

# Waste Segregation and Management using Electrical Conductivity Threshold

Yash Malik, Nishtha Agarwal, Anushree Chandra Prof. S.P.Gaikwad

(Department of Electronics Engineering)

BharatiVidyapeeth (Deemed To Be University) College of Engineering, Pune

**Abstract** – The project introduced is a solution for waste segregation and its disposability, which uses basic equipments and whose data is accessible in real time from any part of the world. It deals with the separation of the waste at the very basic level viz ,waste producer, distinguishing the waste into dry and wet, and helps monitoring the staff when to empty the bin and keeping the surrounding clean .This project uses sensors and whose data is sent to the Blynk app to be processed in real time and can be accessed anywhere in the world, instant notifications are sent to keep the bins in check and the data collected can be saved for future references. This project can be of great use to the general public and the waste producers and help save a lot of money and time.

**Key words:** Segregation, Blynk app, Liquid Crystal Display(LCD)module, Atmega328, Flowchart.

## 1.INTRODUCTION

Waste segregation is the separation of wet and dry waste, the waste created all together affects the life of thousands of people, and therefore waste management is a necessary part of our day to day lives now, and waste segregation is one of the most prominent techniques. In recent times, especially in India, waste is increasing at an alarming rate, the consumption of different items and resources have increased exponentially due to the rise in population, and with this the waste consumption increases. Waste affects the life of thousands of people, and therefore waste management is a necessary part of our day to day lives now, and waste segregation is one of the most prominent techniques. The Govt. has started the Swachh Bharat Abhiyan, but seldom do we see it implemented. People continue to put all the waste in

the same bin, saying that they get confused seeing multiple bins and what to do with them. Thus, the recyclable material goes wasted and the municipal staff faces a horrendous job of cleaning up our mess. This project solves the above mentioned problem, figuring out the dry and wet waste altogether so that we don't have to, and ends up saving the recyclable materials, and also a lot of money and time. If implemented correctly, it gives us a real time data via the Blynk app. It indicates when the bins are filled and when they need to be emptied. In this manner, there can be one centralized station where all the data can be processed and then from there on the respective cleaning staff can be notified. This process will also make the waste easy to be used for further processes, like Composting, Recycling and Incineration. We have used two servomoterSG90, three Ultrasonic sensors, One stepdown transformer, one Atmega328 and Wi-Fi module, and one LCD (16X2) as our basic components and we have built this project from there on.

## 2.SYSTEM OVERVIEW

This section is an in-depth detail of the list of components used in the project, their role and benefits. We used an Atmega328 microcontroller to control the actions being performed on the system. All the sensors and motors are connected to the same. Let us begin by identifying and explaining each component.

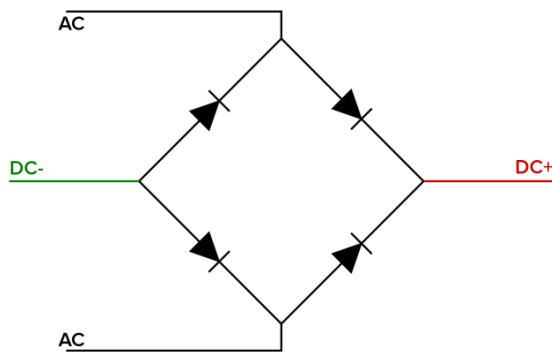
**Step Down Transformer:** The AC source running through our homes is 220 V, and to tone this voltage down we need a step-down transformer. We used a transformer that tones the voltage from 220 V to 9 V, which is the exact value at which we want our system

to work properly without any damage. The step-down transformer has lesser turns on the secondary coil as compared to the primary hence it is able to lessen the value of voltage.



**Fig -1:** Step Down Transformer

**Rectifier:** We used a rectifier to convert the alternating current to pulsating direct current and achieved it by letting the current flow through only one direction. The result is a pulsating current which is twice the frequency of the input AC voltage.



**Fig-2 :** Bridge Rectifier

**Regulator 7805:** A regulator is a device that is designed to maintain a constant level of voltage, in this case 5 volts. We used this to give the supply to Atmega328, LCD and the ultrasonic sensors, the numbers '78' means positive voltage and '05' means the voltage level. Regulator maintains the same output voltage even after the input voltage suffers from fluctuations or any other kind of discrepancy. It is

basically a device which adjusts voltage from the source in accordance to the specified device.



**Fig-3:** Regulator 7805

**ATmega 328 Micro-Controller:** Atmega328 is a single chip microcontroller, originally created by Atmel and is of the megaAVR family. It does all the processing work in the system. It has a Harvard Architecture and an 8 bit RISC processor core. It has a Flash Program Memory of 32Kb size with read-write capabilities, 1KB EEPROM and 2KB SRAM. There are 23 general Input Output ports with 32 registers, and it has 2 8-bit timers and 1 16-bit timer. There is 1 comparator, the operating temperature range is -40 to 85 which is wide and one of the reasons why it has been used for quite some time now. The operating voltage range is 1.8 to 5.5 volts, which is why we supplied a 5v constant via the regulator, and the total pin count is 32. This is commonly used for in many projects and autonomous systems where a simple low powered and low-cost microcontroller is to be used.



**Fig-4:** ATmega328

**Ultrasonic Sensor:** This is an electronic device that is used to measure the distance of objects or things. It does this by, the sensor head emits ultrasonic wave and receives the wave back from the object at the receiving end, the sensors measure the distance to the

object by measuring the time between the whole process of emission and reception.



Fig-5: Ultra Sonic sensor

**Liquid Crystal Display:** LCD (16X2) is an electronic display module and has variety of applications. The module used here 16X2 means that it can display 16 character, number and letter included and there are 2 such lines where the character gets displayed. LCD uses light modulating properties of liquid crystals combined with polarizers. LCD do not emit light directly but uses a backlight to produce images in colour or monochrome.



Fig-6: LCD Module

**Servo Motor:-** Servomotor is a rotary actuator that allows for precise control of angular position and velocity. It is a closed mechanism and uses feedback to control the rotational speed and position. Motor is controlled via an electric signal which determines the

amount of movement required and can be programmed accordingly We used the SG90 because it has a higher output power.



Fig-7: Servo Motor SG90

**Wi-Fi Module:** We used WiFi module ESP 8266, because it is a full stack Transmission control Protocol/ Internet Protocol capability and it is of low cost, it allows the microcontroller to be connected to a WiFi network and display the data processed in the atmega328 on the Blynk app in real time and from there on we can control the variables of the system. it uses Hayes styles commands.

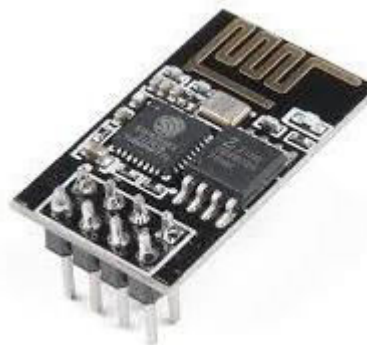


Fig-8: Wi-Fi Module ESP8266

### 3.FLOW CHART

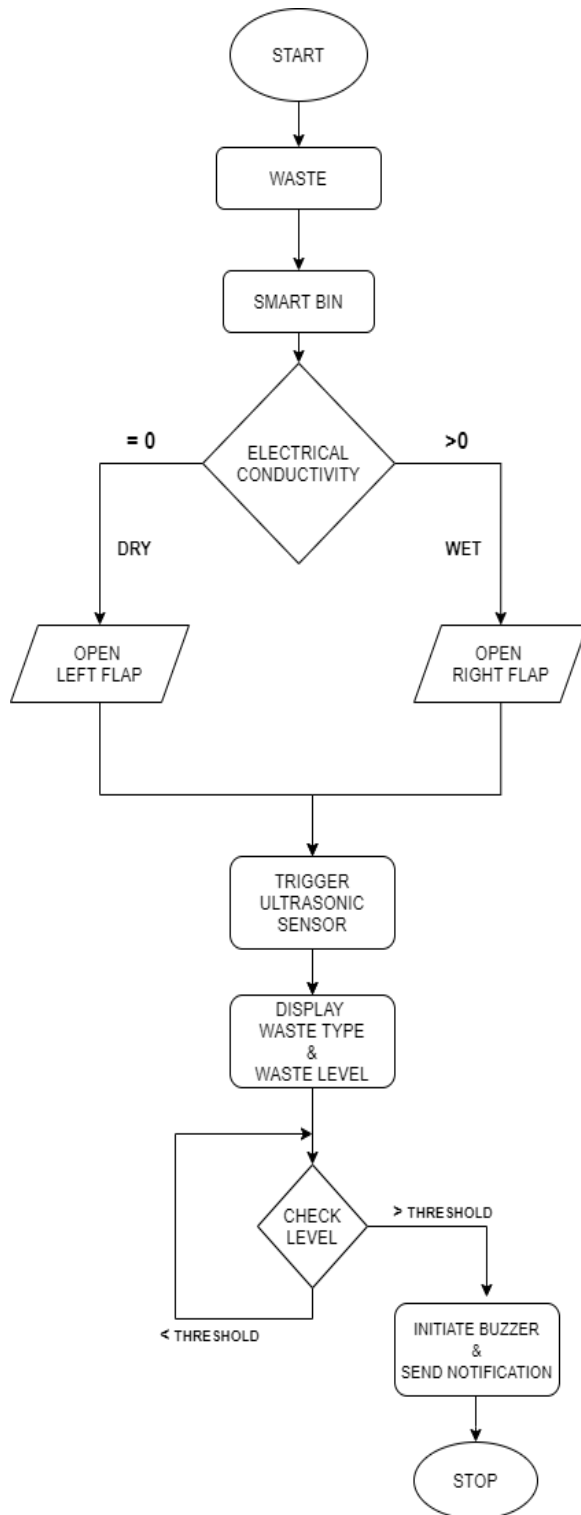


Fig-9: Flow chart of working system

### 4.WORKING

We start by powering on the main supply, whose output is treated as an input to the Step-down transformer, which basically converts the 220 V household AC source to 9 VAC source which is suitable for the system. This indicates that the hardware is powered up and ready for functioning. The output of transformer goes to a bridge rectifier which converts the AC voltage to pulsating DC voltage, the pulsating DC received is treated as an input to the 1000 microfarad capacitor that is used to filter the noises present in the signal. We have used a 5 V regulator, which supplies constant linear voltage to the Atmega328 microcontroller, LCD module and the 3 ultrasonic sensors used, all of which need ~5v supply. One Wi-Fi module is attached to the framework which will provide connectivity to the other devices or one main governing device, it will display all the real time data that is created by and in the system to the device on which the data will be constantly monitored. We have used Blynk app for the monitoring of the data. There are 2 servo motors(SG90) used for the angular rotation of the flaps, the flaps are the ones which decide where the waste will be finally dumped as there are two copper plates attached to the flaps for electrical conductivity detection. The servo motor applied at each flap's end decides how much the flap will rotate by what angle and at what velocity. An LCD module is added to show the data, viz the garbage is wet or dry, quantity of the garbage., this is also monitored on the app. A potentiometer is added to adjust the display of the LCD screen to change it to bright or dim depending on day or night used, there are the total components added on the framework .Once the garbage is put in the main bin, it lands on the copper plates which are added to the flaps, the main power supply is switched on, the processor senses the electrical conductivity of the object and when it is greater than 0, that object is declared as a wet object, if the electrical conductivity is 0 then that object is treated as dry object. Once the processor classifies the conductivity then the signal is passed to the servo motor, of respective side depending on the type of garbage(wet or dry), the servo motor comes into play and then the flap is lowered by a certain angle releasing the object in the bin. There is 1 ultrasonic sensor attached in front of the flaps, whose job is to make sure that the flap comes to its resting place and is ready to start again. Inside the separating bins there are 2 more ultrasonic sensors, which decide how



much the bin is filled or not, it sends out ultrasonic waves and depending on the time between transmission and receiver, the distance is calculated. Once the bin is full and no more can be put in the bin, the ultrasonic sensor sends the data to the processor, who sends it to the Wi-Fi module which uses TCP/IP characteristics to transfer the data onto the App, there is also a physical buzzer on the system that buzzes when either of the bin is filled, all of this data at the real time is displayed in the LCD module, and also is

sent to the Blynk app. Blynk app is a free app that helps monitor these things as a whole, once the bin is full, there is a notification panel enabled in the app that runs in the background even when the app is closed, the monitoring body receives the notification and knows how and when to enable the cleaning staff on their respective jobs and get the bins emptied.

### 5. CIRCUIT DIAGRAM

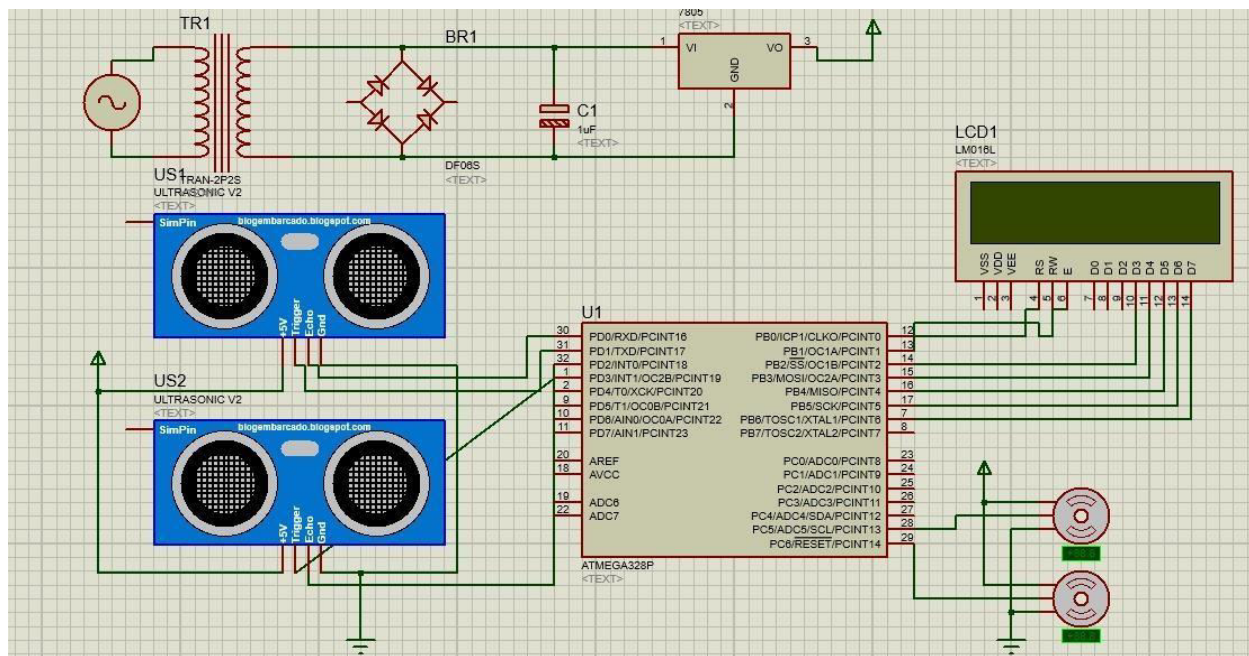


Fig-10: Circuit Diagram

### 6. CONCLUSION

The said project helps in cleaning the city and even households when implemented. The person is free from deciding which garbage goes where and hence is free from any botheration about the waste. This project will save every data in real time and will help the monitoring body to release the cleaning staff towards each bin or even a dumpster. Our country needs this kind of project more than any other country in the world as the increasing population is

the biggest threat. This is a key project to reduce waste minimization. It improves the public health protection and should be done at the producer level. The main emphasis is on the producer level, because it is that at the exact moment when we can stop the spread of these waste materials, and if we sort our waste according to the Dry and Waste waste, then the people at the other end who deal with waste materials on a daily basis have less hectic jobs and are safe and secure. Start at home.

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