment of cashless and secure payment system in vending machine by using Radio Frequency Identification Technology.[2]

In Design of removable Vending Machine and Research on the key implementation technology, Changjun Qiu, Xiaoyan Wu, Changxing Han, Liangbin Hu Conducted A removable Vending machine which can automatically move in front of the user to meet their demands. A supplement to physical stores and online stores. This article aims to design a removable vending machine.[3]

In Smart Coffee Vending Machine Using RFID, Rahul Jadhav, Mrunali Jejurikar, Pranita Karve & Prof. H.P. Chaudhari Conducted The vending machine which provides the beverage like snacks, cold drink, it is also used for ticketing. An employee goes to vending machine shows his card to the reader then the drink is dispensed.[4]

In Smart Ration Card System using RFID and Embedded System Prof. Kanchan Warke, Miss. Gaikwad Snehal Sunil, Miss. Attar Sultana Mahamad, Miss. Gardare Swati.S, Miss. Nchal Bhagyashri Sudhir Conducted RFID Tags are introduced, the RFID card are used instead of ration cards, which consists of all the details about card holder like family details, type of card and its validity. The automatic ration distribution system implemented for the automatic ratio distribution [5]

In Biometric based RFID tag mutual authentication protocol defending against illegitimate access Keerti Srivastava, Amit K. Awasthi and R. C. Mittal Conducted the research paper focuses on structuring an RFID protocol in which the answer to the question "Am I really the person who is accessing the resources" will be solved by implementing biometric techniques with RFID protocol. RFID protocol using biometric impression of RFID tag holder for resisting the protocol against illegitimate access [6]

Vaskar Deka, Shikhar Kumar Sharma, in "Design and Development of RFID based Software Framework Prototype for Smart Home" suggested the concept of home automation for realizing the remote access cum control of electrical appliances has been migrating to the concept of smart environment by the rapid incorporation of the information and communication technologies [7]

In Performance of Servo Motor Control System for a Mini Vending Machine Dr. Wai Phyo Aung, Htut KO Win & than Toe Aung Conducted Design and Construction of a microcontroller based mini vending machine [8]

Working Principle of Arduino And Using It as a Tool For Study and Research Leo Louis Provides a glimpse of type of Arduino boards, working principle, software implementation and their applications. Arduino board can provide a quick tool in development of sensors as application of Arduino board [9]

In Automatic Paper Vending Machine, Kamalnathan. P, Irshath Ahmed.R, Mohamed Aamir. M, Kalaiselvan. P Conducted the Proposed to deliver the paper to the public by using sensor and microcontroller based on mechatronics principal. This will be more cheap and economic for the bulk production and deliver the product [10]

Publishers Sooraj, Bony Mons, Dr. Jisna Kuruvilla in IOT Based Vending Machine with Cashless Payment Conducted So Far: Cashless Payment System in Vending Machine using IOT. Vending machine is an automated machine that provides items such as snacks to employee; a card is inserted into machine. This is cashless payment concept.[11]

PROPOSED METHDOLOGY

A. Mechanism

- Arduino based vending machine has to design. Arduino is programmed with Arduino software(IDE)
- RFID card is for the cashless payment.
- The LCD display is for information and product display at output.

B. Software implementation

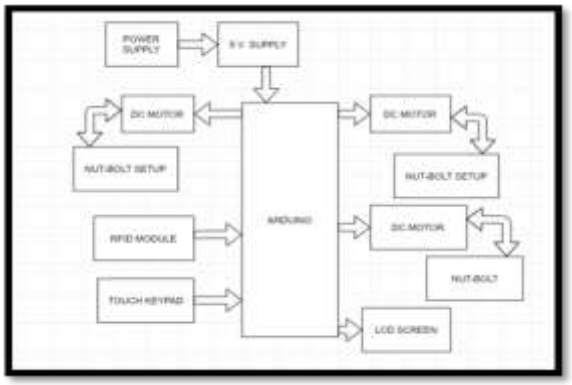
- Software part programming is through Arduino Uno software (IDE).
- Easy to write a code and upload it.
- C and C++ languages used for programming.

C. Hardware components

- Arduino Uno kit
- RFID tag reader
- Nut-bolt setup assembly.

BLOCK DIAGRAM

Following are the block diagram of the proposed Industrial Vending Machine System



In this system we used 5 volt Regulated Power Supply to ensure that the output remains constant even input changes. A Regulated Power Supply is used to convert unregulated AC to regulated DC. Here in this proposed system we required +5 Volt input. The +5 Volt output of the power supply is given to the input of Arduino Controller. Here Arduino Uno acts as a controller in the proposed system. This Arduino is interfaced with the RFID Module, LCD Screen, Keypad and DC Motor. The programming of the Arduino is done in C, C++ programming language. The RFID we are going to used is MFRC522 reader module and it communicates with Arduino through SPI protocol. RFID is scanning user card. User will scan the card then the RFID sends information to Arduino. Then it compares unique identity number of card scanned by user with the already programmed identity number. To automatically identify and track tags attached to objects. The tag contains electronically stored information. After the comparison of unique identity number, if the identity number matches then the information of available products will display on the LCD Display. According to the availability of product user selects product and their quantity using the 4x4 matrix keypad. After selection of product with the information of selected product Arduino works on program which is already done and rotates the DC motor for the collection of product at output side. After all the procedure information about selected product and quantity of product & its billing is get transferred to the server.

HARDWARE IMPLEMENTATION

The Industrial Vending Machine proposed in this paper, is made by the following list of components:

1 ATmega16
2 LCD Display
3 RFID
4 DC Motor
5 Keypad
6 Wi-Fi Module
7 Power Supply

ARDUINO:

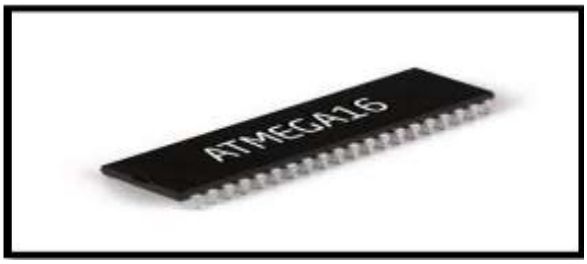


Figure. ATmega16

ATmega16 is an 8-bit high performance microcontroller from the Atmel's Mega AVR family. It is a 40 pin microcontroller based on enhanced RISC architecture with 131 powerful instructions. It has a 16KB programmable flash memory, static RAM of 1KB and EEPROM of 512 Bytes.

LCD DISPLAY:

Figure. LCD Display

Liquid Crystal Display is interface with Arduino to provide a user interface. LCD are the commonly used to display data in devices. Here the information of product will get display on the LCD.

RFID:

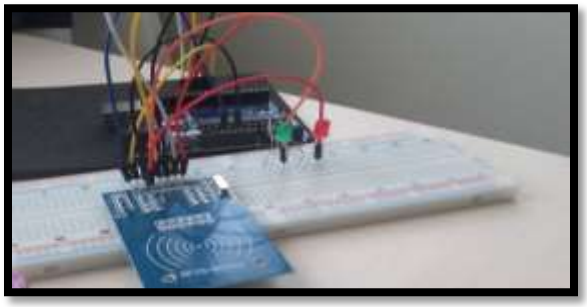


Figure.RFID

The RFID reader we are going to use is MFRC522 reader module and it communicates with the Arduino through SPI protocol. It operates at the 13.56 MHz frequency. The tags are based on MICARE protocol and they have 1Kb of memory. RFID is scanning user card and send information display. RFID is Radio Frequency Identification uses electromagnetic fields. To automatically identify and track tags attached to objects. The tag contains electronically stored information.

DC MOTOR:

Figure. DC Motor

A DC motors have the higher starting torque, Quick starting and stopping and reversing variable speeds with voltage input and they are easier and cheaper to control than AC. Here Products packets are attached in spirals, as stepper motor rotate with some angle product get available at output site.

KEYPAD:

Figure. Matrix keypad

The above figure shows the 4*4 Matrix Keypad. Keypad is the great way to user interacts with system. We can use them to navigate menus, enter password and control games and robots etc.

Wi-Fi MODULE:

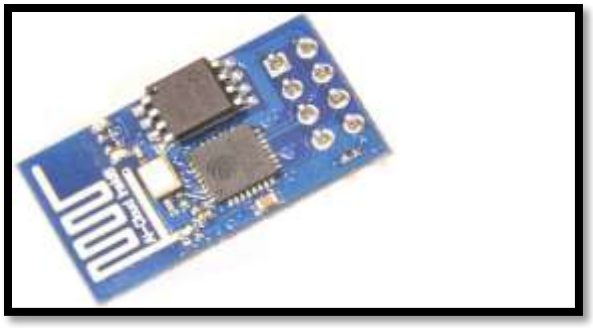


Figure.Wi-Fi Module

The WiFi module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network.

POWER SUPPLY:

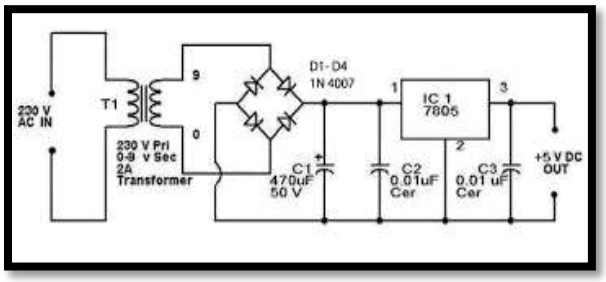
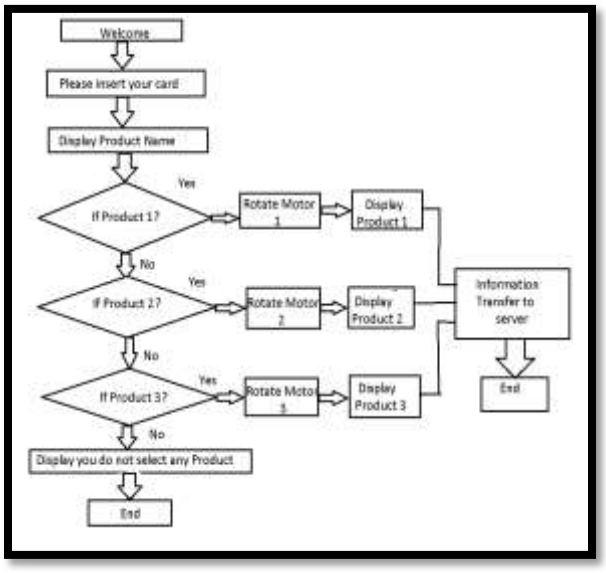


Figure. Regulated Power Supply

A regulated power supply is used to ensure that the output remains constant even if the input changes. It converts unregulated AC to a constant DC. It contains Step-down transformer, rectifier, DC filter and regulator. In this system we required +5V output.

FLOW CHART:



Following are the flow of proposed system:
Step.1: Displays WELCOME message on LCD display.
Step.2: After this it displays the message "PLEASE INSERT YOUR CARD" on LCD Screen.
Step.3: The user has to scan the card which contains unique identification of each user.
Step.4: After successful scanning of card List of available products in the machine is displayed on screen.
Step.5: According to requirements of the user, user will select the product and enter quantity of product that user will need.
Step.6: Command is given to the motor through Arduino programming.
Step.7: According to keypad selected product is transferred at the output side.
Step.8: If the user does not select any product then it displays message "YOU ARE NOT SELECTED ANY COMPONENT" on LCD display.
Step.9: If desired product is not available in the machine then user will select "EXIT" option.
Step.10: After all the procedure information about selected product and quantity of product & its billing is get transferred to the server.

ADVANTAGES

- Increase productivity
- Save time
- Reduced Manpower
- Provide user data
- Increase accountability
- Provides Security

DISADVANTAGES

- Consume large space
- Maintenance is high
- Added Administrative costs
- Costly investment
- Regular check on the machines have to be conducted

CONCLUSION

In the proposed system of "Industrial Vending Machine", we make automation in coin based vending machines. Industrial small scale products are available in market like hardware components nuts, bolts, Bracket Components, Washers etc. We buy it generally at any shop of hardware components. Vending Machine can make automation at that interface and can provide selection of variation in product of consumer.

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