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A4 Sheet Vending Machine

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A B S T R A C T

In thisPaper we will discuss about the use of a4 vending machine and how it benefits the students in many ways. The use of sensors combined with microcontrollers makes it possible for an efficient machine that can produce a4 sheets depending on the money being inserted. This all the more makes the accessibility of a4 sheets much easier helping students in their everyday assignments..

Keywords:. A4, Vending Machine, Sensor, Arduino, Motor Driver Module, Dc Motor.

1 INTRODUCTION

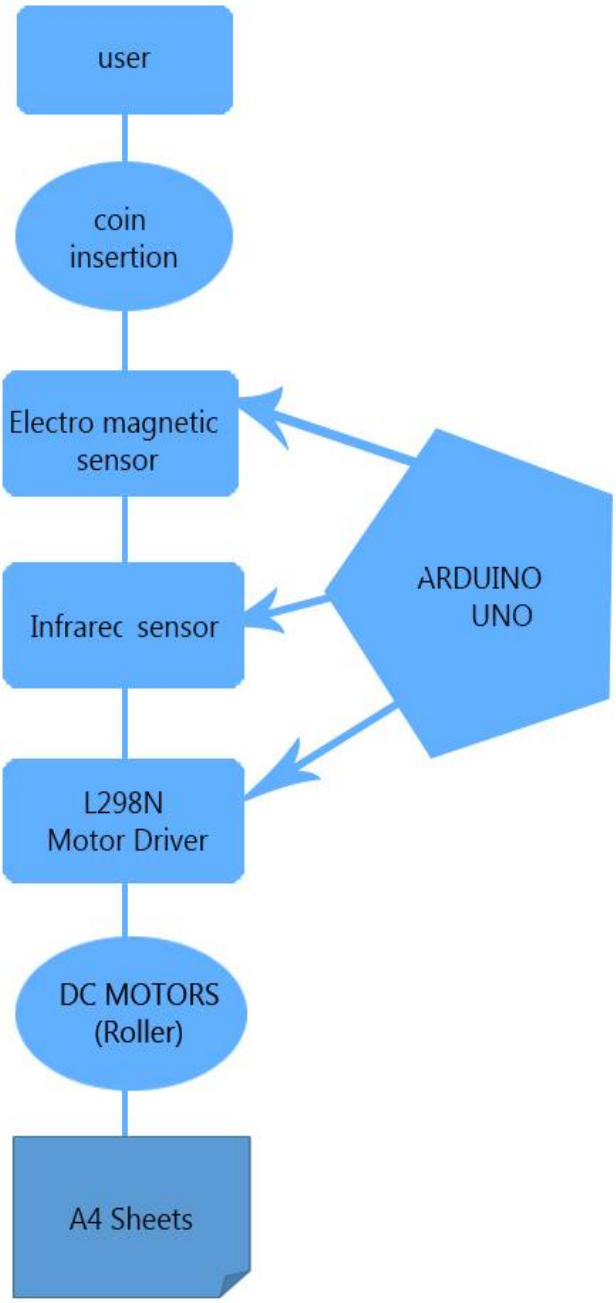
In the current 21st century, the use of paper has been so vast that it has become a key factor in the university and other educational institutions. Also the implementation of automation in malls, shopping centers and retail stores have become existent in big numbers. The use of automation has taken a major step ahead in the advancement of technology thereby making life easier for human beings. The use of vending machines in many public places for accessing different products like biscuits, chips, cigarettes, perfumes, alcohol, lottery tickets, gold and much more has been common these days. In this project, the a4 vending machine is an automated device which contains bundles of a4 sheets stacked and stored inside it. This vending machine works on the basis of combining both electronics and mechanical engineering to form a class of engineering called mechatronics wherein both a microcontroller and a motor is interfaced together to operate simultaneously. Upon the insertion of a coin the sensor detects the denomination of the coin and respectively produces the number of a4 sheets that's required based on the set price of it. Due to this implementation, much of consumer's time can be saved. Also it takes much less effort to access these machines and with proper implementation of these vending machines, it can be very easily accessible to the general public. This machine can also eliminate the time required to buy an a4 sheet during exam season. One classic example of a vending machine is the money ATM that is implemented in every corner of the street. This helps cashing out money so easy for everyone whenever anyone is out of money. Hence ATM have long been considered to be a revolutionary invention bringing ease to people's fast paced lifestyle.

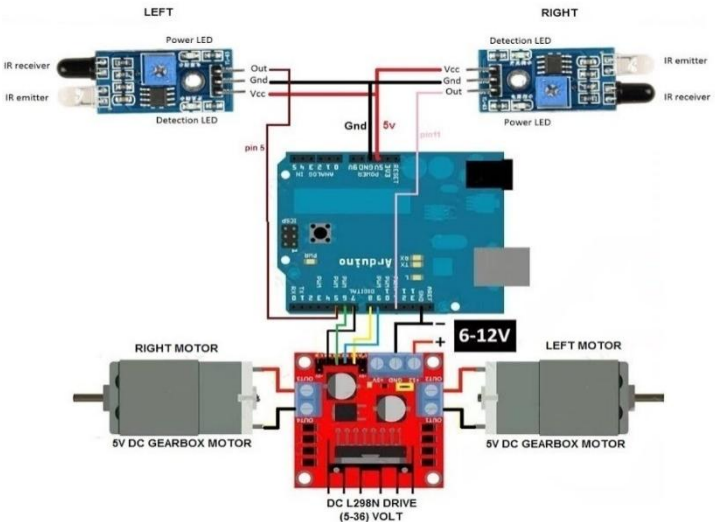
2 PRINCIPLE OF WORKING

The a4 vending machine designed works on the principle of mechatronics. Here, in this vending machine, there exists an electromagnetic sensor which helps in detecting coins with respect to its size and thickness thereby producing a4 sheets respectively. A motor driver module is interfaced with Arduino UNO and the dual DC motor shafts are fixed on each corner of the roller which helps in rolling out the a4 sheets out of the vending machine upon detection of coins respectively. These two DC motors are connected to the motor driver module and programmed using the Arduino IDE in such a way that the delay and speed of the rotation of the DC motors is configured so as to produce an a4 sheet with respect to each rotation with delay.

The electromagnetic sensor is connected to the Arduino UNO's interfacing pin and taken as input. When the sensor is made high, it detects the type of coin being passed through it and sends a positive signal to the Arduino UNO. Upon receiving the signal, the message is passed on to the motor driver module which then enables the motor with a specific delay in between so as to maintain the flow of a4 sheets out of the vending machine. Once, an a4 sheet has been produced, the motor turns off until the next coin detection by the sensor. This in turn stops the roller from spinning thereby restricting the flow of a4 sheets out of the vending machine.

3. SYSTEM DESCRIPTION WITH BLOCK DIAGRAM





A. *ARDUINO UNO*

Arduino UNO is a micro-controller with many different interfacing input and output ports embedded in it. It is an open-source module developed by Arduino.cc on the basis of ATmega328P. Different interfacing ports like the USB, analog pins and digital pins are present which are used to transfer and receive data/signals from various sensors that can be interfaced with the Arduino. Also an Arduino contains led for signaling the data transmission and reception.

B. *L298N MOTOR DRIVER*

The L298N motor driver is a module designed to control and configure the functioning and operation of a motor, solenoids and relays. This driver is designed to contain a high voltage and a high current dual full bridge. It contains several logic pins that act as enablers and helps in the activation of the dc motors with respect to the obtained signal. This motor driver has the ability to maintain the delay, control the rotor speed and the direction of the spin.

C. *DUAL SHAFT DC MOTOR*

The basic principle on which the dc motors work is by electromagnetic induction. There exists inductors inside the dc motor which upon receiving electric current starts getting induced thereby causing a rotatory movement. Hence the dc motor basically converts the electric energy (direct current) into mechanical energy (rotation of the motor). This basic motion works by the principle of electromagnetism.

D. *INFRARED SENSOR*

The infrared sensor is a simple electronic device which is used to detect the motion of an object and act accordingly. This is achieved by the sensor emitting infrared rays which when interfered by objects, sends a signal to the controller. The infrared sensor is also helpful in detecting the heat of an object that emits infrared radiation. Here in this project, the infrared is used to transmit a high signal whenever a coin obstructs the path of the emitted infrared rays thereby signaling the microcontroller to turn the dc motors on.

E. *ELECTROMAGNETIC SENSOR*

The magnetic sensor is used to detect different objects that attract to magnets and determine the amount of magnetic field created by these objects with respect to the sensor. The magnetic sensor measures parameters like flux and strength. In this project, a magnetic sensor is used to differentiate between real and fake coins and also to distinguish between the different denominations of the coins based on its sizes.

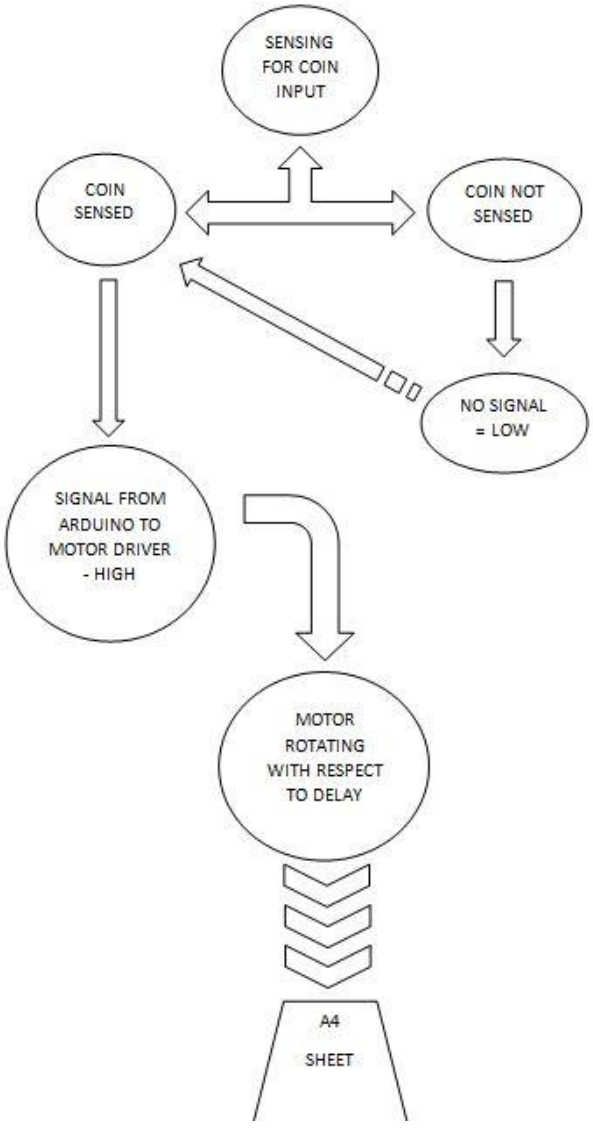
F. *COIN ACCEPTOR*

A coin acceptor is used to accept coins being inserted through it and differentiate them based on size, thickness, diameter and its magnetic property and later send an electric signal to the microcontroller based on the type of coin being inserted for further processing. The coin acceptor is a key component in validating the genuity of the coins being inserted.

4.SOFTWARE IMPLEMENTATION

The motor driver has been programmed to work with respect to the signals being detected and analyzed by the magnetic and infrared sensors. The motor driver therefore has been interfaced with the help of Arduino UNO and programmed with the help of Arduino IDE. The dc motors have thus been interfaced with the L289N driver motor and works based on the given program in Arduino IDE.
Arduino IDE is an open source cross platform application that is used for programming and interfacing of different boards for development. In Arduino IDE, the programs written are a form of java, C and C++ language.

5 FLOW CHART OF THE PROGRAM



6 ADVANTAGES

- This vending machine serves to ease student life.
- Ready availability of a4 sheets without any hassle.
- This vending machine can be accessed 24/7.
- It is energy efficient

- Cost effective
- With a large number of a4 vending machine installation inside a campus, students will have easy access to the machine around every corner of the block.
- It reduces human effort.
- Eliminates long queues during busy exam seasons.

7 LIMITATIONS

- The a4 sheets have to be refilled frequently.
- Credit cards and debit cards cannot be used in case ofbulk purchase of a4 sheets.
- This vending machine does not accept paper currency.

8 APPLICATIONS

- This machine can be installed in college campus and universities for betterment of students.
- Implementation of the a4 vending machine in offices and other work spaces can benefit the employees.
- Even installing this machine in public places can help people who are in need of paper to write urgently.

9 RESULT

Thus the proposed model of the a4 vending machine has been successfully designed and constructed and the working of the machine has been verified and accomplished.

10 INFERENCE

- The implementation of this design is very easy and secure.
- With the help of this machine, people can get access to a4 sheets anytime of the day.
- With this design being cheap and efficient, so many student's college life can be made better.

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