

# Smart Waste Management System using RFID

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**Abstract** - Smart Waste Management System is an advance hardware module which uses RFID system to honour the person in exchange of disposal of waste. In this manifesto, this idea is further extended to resolve the issues regarding waste management in school, colleges, households etc. Moreover, this module motivates kids and students for disposing waste into dustbin.

**Key Words:** RFID, Waste management, Dustbin, Waste disposal.

## 1. INTRODUCTION

Cleanliness is necessary for physical as well as mental health. Whether it is urban area or rural area, cleanliness plays an important role. Waste disposal is a difficult task for every country. To encourage Cleanliness and to awake the citizens about it "The Govt of India" initiated "Swachh Bharat Campaign". This module mainly targets to improve the scenario of waste disposal in schools by students.

This module consists of Dustbin with Arduino Board, RFID reader, candy vending machine which is driven by Servo Motor. Whenever a person throws the garbage in the dustbin, the PIR Sensor detects the motion of garbage within the dustbin and sends the digital output to Arduino Board. Arduino activates the RFID reader through digital input. RFID Reader reads the RFID card of the student and uploads the data to the excel sheet. At the end Servo Motor opens the gate of candy vending machine which gives the reward to the student.

### 1.1 LITERATURE SURVEY

- A. Recent advancement in RFID technology has made this system more feasible.
- B. Advancement in microcontroller[3], IOT[2] and cloud based system reduced the man power by automation [5].
- C. Idea of Smart City implements multiple microcontroller based hardware system which help in better utilisation of resources [1].

## 2. BLOCK DIAGRAM

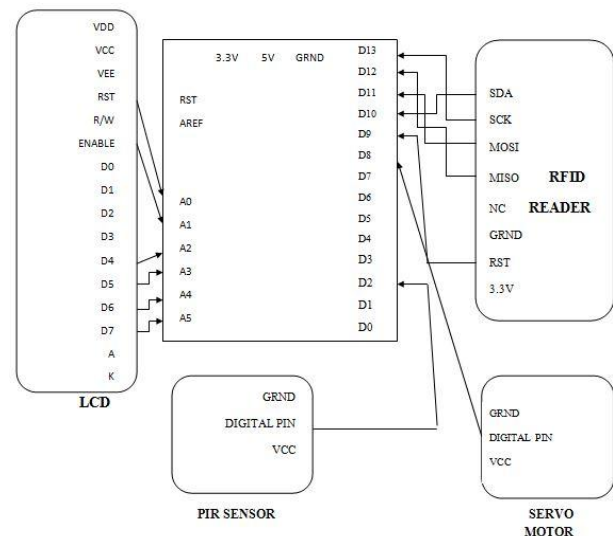


Fig 1. Block Diagram of Smart Waste Management System

## 2. HARDWARE USED

### 2.1 ARDUINO UNO

Arduino Uno is ATMEGA328 based microcontroller. It can be powered via power supply as well as USB connection. It has 6 analog, 14 digital pins and Reset button. Fig 2 shows the Arduino Uno Board.



Fig 2 . Arduino Uno Board

### 2.2PIR SENSOR

PIR or Passive Infrared Sensor detects the motion object in its active area. Basically it detects the capture of infrared radiations by warm bodies in its field. It has three pins. It has

capability of detection up to 14 meters. Fig 3 shows the PIR sensor.



Fig 3 . PIR sensor

### 2.3 SERVO MOTOR

Servo Motor allows precise control over angular acceleration and angular position. There are 3 pins in Servo motor out of which two are used for power supply and one for the digital input. Servo motors are used in automated machinery and robotics. Figure 4 shows the Servo Motor.



Fig 4.Servo Motor

### 3. WORKING MECHANISM

The working this system could be summarised by splitting into the process involved in it. The various steps involved in this system are described in a step by step manner as follows.

#### 3.1 Throw the waste into dustbin

The collected waste should be thrown in the dustbin. The dustbin consists of a smart system build inside it. Figure 5 shows the process involved.



Fig 5. Waste dumping in the dustbin

#### 3.2 Waste detection using PIR sensor

The waste is then detected with the help of PIR sensor. PIR sensor sends the digital output to the Arduino board.

Figure 5 shows the process of detection of waste by PIR sensor.



Fig 6. PIR sensor detecting waste

#### 3.3 Scan the RFID card using RFID reader

The donor is requested to scan the RFID card over the reader so that the information of the card can be extracted. Figure 7 shows the process of reading RFID card.



FIG.7. RFID TAG SCANNED USING RFID

#### 3.3 RFID data is updated to the server with a reward

RFID data is stored to the server in the form of name and ID etc. Person collects the reward. Figure 8 shows the final process.

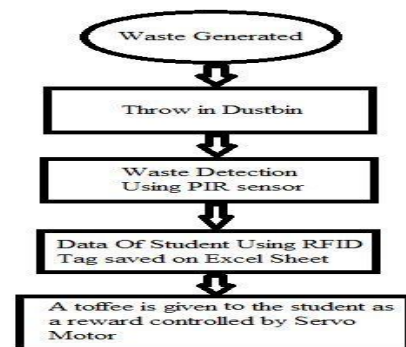


Figure 8. working of smart waste management system

#### 4. ADVANTAGES OF SMART WASTE MANAGEMENT SYSTEM

- It promotes the student for the disposal of waste into dustbin and cleanliness of surrounding.
- It makes the process of disposal interesting so students can contribute their part for the Clean India Mission.
- It reduces health risk among the society and helps to maintain the hygiene.
- Waste disposed into the dustbin can be recycled. It promotes 3R principle recycle, reduce, reuse.
- Applying this technology to the schools optimises management of the garbage.

#### 5. FUTURE ENHANCEMENT

A few more features that can be added to this smart waste management system are as follows:

- A. Monitoring of level of dustbin can be applied by adding Ultra Sonic sensor module .It can help to notify the authority about the level of dustbin and schedule the collection accordingly.
- B. This system can be integrated with the web server and software system can be included with it [4].
- C. System can be made decentralised through Blockchain technology.

#### 6. CONCLUSION

Architecture for designing Smart waste management system is provided in this paper. The system simply works after detecting the motion of garbage inside the dustbin by using PIR sensor. It is operated by Arduino Uno microcontroller.

RFID reader reads the card of the user to save the details. This system can be modified to save the cost and few modules can be added to update its functionalities.

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