Smart and Automatic System for Garbage Pickup

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***Summary* — Many times, we can see overflowing dustbins in public places in cities. It generates unsanitary conditions for humans, ugliness in the area as well as foul odour. We primarily suggested solutions to deal with this problem by implementing IoT Based Smart Garbage Collection Bins. These bins will be connected to a microcontroller-based system with ultrasonic sensor systems and a central system that will display the current garbage status on a mobile web browser with an html page through Wi-Fi. This system will allow the user to know the garbage level of each dustbin in a locality or city at all times, to give a cost-effective and time-saving route to the truck drivers.**

I. Proposed Methodology

A. Detailed Description

We propose the use of smart bins which can keep track of the garbage levels inside them. The system can be used for monitoring the waste in different locations by using the IoT and web applications. Developing the full-fledged application as per stated objectives and board components justification will lead to notable advantages over other solutions. When the garbage level reaches a threshold value, then the system would notify the concerned authorities to dispatch a garbage collection vehicle to the bin's location. Moreover, these smart bins would also be able to detect a person within their range and open its lid whenever a person approaches. An LCD screen would be interfaced with the controller to display the garbage level and bin's lid status.

For garbage level detection, an ultrasonic sensor is installed on the inside of the lid to measure the distance of the garbage surface from itself. The levels are proportionate to the calculated distance. A set of ultrasonic and IR sensors is installed on the outside of the bin to detect any approaching person. If so, then the dustbin would open its lid to allow the person to dispose of his/her garbage.

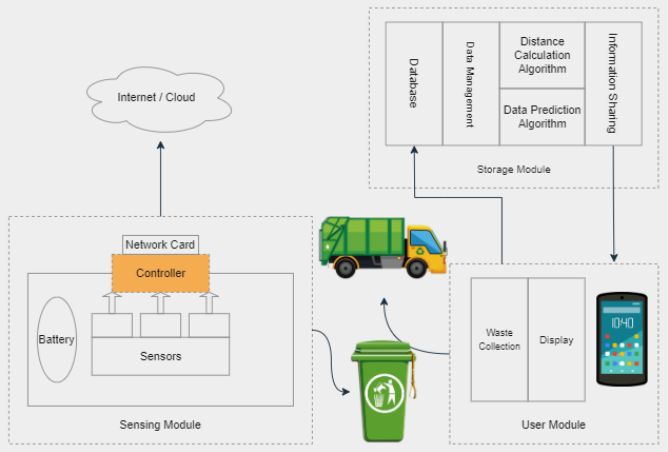


Fig. 1: Block diagram

A Wi-Fi module ESP8266 is installed and programmed to provide internet connectivity to the computer system. When a garbage bin is full, it sends a digital message over the internet to the concerned authorities, who can then optimise their vehicle routes and manage drivers accordingly. The proposed methodology can even likely help the municipal department for collecting and dumping the garbage in an effective, efficient, and smarter manner.

B. Block Diagram

[1] Sensors on dustbin send the data to Cloud and then data will be updated on the database. Now after processing the

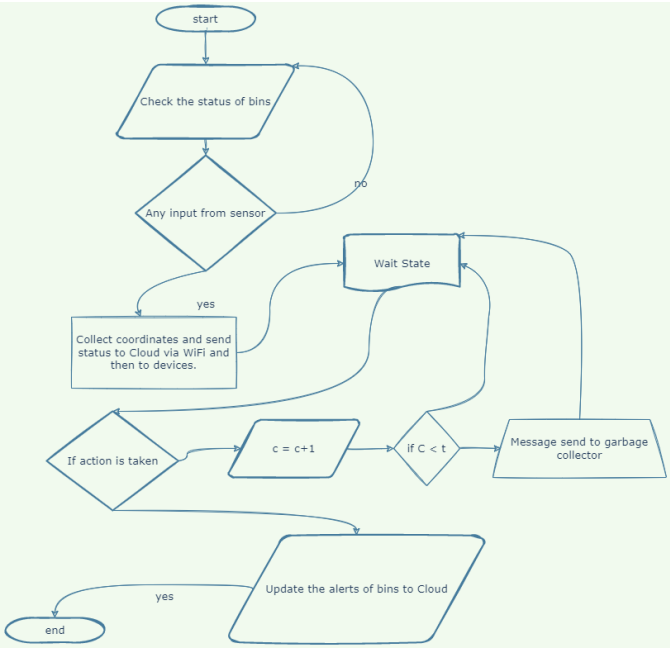


Fig. 2: Dataflow diagram

information data will be displayed to the user and then the user will take the necessary action. If the Dustbin is full then the message will be sent to the garbage collector else user can through the garbage.

C. Dataflow Diagram

[2] At the start, dustbin status will be checked and accordingly, action will be taken. If the input sensor reads full then the bin can't be filled more and the message will be sent to the garbage collector, else user can throw the garbage and the status will be updated.

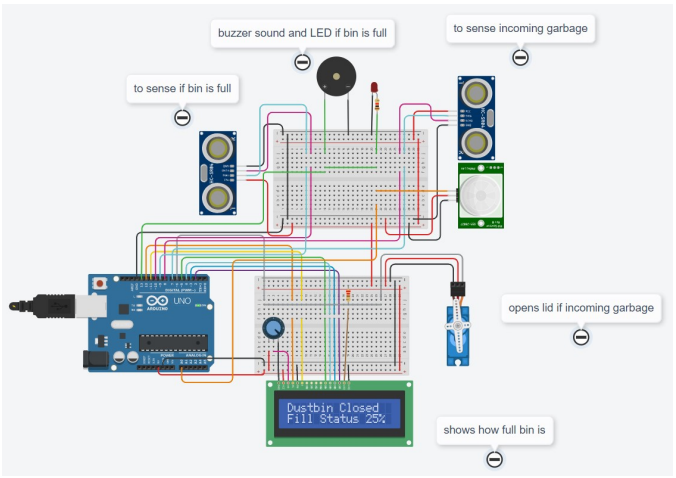
D. Circuit Diagram

[3] We have implemented the proposed system on Tinkercad, an online circuit simulator. The implementation was done interfacing the available electronic components with an Arduino Uno board and doing the necessary programming.

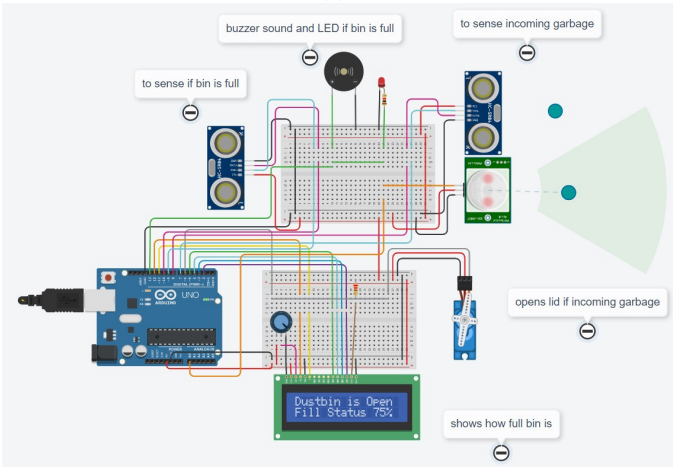
(a) Person is located away from the dustbin and it is 25% full.
(b) Person is near the dustbin and moving. Dustbin is at 75% capacity.
(c) Person is moving away, lid is closing and the dustbin is 100% full.

E. Components Interfacing

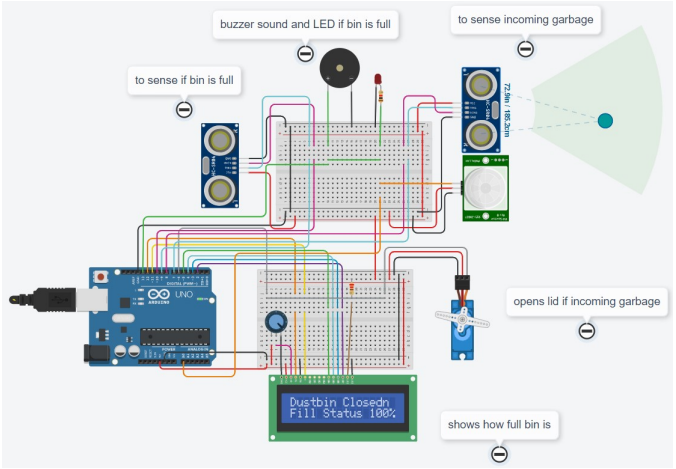
(a) Arduino Uno has 14 digital input/ output pins, 6 analogue inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It is used for overall working amongst all the components.
(b) The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it took for



(a)



(b)



(c)

Fig. 3: Circuit diagram

https://www.tinkercad.com/things/8o1MRhkf7z9-smart-garbage-management-system/editel?sharecode=qTAlMPZ_T7zahtQ41J0LXVT8y9afDUIKrPNFQhChgxQ

https://gist.github.com/anuragnitt/0345c16142dbcbd9035f353a24a0b1fe

the echo of the sound to reflect back and uses this information to determine the distance to an object.

(c) Servo motor is an electrical device which can be used to rotate objects precisely. Servo motor consists of a DC motor with error sensing negative feedback mechanism.

(d) PIR modules have a passive infrared sensor that detects the occupancy and movement. It has 3 pins connected to power, ground and signal.

II. CONCLUSION AND FUTURE WORK

The proposed model was successfully implemented and tested on Tinkercad using Arduino Uno, Ultrasonic Distance Sensors and Micro Servo Sensors. This has the potential to automate sections of the crucial garbage industry and make a positive impact on the lives of residents and garbage collectors.

In future, we can consider connecting it with an Android application. By using an android application one can view the bin location surrounded by his area. This will save both the time and effort of people in tracking the location of the bin. Alert messages can be sent to the collectors at the point when the trash level arrives at the greatest amount. If the dustbin isn't cleaned the message can ship off to the higher city authorities. It will lead to a cleaner environment by disposing of the waste without affecting the surrounding environment in a convenient way through the application.

III. ACKNOWLEDGMENT

The author(s) of this paper acknowledge no conflict of interest.

Contribution Document

106119100
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May 04, 2022

Team Contribution Summary Sheet

106119100, Rajneesh Pandey - 31%

Made The Data flow chart of the Proposed methodology. Write the summary of the system architectures and the Data flow Diagram Made the circuit on the tinkercad to make the functionalities using ultra sonic sensor, buzzer. Wrote the part of Component Interfacing. Contributed in the IEEE document preparation in LaTeX.

106119014, Anurag Goyal - 27%

Did most of the IEEE document preparation in LaTeX. Made The Block diagram of the Proposed methodology. Wrote the discription. Contributed in the circuit on the tinkercad to make the functionalities using ultra sonic sensor, buzzer.

106119112, Satyarth Panday - 25%

Wrote the conclusion and future scope of the project. Wrote the summary. Wrote the part of Component Interfacing. Contributed in the IEEE document preparation in LaTeX.

106119058, Kartikey Agarwal - 17%

Contributed in the circuit on the tinkercad to make the functionalities using ultra sonic sensor, buzzer.