

Arduino based Reverse Vending Machine

Amrita Soni¹, Manvi Kaushik², Neha Kumari³, Dr. Gajendra Singh⁴, Gulshan Kr. Dubey⁵

^{1,2,3}Student of Electrical and Electronics Engineering, ABES Engineering College, Ghaziabad, Uttar Pradesh, India

^{4,5}Professor of Electrical and Electronics Engineering, ABES Engineering College, Ghaziabad, Uttar Pradesh, India

Abstract- World is facing COVID-19 dangerous situation and over 20 M individual have get affected worldwide. Now people has started using individual plastic bottle which has led to increment of plastic waste and creating waste management problem, unknowingly. So, to solve this difficulty, an innovative idea to design a system is used that can store the used bottle of drinks and beverages. It has an ability to store those bottles in predefined individual storage and calculated the amount of money to be returned to the consumer as a reward. The system is based on Arduino, capacitive proximity sensor and motors. The capacitive proximity sensors are mounted on the side of the conveyer belt. Capacitive Proximity sensor and a microcontroller are logically interfaced for controlling the movement of servo motors, counting the number of bottles, calculate the amount of money to be returned. It can store the used bottle in individual storage according to the type of materials and print the amount of money to be returned. The plastic bottle wastage problem can be solved with this design and with rewards many people can be motivated in developing countries like India. This will also support in many government schemes like Smart Cities or Swachh Bharat Abhiyan.

1. INTRODUCTION

The world population is increasing dramatically. The increase in consumption increasing the waste. Absolute waste on the planet is huge. Some of it is reused yet a great deal is essentially dumped, causing issue for the individuals and the earth. Consistently 2.12 billion tons of waste is dumped. In the event that this waste was put on a trucks, they would circumvent the world multiple times. Among the type of the waste, the maximum number of waste are built from the bottles or can of the drinks and beverages. Every year around 4,321,40 used bottles of drinks waste dumped in the ocean. Thus, polluting the water. More than 100 million bottles are used world wide everyday. It takes one plastic container 700 years to begin breaking down. Microorganisms, which as a rule helps in breaking down natural materials don't respond with this sorts of jug. Just 1 out of 5 containers or jars are reused. The remainder of them simply become squander. For saving the used bottle from turning into waste and managing them, a conventional system exists called "Bottle return and Handling machine". It can detects the types of bottle and return the money to the consumer.

To develop a better system, an " Arduino Based Recycling system" is proposed where some new features are added in the system. In this system option of counting the bottle according to the type of material is added, whereas in the conventional system it can count and calculate the money by the QR code. The best feature is that, the option of the bottle being separated into the predefined storage of their own is added, so that recycling can be done easily by collecting them from the storage

2. LITERATURE REVIEW

An Reverse Vending Machine is where individuals can return void drink holders like containers and jars for reusing. The machine frequently gives back a store or discounts add up to the end client. This is the thing that makes it an "opposite" candy machine: rather than the client placing in cash and getting out an item (like at a treats candy machine), the client places an item in and gets out a money related worth. The machines are famous in places that have compulsory reusing laws or compartment store enactment. The essential activities include steps where the recycler places the unfilled jug/can into the getting opening; the level in-feed framework permits the client to embed holders each in turn. The container/can is then naturally pivoted. The acknowledgment of the plastic is finished by utilizing capacitive sort vicinity sensor and ultrasonic sensor.

With respect to the prize framework, RVM conveys significant tokens, similar to coins or coupons, when refreshment holders are reused. The coupons are then used to recover endowments at the counter. In any case, the familiarity with natural issues and the point of decreasing paper utilization, the printing of coupons is not profoundly preferred. Current application is by utilizing electronic remunerating framework. Customized attractive card or shrewd card framework gives the clients reward focuses. Electronic remunerating framework additionally builds client steadfastness. Most markets have given devotion cards to client to store the prize focuses. The framework might be coordinated with different kinds of individual records, for example, school ID or library card. In this way, this methodology completely enhances the utilization of card framework and client accommodation. The UI of RVM from Reverse Vending Corporation is a LCD screen to show video messages on the 17"/19" LCD screen on the front board of the unit. The

RVM likewise has the abilities to peruse the scanner tag of the item embedded and play a video which compares with this item. Reverse Vending Machine has drink compartment database to check whether a container ought to be acknowledged or dismissed. For the nations that don't have a national compartment database, the store can likewise adjust and refresh the individual holder and make database. The Reverse Vending Machines can likewise be gotten to distantly permitting the prepared expert, to attempt far off critical thinking, mistake checking, refreshing of programming, refreshing of standardized tag database and distinguishing proof of material sort and stream. Reverse distributing frameworks are a computerized approach to gather, sort and handle the arrival of utilized beverage compartments. The first completely robotized invert candy machine was made by TOMRA in 1972. Invert candy machines are particularly basic in districts with compartment store laws (where you get cash back for restoring certain holders) or compulsory reusing enactment. The name of reverse vending machines is at times abbreviated to RVMs. They are otherwise called recover machines, reusing returns machines, or can and bottle reusing machines.

3. PROPOSED METHODOLOGY AND DIAGRAM

In the present scenario, the waste problem is increasing and thus population is a severe problem in many modern cities all over the world. To overcome it, "Arduino based Reverse Vending Machine" is design. In this project, demonstrate the management system of used bottle and can of drinks and beverages by the consumers and the option of getting money in exchange of the plastic bottle or can.

The operation of plastic RVM machine has main three which are as follows:

- (1) First, the user can insert plastic bottles of any size and shape in the RVM machine.
- (2) Then, it is checked by the sensors
- (3) At last, according to weight of the plastic bottles reward is giving to the user.

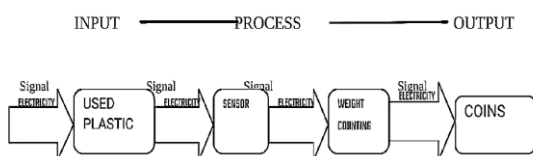


Fig 1: Block diagram of proposed project

Using Arduino:

The most commonly used microcontroller are arduino uno, the pins use in microcontroller on the right side of the arduino board have digital pins and on the left side of the arduino board have analog pins. The digital signal are name as PWM Tthe brightness of the signal can be adjusted because the PWM signal provide the supply voltage on time. Connection diagram of the project using arduino is shown in Fig. II.

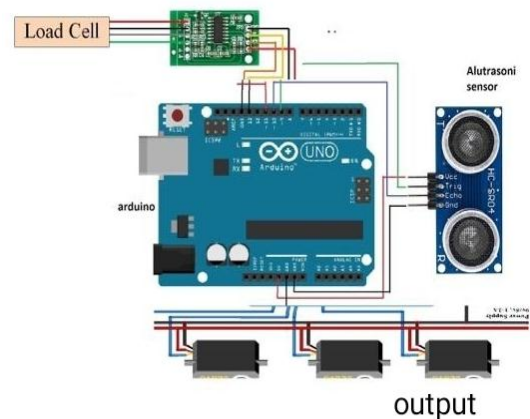


Fig 2: Circuit diagram for the project

Technical aspects of the components used-

- 1. Arduino Uno and wires: Arduinio is used as a microcontroller in this project. program are writte in arduino and then plced it in block diagram with LED and motor. Then this block diagram is simulated on Proteus software.
- 2. Ultrasonic sensor: An Ultrasonic sensor is an instrument which is used to measure the distance of the object using ultrasonic sound waves. Ultrasonic sensor is used as a transducer to send and receive ultrasonic pulse which relay back the information about the object proximity.
- 3. Dc motor: A DC gear engine is any electric engine combined with a rigging train. As a rule, the expansion of an apparatus box is expected to confine the speed of the engine's pole, and increment the engine's capacity to yield force. Apparatuses really change shaft speed into force at explicit proportions, with least productivity misfortunes, making it conceivable to make the perfect force yield and speed by including the properly estimated.

4. Simulation

This section discussed about the testing and performance of the project. Simulation is done to check that the result desired are getting correctly through the programs written on the Arduino programming software and simulation on Proteus Application. And Result obtained is same as desired.

1. When input is given as glass or wood other than plastic. The ultrasonic sensor will not be able to sense the input. So, LED will not glow. As shown in Fig.3.

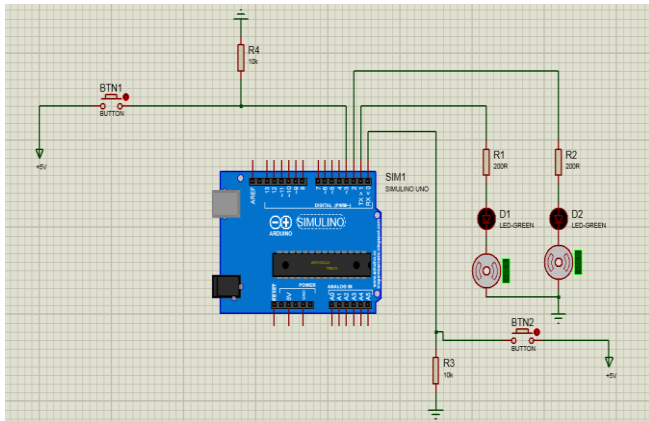


Fig.3: Circuit Before simulation

2. When plastic bottle is given as the input. The ultrasonic sensor will sense the plastic bottle. So, LED will glow. As shown in Fig.4.

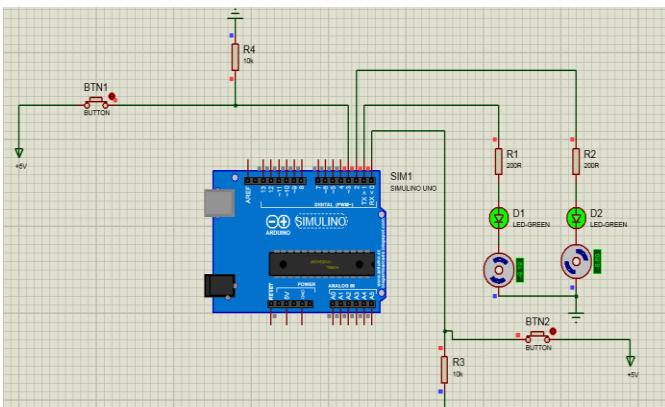


Fig.4: Circuit After simulation

5. References

[1] Gaur, Aditya & Priyadarshini, Rashmi. (2018). A Simple Approach to Design Reverse Vending Machine.

[2] Ahmad, Irfana & Mukhlisin, Muhammad & Basri, Hassan. (2016). Application of Capacitance Proximity Sensor for the Identification of Paper and Plastic from Recycling Materials. Research Journal of Applied Sciences, Engineering and Technology. 12. 1221-1228. 10.19026/rjaset.12.2880.

[3] A. N. Kokoulin and D. A. Kiryanov, "The Optical Subsystem for the Empty Containers Recognition and Sorting in a Reverse Vending Machine," 2019 4th International Conference on Smart and Sustainable Technologies (SpliTech), Split, Croatia, 2019, pp. 1-6, doi: 10.23919/SpliTech.2019.8782990.

[4] L. R. Kambam and R. Aarathi, "Classification of plastic bottles based on visual and physical features for waste management," 2019 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 2019, pp. 1-6, doi: 10.1109/ICECCT.2019.8869191.

[5] M. F. Karin, K. S. Noor and H. U. Zaman, "Hardware based design and implementation of a bottle recycling machine using FPGA," 2016 IEEE Conference on Systems, Process and Control (ICSPC), Bandar Hilir, 2016, pp. 43-46, doi: 10.1109/SPC.2016.7920701.