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Automated Waste Bin Monitor

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Abstract: One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. Foul smell from these rotten wastes that remain untreated for a long time due to negligence of authorities and carelessness of public may lead to long term problems. This may even cause dreadful diseases. So waste management has been a crucial issue to be considered. In this project, smart automated waste bin monitor is built on a microcontroller based platform Arduino Uno board which is interfaced with GSM modem and Ultrasonic sensor to eradicate this problem.

Keywords: Waste management; Smart automated waste bin monitor; Arduino uno board; GSM modem; Ultrasonicsensor

I. INTRODUCTION

Dust bin is a basic need and it is an important for a sound and healthy environment. So this project was done for the eradication of this waste management problem for the poor or developing countries throughout the world. This project results a cheap and feasible waste management system which is done based on microcontroller. This project set on a dustbin can monitor the garbage level all the time and gives information of the situation of the waste in the monitor. After crossing the setting limit of the garbage level, this will warn the authority by alarm as well as this will give the authority a sms. So why this smart dustbin is needed?

It is learnt from the primary survey done in Guwahati, a city in Assam that garbage accumulation causes 41% of the air pollution [1]. They cause air pollution which generally leads to various respiratory problems like COPD, asthma etc. Breeding of mosquitoes and houseflies occur mainly in garbage which are a major cause for various diseases like malaria, dengue, chikungunya etc. This also causes headache, nauseous sensation and increase in the stress level. A city with poor sanitation and smelly environment can never be a healthy place to live in. There are about 235 million people currently suffering from asthma for which foul smelling of garbage is also a vital reason. Almost 90% of chronic obstructive pulmonary disease (COPD) occur in low and middle income countries which is caused by foul smelling. More than 3 million people died of COPD in 2005[2]. Improper management of garbage is identified to be one of the major causes for 22 human diseases causing premature death every year [3].

II. PROBLEM DEFINITION

So Instead of using plenty of bins in an unordered fashion around the city, minimal number of smart bins can be used.

2.1 Design

2.1.1 Ultrasonic sensor:

The ultrasonic sensor has two pins: Trigger and Echo, which are used for calculating the distance of the object

by generating sound waves and thus calculating the time duration of the echo that is generated (Figure 1).



Figure 1: Ultrasonic sensor.

2.1.2 GSM modem:

A GSM modem is a specialized type wireless modem that works with a GSM wireless network. It accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. GSM Modem sends and receives data through radio waves in our experiment we used gsm900 A (Figure 2).



Figure 2: GSM modem.

2.1.3. LCD display:

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements [4] (Figure 3).

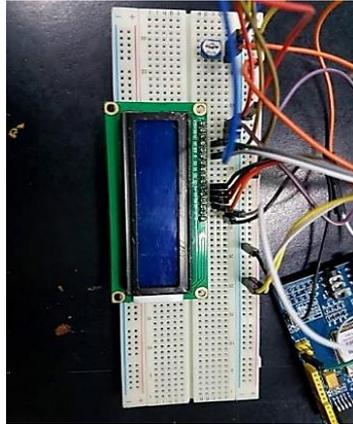


Figure 3: GSM modem.

2.1.4 Arduino uno:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing [5] (Figure 4).

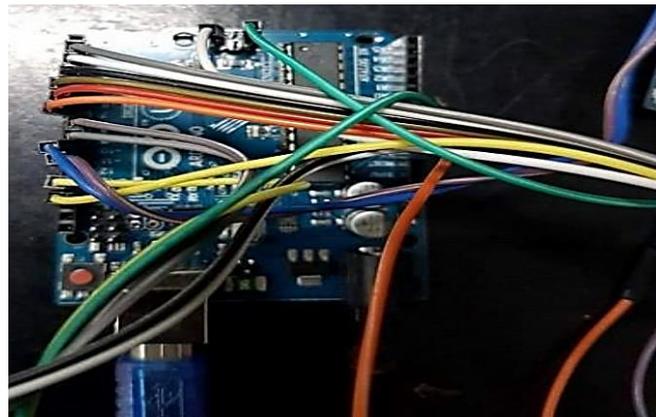


Figure 4: Arduino uno.

III. METHODOLOGY

The ultrasonic sensor is used to find the height of garbage filled at different intervals of time. Arduino Uno board is used as microcontroller platform. Where h is the height of the bin but to make it affordable and to achieve the same results, only one sensor is placed at surface level. Arduino Uno board is used as microcontroller platform. Interfacing is done between GSM modem and Arduino board by connecting RX pin of modem to TX pin of board and viceversa. ECHO and TRIGGER pins of sensor is connected to digital pins 5 and 13 of Arduino board. Arduino board works at 5V power supply and GSM modem requires 2A to power on. Threshold height is set to 15 cm. Threshold distance is the difference in height at which sensor is placed and the level of garbage fill. During the course of garbage accumulation, whenever the difference falls below threshold value, GSM modem is activated to send an alert signal to the concerned authority through an SMS (Figure 5). A working flow chart is given below to understand the working principle (Figure 6).



Figure 5: Smart wastebin.

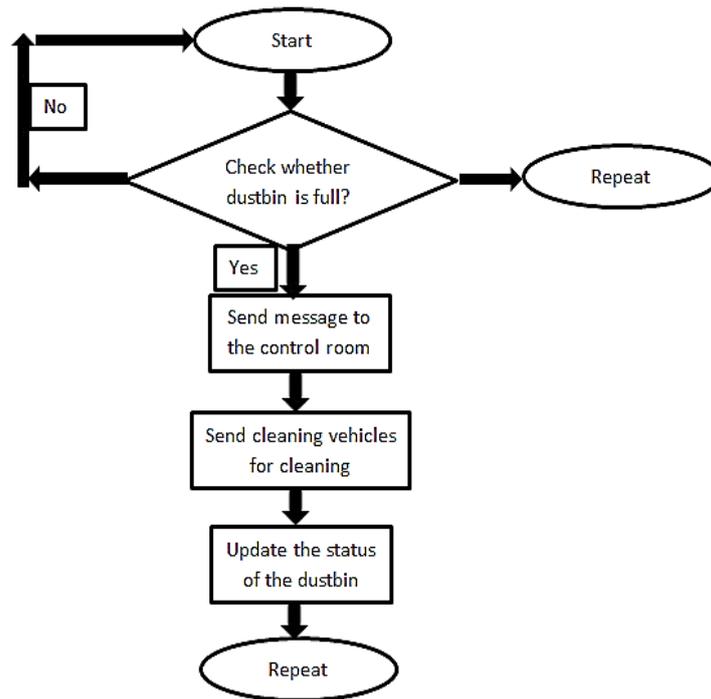


Figure 6: A working flow chart is given below to understand the working principle.

In 5 our microcontroller we input the programme through our Arduino software. The snapshot of the programme is given below:

1. #include <LiquidCrystal.h>
2. #include <SoftwareSerial.h>
3. #include <NewPing.h>
4. #define TRIGGER_PIN 9 // Arduino pin tied to trigger pin on the ultrasonic sensor.
5. #define ECHO_PIN 8 // Arduino pin tied to echo pin on the ultrasonic sensor.
6. #define MAX_DISTANCE 200 // Maximum distance we want to ping for (in centimeters). Maximum sensor distance is rated at 400-500cm.
7. #define mindistance 15 //if needed to change the min dis.
8. NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);
9. // initialize the library with the numbers of the interface pins
10. LiquidCrystal lcd(2,3,4,5,6,7);
11. SoftwareSerial mySerial(10,11);
12. // #define buzzer 12
13. #define buzzer 13
14. int i=0;
15. int distance()
16. {

```
17. unsigned int uS = sonar.ping();
18. int distance=(uS / US_ROUNDTRIP_CM);
19. if(distance>200)
20. {
21. distance=0;
22. }
23. return distance;
24. }
25. void setup()
26. {
27. . pinMode(buzzer,OUTPUT);
28. //pinMode(lights,OUTPUT);
29. lcd.print("Starting...");
30. delay(1000);
31. lcd.clear();
32. lcd.begin(16,2);
33. mySerial.begin(19200);
34. Serial.begin(9600);
35. lcd.print("depth:");
36. delay(1000);
37. mySerial.println("AT+CNMI=2,2,0,0,0");
38. }
39. char text[200]={'\0'};
40. char cmd[200]={'\0'};
41. int msgsend=0;
42. int d;
43. void loop()
44. {
45. d=distance();
46. lcd.clear();
47. lcd.print("depth:");
48. lcd.setCursor(6,0);
49. lcd.print(d);
50. Serial.println(d);
51. if(d<mindistance)
52. {
53. digitalWrite(buzzer,HIGH);
54. lcd.clear();
55. lcd.print("depth:");
56. lcd.setCursor(6,0);
57. lcd.print(distance());
58. lcd.setCursor(0,1);
59. lcd.print("clear the box!!");
60. if(msgsend==0)
61. {
62. SendMessagefull();
63. }
64. msgsend=1;
65. }
66. else
67. {
68. msgsend=0;
69. digitalWrite(buzzer,LOW);
70. }
71. if(mySerial.available())
72. {
73. i=0;
74. while(mySerial.available())
75. {
76. text[i]=mySerial.read();
```

```

77. Serial.print(text[i]);
78. i++;
79. delay(5);
80. }
81. if(i>18)//msg limitation.
82. {
83. printtext();
84. work();
85. }
86. }
87. }
88. void printtext()
89. {
90. int a;int c=0;
91. for(a=(i-18);a<=(i-2);a++)
92. {
93. Serial.write(text[a]);
94. cmd[c]=text[a];
95. c++;
96. }
97. int b;
98. for(b=0;b<i;b++)
99. {
100.text[b]='\0';
101. }
102. }
103.void work()
104.{
105.if(strcmp(cmd,"free space in box")==0)//wht should i txt to see the condition.
106.{
107.Serial.println("sending msg");
108.SendMessage();
109.}
110.else
111.{
112.Serial.println("None");
113.digitalWrite(buzzer,LOW);
114.lcd.clear();
115.lcd.print("depth:");
116.lcd.setCursor(6,0);
117.lcd.print(distance());
118.delay(1);
119.}
120.}
121.void SendMessagfull()
122.{
123.mySerial.println("AT+CMGF=2");
124.delay(1000);
125.mySerial.println("AT+CMGS=\"+8801745633473\"");
126.delay(1000);
127.mySerial.print("full!! distance:");
128.mySerial.print(d);
129.mySerial.println("");
130.delay(100);
131.mySerial.println((char)26);
132.delay(1000);
133.}
134.void SendMessage()
135.{
136.mySerial.println("AT+CMGF=2");

```

```
137.delay(1000);
138.mySerial.println("AT+CMGS=\"+8801745633473\"r");
139.delay(1000);
140.mySerial.print(distance());
141.mySerial.println("");
142.delay(100);
143.mySerial.println((char)26);
144.delay(1000);
145.}
146.void RecieveMessage()
147.{
148.mySerial.println("AT+CNMI=2,2,0,0,0");
149.//mySerial.println("AT+CMGR=1");
150.delay(1000);
151.}
```

Note: In this programme all the comments are given where we want to modify like minimum distance or phone number of the receiver, display words etc.

IV. CONCLUSION

This modernization is positively compatible for our country and also very inexpensive to avail. So now it is the time for municipality to look over the city cleanliness throughly by automated smart wastebin system, with the MOTTO “lets keep our city clean with smart waste bin”. Yes we are being digitalized but now we have to be liberal this time for the sake of our own city by modernizing the waste bin.

V. FUTURE WORK

In this paper, implementation is done only for a single bin. Integration of many bins each with a unique ID can be done and creating database for each bin which can be maintained by using SQL technology and a login webpage is created to ensure authorized entries. Apart from this, differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. To implement this methane and smell sensors can be used. This helps in distinguishing the waste at the source and hence reducing the requirement of manpower. To enhance it further, an automated system can be developed which is able to pick up waste in and around the bin.

VI. REFERENCES

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