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Face-mask Vending Machine

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Abstract - *A vending machine is an, "electronic machine used to dispense a product to a consumer after a certain amount of money has been put into the machine". COVID-19 cases are rising across the country. To prevent the spread of the virus, people have been asked to cover their faces and mouth with masks and use sanitizers. To ensure that people are not running out of either of these safety essentials, vending machines providing the masks and sanitizers have been installed at several places across India. This is an Arduino based vending machine that sales two types of masks from machine. The machine is useful on public places like hospitals, institutions, railway stations, bus stands etc. The machine helps in saving time of a user and it's easy to use. This will ensure zero contact between the buyers and sellers which will reduce the spread of COVID-19.*

Key Words: Automation, Vending machine, Covid-19, Arduino

1. INTRODUCTION

In many technologically advanced nations such as USA, UK, China, Japan and other, vending machines are extensively and frequently used. Vending machine is essentially an automated machine that dispenses items such as beverages, snacks, consumer products and so forth after the customer inserts currency or credit into the machine.

Due to the outbreak of covid-19, everyone has been advised to protect themselves and remain safe. World Health Organization and medical experts have advised to put on face masks. Especially when outdoors or in public places, contacting viral infections can be prevented by wearing a face mask. To ensure that face masks are made available at the fingertips of individuals and families., smart vending machines have been deployed across the nation. This vending machine can dispense face masks, one of the safety tips recommended by the World Health Organization.

The basic thought of implementing this idea to help out people with face-masks while on the go. Face-mask vending machine was developed to make it easier for the general public to have access to face-mask and personal hygiene products. The face-mask vending machine is completely automated. It can dispense face-mask upon the insertion of coins.

To get a face-mask, you can activate the vending machine using coins. The coin mechanism for the vending machine is activated, when predetermined coins have been inserted therein. The vending machine can be installed at offices and other public places such as educational institutions, parks, airports, police stations, supermarkets, railway stations, hospitals, factories, and more.

AIM & OBJECTIVES

- **AIM :** To create a vending machine for dispensing facemasks.
- **OBJECTIVE :** To avoid the contact between seller and buyer while purchasing of products.

2. LITERATURE SURVEY

In this section, some of the existing research on vending machines has been discussed which motivated the design of Face-mask vending machine.

[1] proposes the design of Automatic Chocolate Vending Machine using IOT. This design uses Arduino UNO, coin acceptor module, RFID Reader, RFID cards, servo motors, LCD display, IR sensors, switches. Variety of product as well as many different types of payment option are offered by this automatic chocolate vending machine.

[2] presents a wireless system which operates on RFID technology. This Design uses Arduino UNO, DC motors, RFID card reader, power supply and LCD display. In this vending machine. Arduino is the master controller along with RFID-Tag and reader.

[3] discussed the construction of 8051 microcontroller-based vending machine. The most important aspect of vending machine is the detection of the coin that accepts and determines the value of inserted coin. If the coin is authentic then the coin detector will accept the coin, but if coin is different from that which is been trained, then it will be returned back to the customer.

[4] approaches different types of products dispenser system. It can accept different amount in form of coins and dispense products according to the amount accepted. The system also uses cashless payment/online payment using GSM module which is used to receive online payment.

3. IMPLEMENTED PROPOSED SYSTEM

In our proposed framework, the vending machine is intended to distribute two types of face-masks of varying costs. The delivery method is spiral coil rotation mechanism which is responsible for delivering the selected mask to the collecting tray. This spiral coil has a free end and a fixed end and consisting of a plurality of continuously connected helical loops, said fixed end being connected to DC motor, and said coil being rotatable thereby, wherein adjoining loops remote from said mechanism are spaced sufficiently closely to each other to allow product(masks) to be supported there between and transported by the rotation thereof, whereby as said mechanism is rotatably operated, product supported by said closely spaced loops is transported from said free end toward said fixed end until it reaches said stretched loop whereat the product falls there through.

Our vending machine has 2 DC motors for two such spiral coils having two different types masks respectively. These motors are driven by the L298N motor driver which is controlled by Arduino Nano.

For handling the payment part, we have a coin acceptor module that accepts only 5Rs coins. The machine accepts only the coins it is programmed to accept and rejects others. The accepted coins are deposited in a container.

6.1 shows the sequence of events. Initially, the customer is prompted to insert the coin in the machine. The coin acceptor system will then validate the entered coin. If the coin passes the validation, the system calculates the total value of the coin and compares it with the price of the masks in the machine. If the value is equal to the price of a mask, then the mask will be dispensed from the vending machine.

4. SYSTEM REQUIREMENTS

➢ SOFTWARE REQUIREMENTS

- **Arduino**

  Arduino is an open-source hardware and software enterprise, project group which designs and produce single- board microcontroller kits for building digital devices and interactive objects which sense and control instruments both physically and digitally.

  Arduino board designs use a spread of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins which will be interfaced with varied expansion boards or breadboards (shields) and other circuits. C and C++ programming languages are used to program the microcontrollers.

- **Fritzing**

  Fritzing is an open-source beginner CAD software for designing electronic circuits by designers and artists developing a prototype by putting together a more permanent circuit. It had been developed at the University of Applied Sciences Potsdam.

  Fritzing was made to foster the spirit of the programming and so the Arduino microcontroller and allows creators to document their Arduino-based prototype and make a PCB layout for finalizing and creating the device. The associated website helps users share and discuss drafts and experiences also on reduce manufacturing costs. Fritzing is an electronic design automation (EDA) tool inspired by the design of projects, while the output is focused on accessible means of production.

➢ HARDWARE REQUIREMENT

- **Arduino Nano**

  The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. It is an is an 8 bit AVR family microcontroller powered by ATmega328P. It has 14 digital I/O pins (out of which 6 provide PWM output), 8 analog input pins and a reset button.

Figure 4.1. Arduino Nano

- **IR Sensor**

  The IR sensor module consists mainly of the IR transmitter and receiver, Op-amp, Variable Resistor, output LED in brief.

  IR LED Transmitter: IR LED emits light, in the range of Infrared frequency. IR light is invisible to us as its wavelength (700nm – 1mm) is much higher than the visible light range. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feet, it depends upon the type of IR transmitter

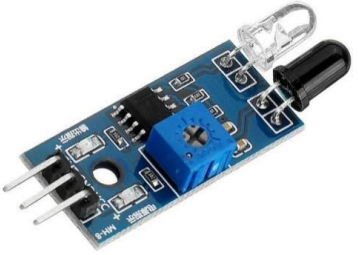

Figure 4.2. IR Sensor

and the manufacturer. Some transmitters have the range in kilometers. IR LED white or transparent in color, so it can give out amount of maximum light.

Photodiode Receiver: Photodiode acts as the IR receiver as its conducts when light falls on it. Photodiode is a semiconductor which has a P-N junction, operated in Reverse Bias, means it start conducting the current in reverse direction when Light falls on it, and the amount of current flow is proportional to the amount of Light. This property makes it useful for IR detection. Photodiode looks like a LED, with a black color coating on its outer side, Black color absorbs the highest amount of light.

LM358 Op-amp: LM358 is an Operational Amplifier (Op-Amp) is used as voltage comparator in the IR sensor. the comparator will compare the threshold voltage set using the preset (pin2) and the photodiode's series resistor voltage (pin3).

Photodiode's series resistor voltage drop > Threshold voltage = Op-amp output is

High Photodiode's series resistor voltage drop < Threshold voltage = Op-amp output

is Low

When Op-amp's output is **high** the LED at the Op-amp output terminal **turns ON** (Indicating the detection of Object).

Variable Resistor: The variable resistor used here is a preset. It is used to calibrate the distance range at which object should be detected.

- **LCD Display**

A 20x4 LCD display is a basic module commonly used in various devices and circuits. A 20*4 LCD display means it can display 16 characters per line and there are 4 such lines. So, it can display (20×4=80) 80 characters in total. We used this type of display as it is easily programmable, cheap and easily available and can even display custom characters.

Figure 4.3. LCD Display

- **Coin Acceptor**

The coin acceptor is used as one of the input devices for vending machine. The sensors in this coin acceptor check width, coin diameter and fall time of the coin to identify it and it can be programmed to accept coins of any nation, denomination. Once we set the valid coin profiles, the coin acceptor will check them and report when each type is inserted, while rejecting other coins. We programmed this coin acceptor to accept coins of denomination namely 5Rs only.

Figure 4.4. Coin Acceptor

- **DC Motor**

We used DC motors that rotate at 30 rpm to ensure smooth and accurate dispensing of the masks. We have programmed the DC motors to rotate for a specific amount of time during which one product is dispatched through the spiral coil rotation mechanism to ensure no extra masks are dispatched.

Figure 4.5. DC Motor

- **Motor Driver IC**

This L298N Motor Driver Module is a high power motor driver module for driving DC and stepper motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

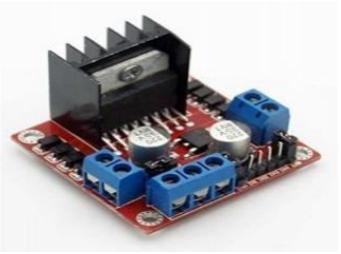

Figure 4.6. L298N Motor Driver IC

5. BLOCK DIAGRAM

This is the block diagram for our vending machine which gives idea about connection of various blocks/components with each other.

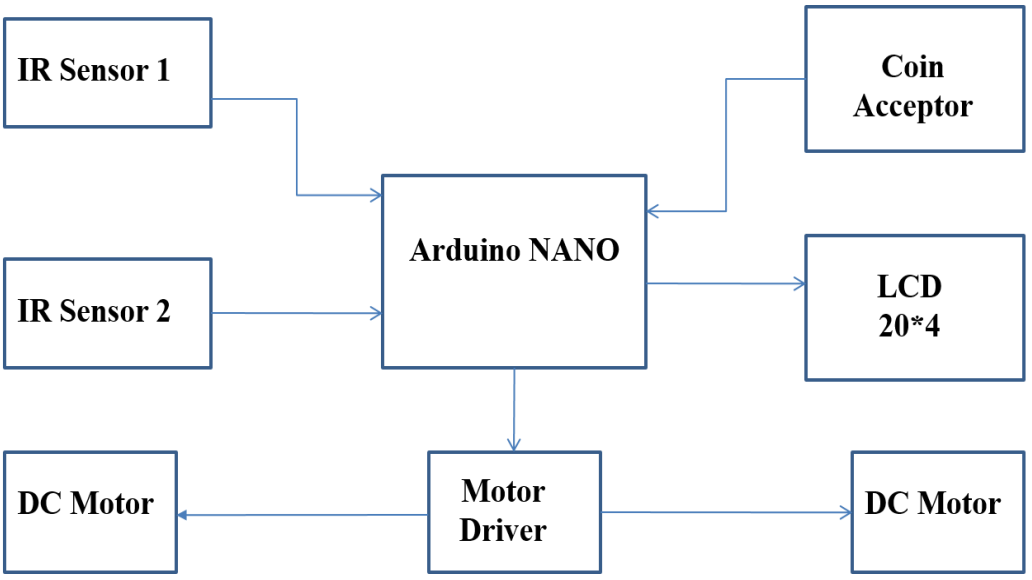

Figure 5.1 Block diagram for Vending Machine

6. FLOWCHART

In the flowchart given below, we first make the payment by inserting a coin. The machine checks if amount entered matches the price of a product and if it does match, the product is dispatched otherwise the transaction is denied and rejected.

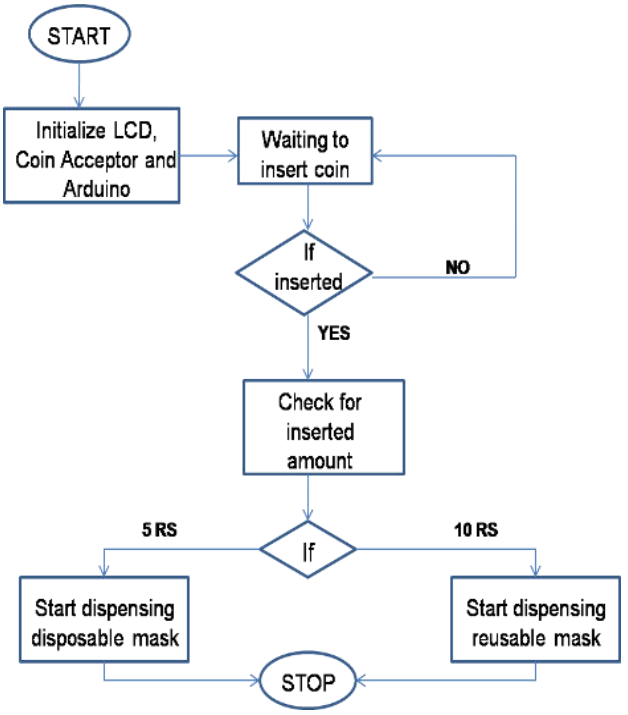

Figure 6.1 Flow chart for Vending Machine Operation

7. CIRCUIT DIAGRAM

In the circuit diagram given below, we have displayed the actual structure and connections of the vending machine components. The diagram is made using Fritzing software.

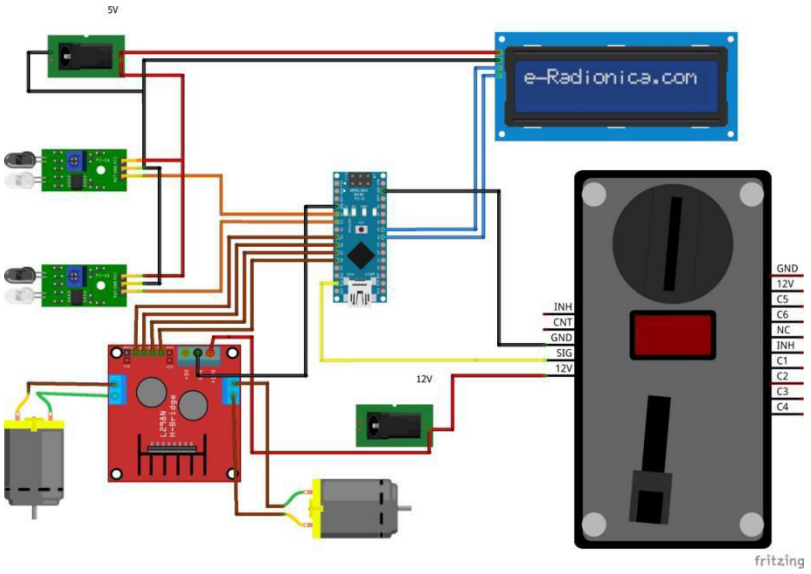

Figure 7.1 Circuit diagram for Vending Machine

8. OUTPUT

- Insertion of money
  For purchasing the face mask, one must first insert coin to pay for that it.
- Collecting the product
  After the insertion of coin, the machine will dispense the face mask from the slot provided in the vending machine.

9. RESULT

The system is operational as a proof of concept model and can be implemented in real world scenarios in actual vending machines for business. The machine costs a fraction of what the alternatives available today in market cost. The system can also be modified to add keypad for making the machine support choice of products having same price.

The system design is such that the cost and resources required are restricted to a minimal level. This was necessary in order to cut the production cost to an extent where the product will be affordable for the offices and other public places.

Figure 9.1. External view

Figure 9.2. Internal view

Figure 9.3. Status shown after insertion of coins

10. CONCLUSION

Implementation of this machine in schools and colleges will help the students to take the face-masks whenever they are in need of it. Coins were inserted and masks were vended successfully. This vending machine can also be useful in the current COVID-19 situation to dispense essential products without any human contact, contamination at any place and any time while helping prevent spread of infection.

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