Ahsanullah University of Science & Technology
Department of Computer Science & Engineering
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CSE 3118
Microprocessors and Microcontroller Lab

Project Report

Project Name: Ecodrop (REVERSE VENDING MACHINE)

Submitted To

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Objectives:

A smart machine for plastic and metal waste disposal is a system which accepts Plastic wastes (bottles) and metal cans for recycling and in return dispenses points in the wallet to the operator who recycles the waste. The reverse vending machine is equipped with a proximity sensor to distinguish between different kinds of bottles and the points are gained when the user enters the code in the website .This invention relates in general to waste management and recycling the plastic and metal waste (bottles) in the environment. The littering of plastic wastes in the environment and less willingness to recycle the plastic presents a continuing problem to the environment and to all living beings.

Social & Economic Benefits:

The current study aims to design a Reverse Vending Machine that can be a potential solution to minimize the plastic waste and improve the plastic waste management and recycling system. Here are some potential social values that can be attributed to the Reverse Vending Machine :

To the Environment : This will help the environment as one of its major problems is the rate of plastic waste used by humanity and this study is a big help for the environment as plastic waste is not soluble in water .

To the Community : This will allow the community to prevent negative impacts on the environment caused by the outraging number of plastic wastes in the community. This will utilize the effectiveness of waste segregation and recycling in solving environmental problems regarding wastes to achieve more control in collecting wastes in the community.

To the Researchers : This will involve their intellectual creativity in designing machines and enhance their knowledge which they can apply the acquired learning and information in this study for the near future or even in their daily lives.

To the Economy : By diverting beverage containers from landfills or incineration facilities , **RVM** helps to save on waste management costs. Landfill space is conserved and the costs associated with waste collection , transportation and disposal are reduced.

Modern Tools:

1. Jumper wires (generic)
2. GPS Module (Generic)
3. Inductive Proximity Sensor, 15 mm
4. Buzzer, Piezo
5. Ultrasonic Sensor - HC-SR04
6. Arduino Mega 2560
7. SG90 Micro-servo motor
8. Battery, 12 V
9. Alphanumeric LCD, 16 x 2
10. Breadboard
11. 9V battery (generic)
12. 5 mm LED: Red
13. Capacitive Proximity Sensor, 12 mm

Tools And Machines:

- Mastech MS8217 Autorange Digital Multimeter
- Soldering iron (generic)
- Wire stripper & cutter, 18-10 AWG

Apps and Platforms:

- Blynk
- ThinkingSpeak API
- Arduino IDE

Working Procedure:

Ecodrop is a device that accepts used beverage containers and returns money to the user (the reverse of the typical vending cycle). The machines are popular in places that have mandatory recycling laws or container deposit legislation.
The basic operations involve steps where the recycler places the empty bottle/can into the receiving aperture; the horizontal in-feed system allows the user to insert containers one at a time. The bottle/can is then automatically scanned with the help of capacitive and inductive proximity sensors.

If the sensor value of the inductive sensor is 1 then the object is plastic and if the sensor value of inductive sensor is 0 and capacitive sensor value is 1 then the object is plastic.

As for the reward system, RVM distributes valuable tokens, like coins or coupons, when beverage containers are recycled. The coupons are then used to redeem gifts at the counter. However, with the awareness of environmental issues and the aim of reducing paper usage, the printing of coupons is not highly favored. So, in our proposed system as the plastic is detected an encrypted code appears on the LCD screen. Then the user has to scan the OR code present on the machine to navigate to the website to redeem his points by entering the code he got on the LCD screen.

The machine has one more feature, if it is full then the garbage collectors or recycle vendors are notified with the help of an application. The level of the machine is monitored using ultrasonic sensors and NodeMCU as the machine is full the collectors are informed and the exact location of the machine is sent by the help of GPS.

Safety Norms:

- Electrical Safety - Ensure all electrical components are properly insulated and grounded to prevent electric shocks.
- Material Safety - Use materials that are free from harmful chemicals and toxins.
- User Safety - Ensure the machine is user-friendly and accessible, with no sharp edges or pinch points. and contains safety warnings.
- Fire Safety - Use fire-resistant materials.
- Nature Safety - Use eco-friendly materials and ensure that the machine can recycle materials without causing pollution.
- Testing - Follow testing protocols.

Multidisciplinary Contribution:

- **Software Engineering** - Here, we will develop the embedded software that controls the machine's operation.
- **UX Design** - Focus on creating a seamless and impressive experience for users interacting with the machine.
- **Environmental Science -** Impact of the machine on recycling materials that bring the overall environmental benefits.
- **Industrial Design** - Focus on the user experience and aesthetics of the machine which can encourage more people to use it.
- **Business & Marketing -** We can analyze market trends, identify potential users, and develop strategies to promote the use of reverse vending machines.
- **Electrical Engineering** - Sensors for item detection, motors for moving parts, control systems for sorting, and power management systems.

- **Safety & Regulation** - Ensure that the machine supports relevant standards and regulations for electrical safety, environmental protection, and user health.

Multiple Stakeholders:

- **Technology Providers**
- **Consumers**
- **Retailers**
- **Investors**
- **Environmental organizations**
- **Maintenance**

Estimated budget:

Equipment	Quantity	Budget(Tk)
Arduino Mega 2560	1	1950
Jumper wires	1	65
GPS Module(Generic)	1	990
Inductive Proximity Sensor,15 mm	1	408
Single Turn Potentiometer- 100k ohms	1	69
Buzzer, Piezo	1	34
Ultrasonic Sensor HC-SR04(Generic)	1	93
SG90 Micro-servo motor	1	149
Adapter 12V	1	128
Alphanumeric LCD, 16 x 2	1	240

NodeMCU ESP8266 Breakout Board	**1**	**100**
Breadboard	**As Required**	**150**

9V battery(Generic)	**1**	**74**
5mm LED :Red	**1**	**2**
Switch Actuator, Head for spring return push-button	**1**	**30**
Capacitive Proximity Sensor, 12mm	**1**	**340**
Total	----------	**4822 Tk**