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A

Project Report

On

Smart Reward Bin

Submitted to

Dept. of Electronic Science

By

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Guide: Prof. G.G.Patil,

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Abstract

Keeping the city clean has been always an ongoing task which needs laborious efforts of people working on ground level emptying the garbage bins whenever they are full. The event of garbage bin getting full is not strictly dependent on a time pattern, instead it sometimes becomes rapidly full or sometimes requires more than normal time to become full. IOT Garbage Monitoring with Weight Sensing project is an innovative step towards making this process more smooths and efficient. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page.

For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. In addition, we also have weight sensors attached below the garbage bins. Thus, the system sends over the internet the level of fill of the garbage bins as well as the weight of the fill of the garbage bins. The advantage of this combo sensing is that the garbage bin lifting weight can also be known by the authorities. If the garbage bin is not filled up, but still the weight of fill has reached the limit of what the garbage lifting vehicles can pick up, the vehicles can be immediately driven towards that bin for evacuation.

Introduction

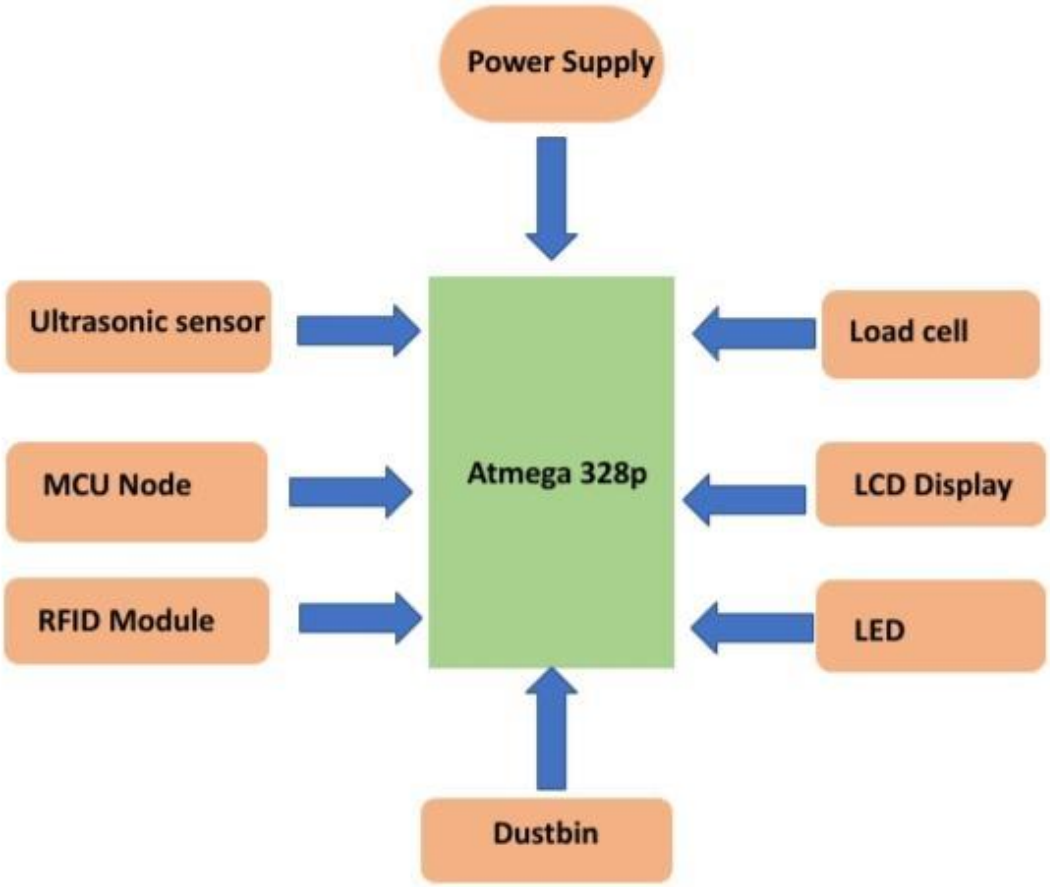
It has been formally defined as a “Information Society Infrastructure,” because IoT sanctions us for Collecting information from all kinds of media such as Humans, animals, conveyances, kitchen appliances. Thus, by Embedding them with electronic hardware such as sensors, Software and networking equipment, any entity in the Physical world that can be provided with an IP address to Allow datatransmission over a network can become part of The IoT framework. IoT is different from the Internet Because it transcends Internet access by allowing everyday Objects that use embedded circuits to interact and communicate with each other using the Internet Infrastructure in use.

IoT weight-sensing garbage monitoring uses Atmega Microcontroller with LCD display, rechargeable battery and Solar panel. A 12V power supply is powered at the system. Similarly, it works with the combination of sensors, namely Weight cell sensor and ultrasonic sensor, indicating their Weight and different levels, respectively. The ultrasonic Sensors will show us the various levels of garbage in the Dustbins and also enable the weight sensors to send their Output forward when they reach their threshold level. The Microcontroller is further given these details, and the Controller gives the transmitter module (Wi-fi module) the Details.

Literature survey

Literature survey is the most important step in software development process. Before developing the tool, it is essential to determine the time factor, economy company power. Once these things are satisfied, then next steps are to resolve which operating system and language can be used for developing the tool. Once the programmers start constructing the tool the programmers need lot of external support. This maintains can be obtained from senior programmers, from book or from websites. Earlier than building the system the above consideration is taken into account for developing the proposed system. How sensors work and how do actuators respond to the input from sensors and IOT is basically a machine-to-machine communication [1]. Figuring out the functionality of machine-to-machine (M2M) communications are Discussed.

Block Diagram



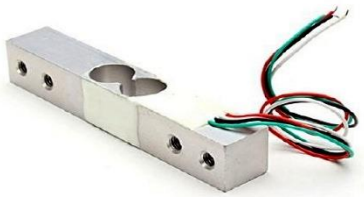
Components List

1) Load cell
2) Hx711
3) Atmega328
4) 16×2 LCD
5) Node MCU
6) Ultrasonic module
7) RFID module
8) Battery/ charger
9) LED
10) Jumper wires

Component's specifications

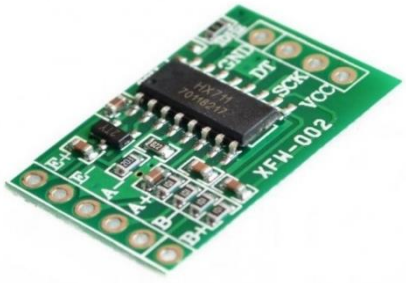
★Load cell:

Load cell is defined as a "weight measuring system Needed for electronic scales that display weights in Figure Its." However, load cell is not limited to weight measurement in electronic scales. Load cell is a passive transducer or Sensor translating the force exerted into electrical signals. They are also called "load transducers". The only load cells That predominate, however the reason why strain gage-based load cells are Broadly adopted is them



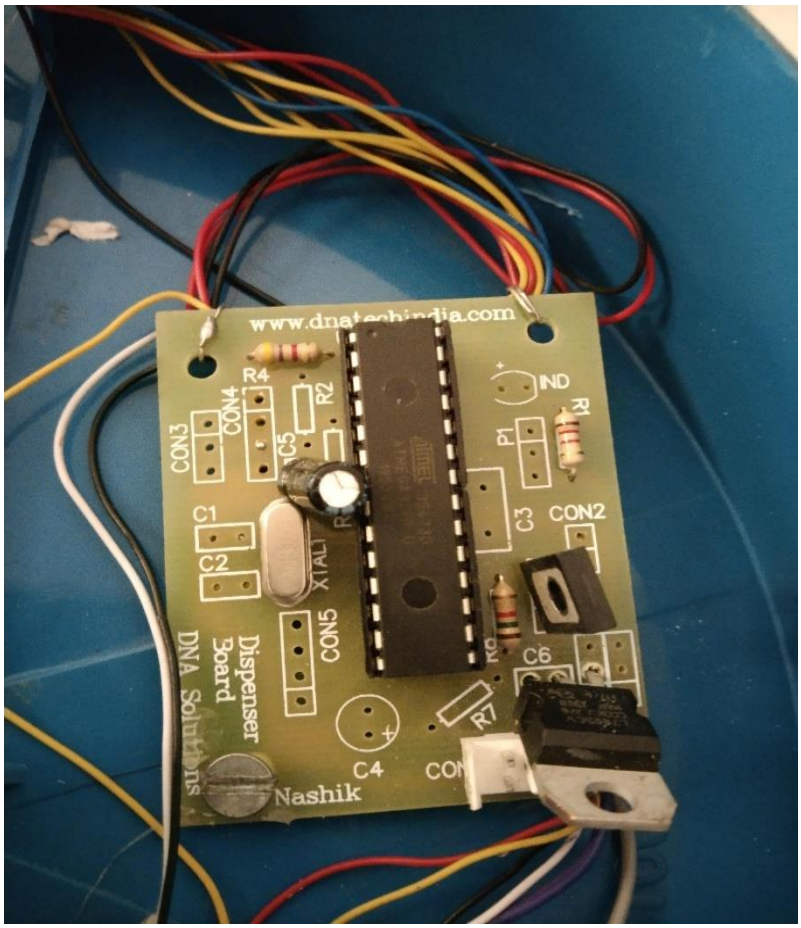
★ HX711: -

Weight Sensor Module is based on HX711, which is a 24-bit analog-to – digital precision converter designed to Interface directly with a bridge sensor for weight scale and Industrial control applications. HX711 not only has a few Simple functions compared to other chips, it also includes High integration, rapid response, immunity and other Features.



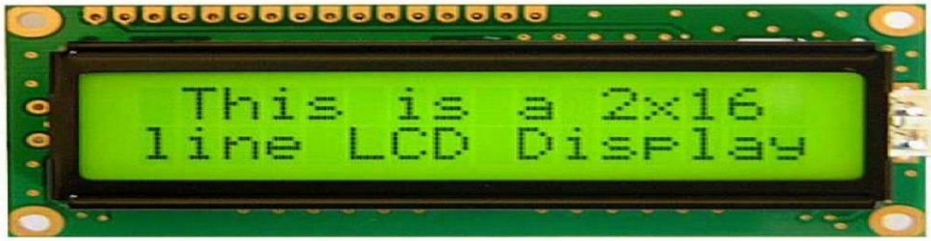
★ATmega328p:

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, 3 flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and 5 software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts.



★Liquid Crystal Display (LCD)

The word LCD stands for liquid crystal display. It is One type of electronic display module used in a wide range of Applications such as various circuits & devices such as cell Phones, calculators, computers, television sets, etc. Such Displays are chosen for light-emitting diodes and seven Segments in multi-segment configurations. The main Benefits of using this module are inexpensive; simply Programmable, animations, and the display of custom Characters, special and even animations, etc., is not limited. A 16 LCD has two registers like the register of data and the Register of commands.



★Node MCU

Node MCU is a low-cost open source IoT platform.[4][5] It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module.[6][7] Later, support for the ESP32 32-bit MCU was added.

★ Ultrasonic Sensor

Ultrasonic sensor HC-SR04 uses sonar to measure Distance to an item. This provides excellent non-contact Range detection with high precision and an easy-to-use kit with reliable readings. It comes complete with module Ultrasonic transmitter and receiver. The time between the Signal being transmitted and received allows us to know the Distance of an object

★RFID Module

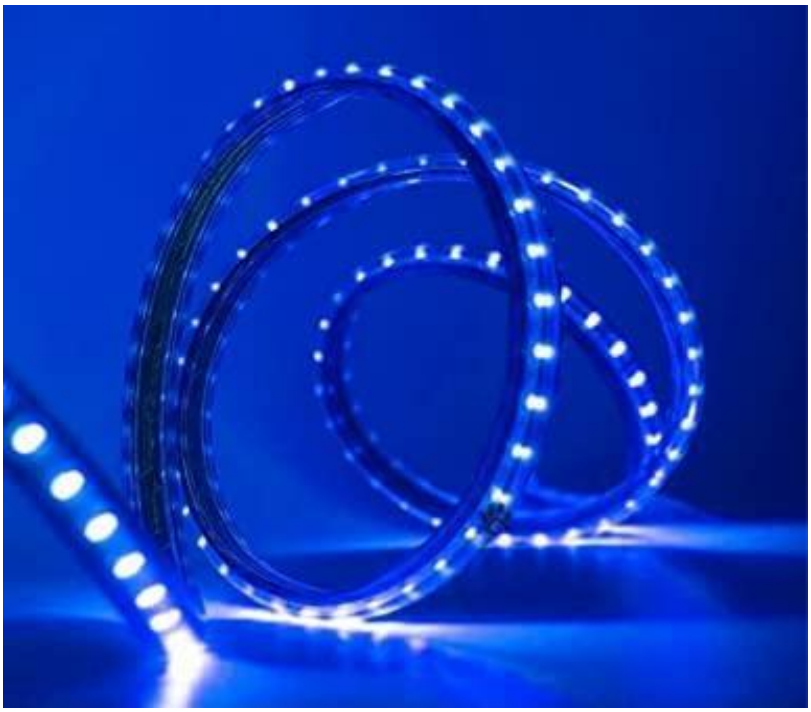
An RFID or radio frequency identification system consists of two main components, a tag attached to the object to be identified, and a reader that reads the tag. A reader consists of a radio frequency module and an antenna that generates a high frequency electromagnetic field**.**

★Battery

Batteries, many times, are also referred to by the number of volts which they have. You've probably heard of a 9-volt battery. This is a battery which has 9 volts of energy across its terminals and which gives out 9 volts when connected in a circuit. Therefore, the voltage specified is the voltage which the battery has when fully charged. Depending on the voltage you need for a circuit determines the amount of voltage which you would need in a battery. All batteries, standard or rechargeable, also come with a specification of milliampere- hours (mAh). This shows how long the battery can last for in operation; or in other words, how long its life is. The mAh specification shows how long a battery will be able to last in a circuit, given the circuit's power requirements, how much current the circuit demands.

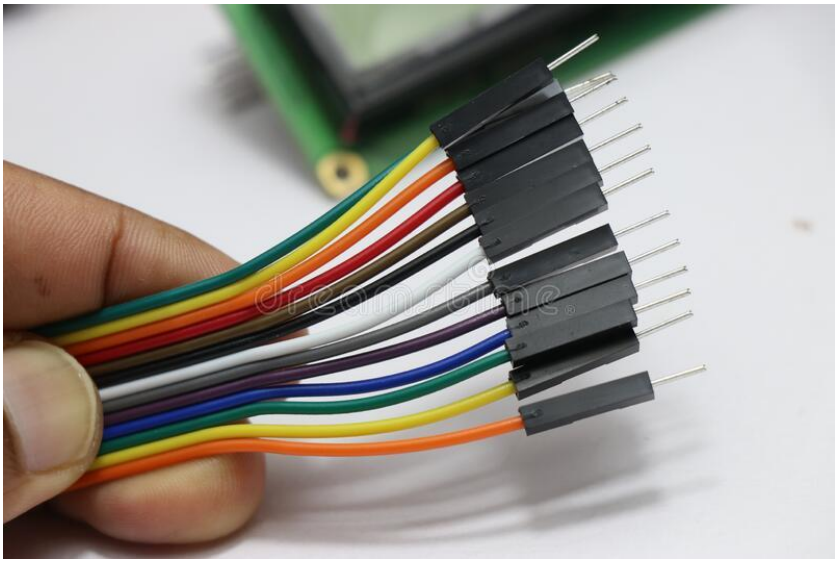
★Light Emitting Diode (LED)

A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.[5] White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device. LEDs have many advantages over incandescent light sources, including lower power consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. In exchange for these generally favorable attributes, disadvantages of LEDs include electrical limitations to low voltage and generally to DC (not AC) power, inability to provide steady illumination from a pulsing DC or an AC electrical supply source, and lesser maximum operating temperature and storage temperature.



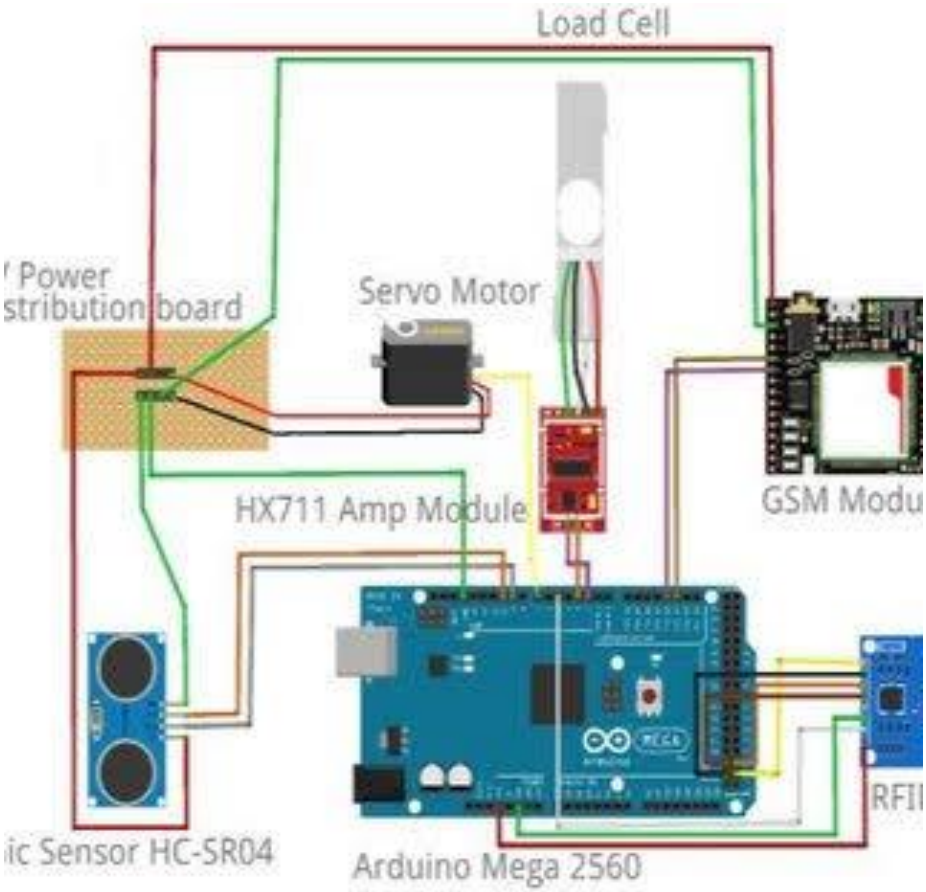
★ Jumper wires

Jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply “tinned”), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.



✯ Hardware Designing

• Circuit Diagram: -



• Working

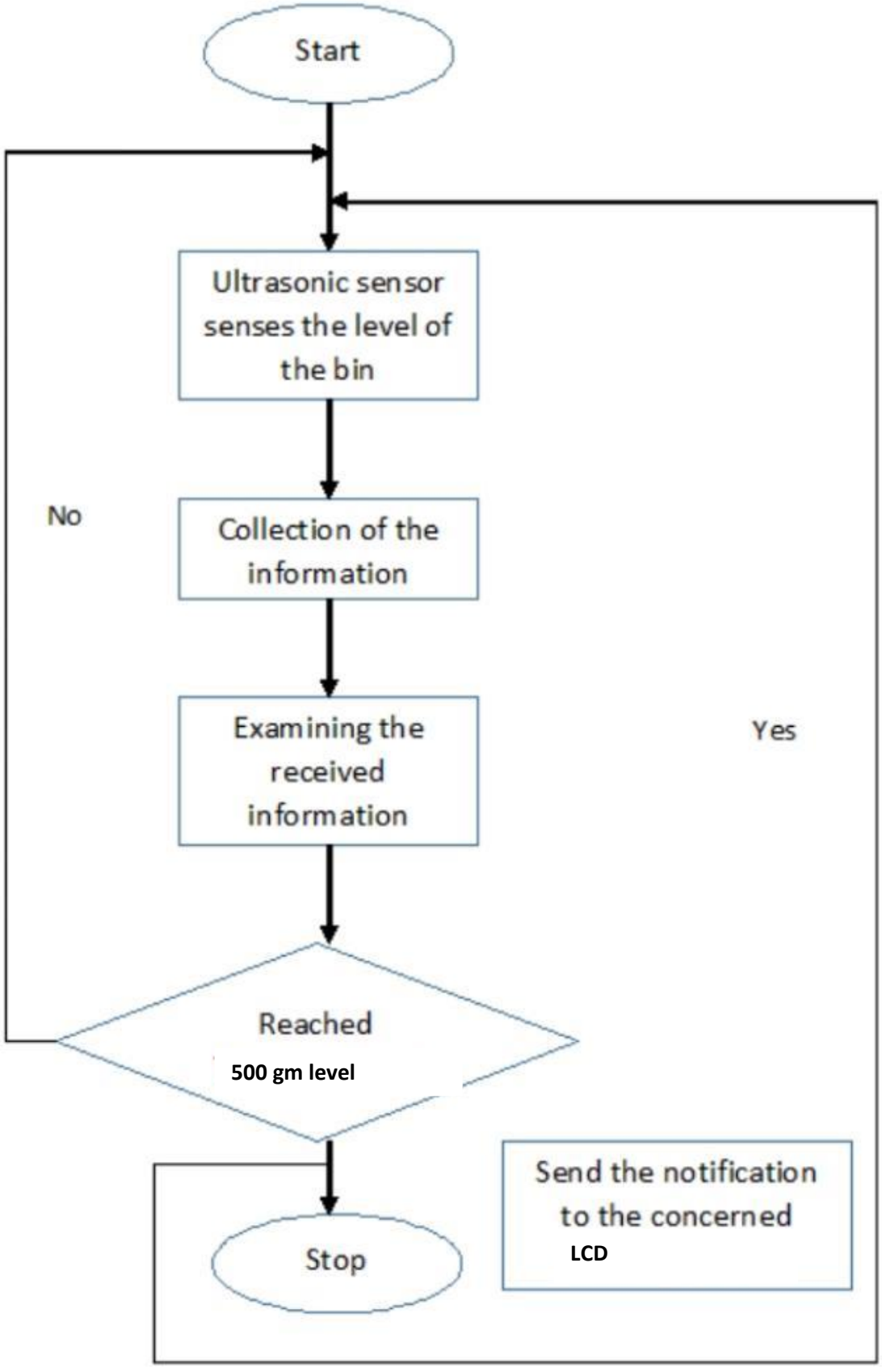
After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well. connected or something missed. After connection set up now next step is to submit/upload code in ATmega328p and supply power to the circuit. When system is powered ON, ATmega328p keeps Monitoring for any things that come near the Sensor at give range. When Ultrasonic sensor detect the garbage at certain level and blink LED An RFID or radio frequency identification system consists of two main compartments, a tag attached to the object to be identified and a reader that reads the tag. A reader consists of radio frequency module and an antenna that generates a high frequency electromagnetic field. Load cell senses the weight of garbage then comparators and microcontroller compaires the weight of certain value and deposite those virtual coins in RFID card. they display all information in LCD screen.

✯ Software development

(a) . Algorithm:

1) Start
2) Check the level of the dustbin with the help of ultrasonic sensor.
3) Collection of the information
4) Examine the recived information
5) Does the level are 500-gram crosses
6) If Yes condition is satisfied
7) If No condition goes to step 2
8) When the first level crosses then the include for the level after each gram of level execute
9) Stop

(b). Flow Chart


Start
Ultrasonic sensor senses the level of the bin
Collection of the information
Examining the received information
Reached
500 gm level
No
Yes
Send the notification to the concerned
LCD
Stop

(C) Program Code

```
#include "HX711.h"  //You must have this library in your arduino library folder

#include <LiquidCrystal.h>

LiquidCrystal lcd(A5, A4, A3, A2, A1, A0);

#define echopin 6 // echo pin

#define trigpin 5 // Trigger pin

#define rl1 9 // LED pin

#define DOUT 3

#define CLK  2


long duration, distance;

HX711 scale(DOUT, CLK);

float calibration_factor = -206600;

float weight = 0;

int count=0;      // a variable to read incoming serial data into

char input[13];

char id1[13]="45003C23207A";

char id2[13]="45003BF3FA77";

int match1=0;

int match2=0;

int point1=0;

int point2=0;

int time = 0;

int mode = 0;
```

```
float level1 = 0;
float level2 = 0;

void setup() {
  Serial.begin(9600);
  lcd.begin(16, 2);
  pinMode (trigpin, OUTPUT);
  pinMode (rl1, OUTPUT);
  pinMode (echopin, INPUT );
  scale.set_scale();
  scale.tare(); //Reset the scale to 0
  long zero_factor = scale.read_average(); //Get a baseline reading
}

void loop ()
{
  scale.set_scale(calibration_factor);
  weight = scale.get_units();
  if(weight<0)weight=0;
  level1 = weight;
  if((level1-level2)>0.02)mode=1;
  if(mode==0)
  {
    lcd.clear();
```

```
 lcd.print("Dust:");
 lcd.print(distance);
 lcd.setCursor(0, 1);
 lcd.print("Weight:");
 lcd.print(weight, 3);
 digitalWrite(trigpin,LOW);
 delayMicroseconds(2);
 digitalWrite(trigpin,HIGH);
 delayMicroseconds(10);
 duration=pulseIn (echopin,HIGH);
 distance= duration/58.2;
 delay (50);
 if(distance<8)
 {
  digitalWrite(rl1,HIGH);
 }
 else
 {
  digitalWrite(rl1,LOW);
 }
 distance = map(distance, 0, 16, 100, 0);
 if(distance>100) distance=100;
}
else
```

```
{
  lcd.clear();
  lcd.print("Scan Your Card");
  while(Serial.available() && count < 12)
  {
    input[count] = Serial.read();
    if(input[count]==id1[count])
    {
      match1++;
    }
    if(input[count]==id2[count])
    {
      match2++;
    }
    count++;
    if(count==12)
    {
      dispence();
      count=0;
      match1=0;
      match2=0;
    }
  }
}
```

```
  count=0;
  match1=0;
  match2=0;
  delay(1000);
  level2 = level1;
}

void dispence()
{
  if(time<(millis()/1000))
  {
    if(match1==12){
      mode=0;
      point1 = point1+10;
      digitalWrite(rl1,HIGH);
      lcd.clear();
      lcd.print("User: 1");
      lcd.setCursor(0, 1);
      lcd.print("Point:");lcd.print(point1);
      delay(2000);
      digitalWrite(rl1,LOW);
    }
    else
    if(match2==12){
```

```
      mode=0;
      point2 = point2+10;
      digitalWrite(rl1,HIGH);
      lcd.clear();
      lcd.print("User: 2");
      lcd.setCursor(0, 1);
      lcd.print("Point:");lcd.print(point2);
      delay(2000);
      digitalWrite(rl1,LOW);
    }
    else
    {
      //Serial.println("ID Not Match");
    }
    time = millis()/1000;
    time = time + 5;
  }
}
```

★ Advantages & Application

1)Recycling improves the Municipal solid waste management.

2)Disposal of waste are to be properly managed.

3)Rewards provided for the segregated waste motivates the user

4)To Avoid Garbage overflow.

5)Provides proper disposing method.

6) A reduction in the number of waste bins needed

7)Analytics data to manage collection routes and the placement of bins more effectively.

8) Improved environment (i.e., no overflowing bins and less unpleasant odors).

9) A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.

10) Can work outdoors and indoors.

Conclusion

Through this project, we have made full use of technology for the collection and management of garbage. In this project, Ultrasonic sensor detects garbage level and LED blinks. After collecting 500 grams of waste in Dustbin, RFED card has to be scanned and users get 10 points. Users get rewards when their points are completed. Due to this reason, people are more attracted towards this smart dustbin. The reduces the total number of garbage collection. It used to maintain a green environment. Helps to preserve cleanliness in society. The smart reward bin system therefore allows collection of the garbage more efficient.

Future work

• Can use solar cell to charge battery to need of plug

• Wifi module for uploading all data to the website.

• To the add ultrasonic sensor and servo motor to the detect human and open bin Lid.

• It is used future in a segregator.

Thank you…

References

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[2] P. D. S. M. Chaware, S. Dighe, A. Joshi, N. Bajare, and R. Korke, “Smart Garbage Monitoring System using Internet of Things (IOT),” Ijireeice, vol. 5, no. 1, pp. 74– 77, 2017, doi: 10.17148/ijireeice.2017.5115.