

Ministry Category: Central Ministry

Problem Statement: Under the Swachh Bharat mission we should have all the government offices fitted with these low cost (under 2000) smart bins which should have anti-theft mechanism and should inform the labour with SMS when the bin is full.

IDEA DESCRIPTION:

Cleanliness is still one of the bigish problems in all the corners of the world. In today's assiduous and occupied world, introduction of smart dustbins can sufficiently help in reducing manual labour as well as genteel waste management. We have come up with the idea of developing the dustbins using simple technology.

These dustbins are installed with two types of sensors:

- 1) ULTRASONIC SENSORS, which are placed at the lids of the smart dustbins and are used to approximately detect the amount of waste in the dustbins.
- 2) INFRARED SENSORS, which are placed at the bottom of the smart dustbins to provide anti-theft mechanism to the dustbins.

Node MCU is programmed to collect the data from the sensors and then uses internet to send the respective data to the server using the Wi-Fi module of the node MCU board. The server then uses MQTT protocol to send the notification about the data collected by the sensors to the corresponding worker alongwith an OTP(anti-theft mechanism) and repeated SMS(on filling of the dustbins). The SMS is sent to the worker at regular intervals after reaching limits set by the manufacturer to the corresponding worker when the bin gets filled at intervals of 70%-80%, 81%-90%, 91%-99% of the capacity and proper LED will glow with respective assigned values in the bin. After receiving the OTP, the worker has to go to the dustbin and enter the assigned OTP in the keypad before lifting the dustbin. If some other person tries to lift the dustbin, the role of the alarms present in the dustbin comes into play as per the anti-theft mechanism. In case, the assigned worker is changed, the new contact number of the worker is adjusted with the mechanism using the keypad and a set of passwords.

This concept will also reduce manual labour and economic wastages as the workers no longer need to come to check the dustbins every week as per their routine schedule and instead come only when the dustbins are full.

Technology Stack:

The mainframe will be based on the Arduino UNO board combined to a Node MCU.

We will install an ultrasonic sensor in the lid of the dustbin which will detect the capacity upto which the dustbin is filled. A code will be programmed in the Arduino UNO such that, when the dustbin is filled to certain amount it will send alerts to the specified worker on duty at intervals of 70-80% (general notification at an interval of three hours), 81-89% (notification after 1 ½ hours) and when the bin is at 90-99% the worker will receive a frequent notification in his device. This is altogether made with the help of the ultrasonic sensor measuring the distance of the waste from the bottom of the dustbin connected to the Arduino. We are using Node MCU (work as publisher) for the transmission of the signal to the server and thereby sending an SMS to the required worker. We will be using a third party service to provide the notification to the GSM module (working as a subscriber).

Components which will be used are:

1. Arduino UNO
2. Power supply
3. Node MCU
4. Keypad Module
5. Display Module
6. Ultrasonic Sensor
7. Infrared Sensor
8. LED bulb

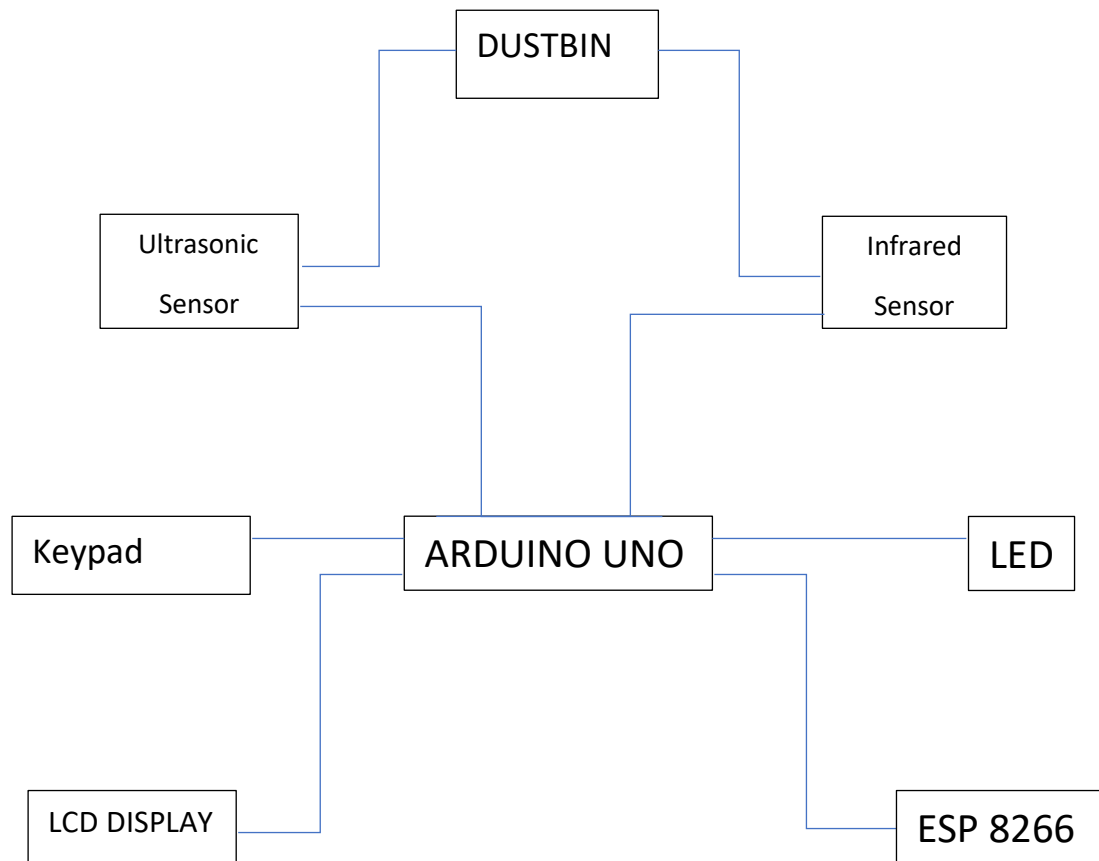


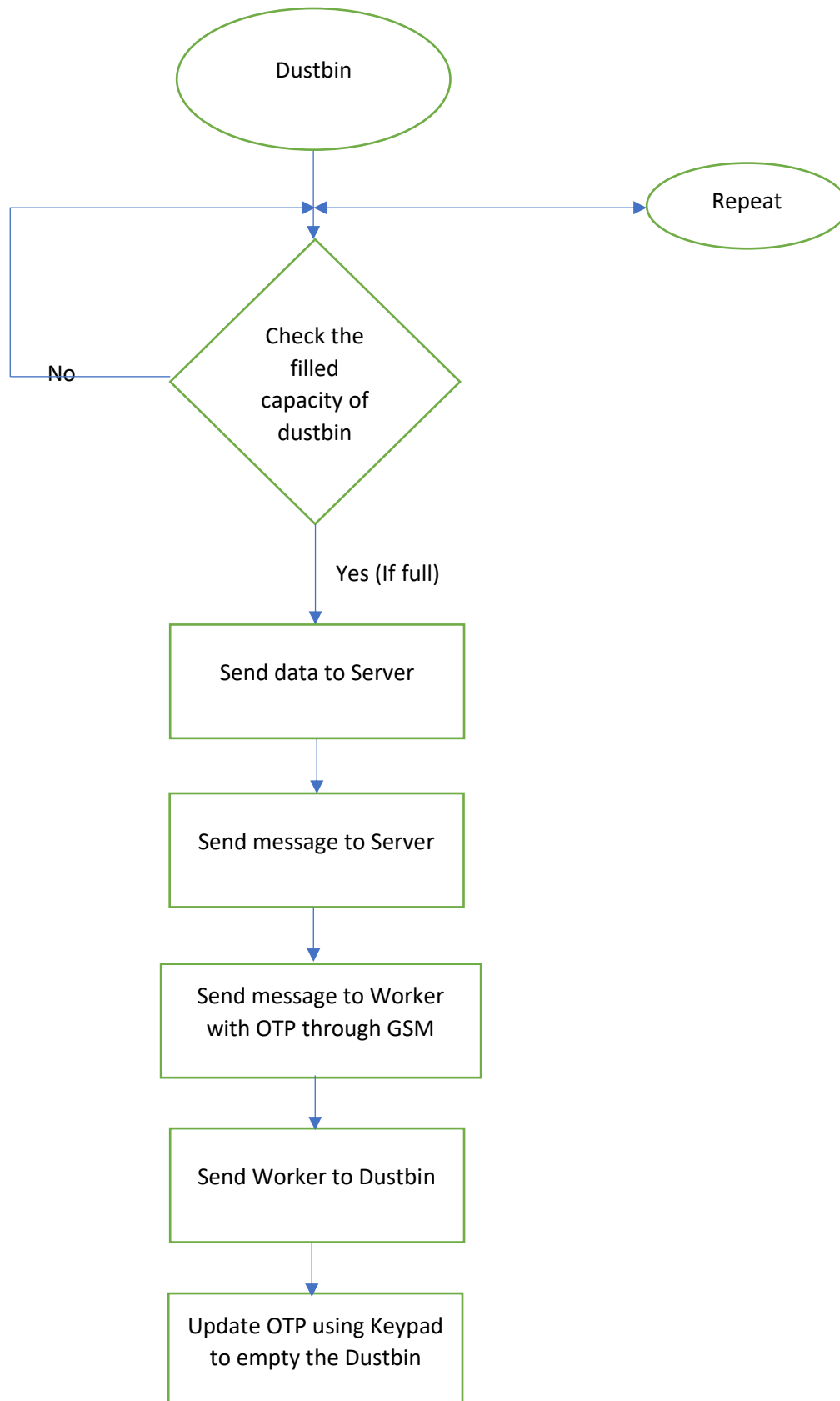
Fig. Block diagram of the connections in the circuit

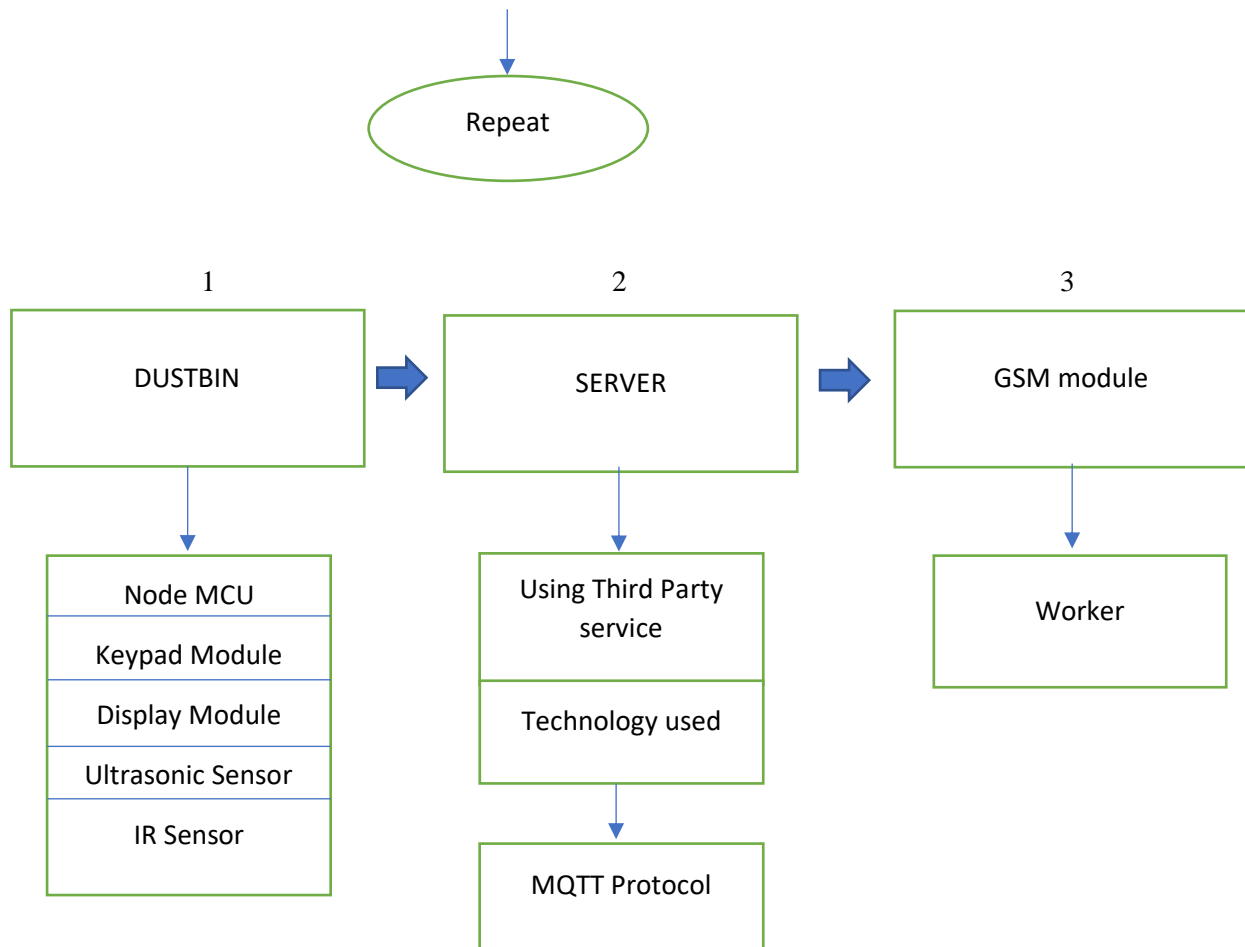
Diagram:



Fig. Schematic diagram of smart dustbin

Flowcharts (Working):





Case Study:

1. **Dustbin -**
 - a) Ultrasonic sensor: To detect the level of waste present in the dustbins.
 - b) IR sensor: To detect the change in distance of the dustbin from the ground for antitheft purposes.
 - c) Keypad and display module: The keypad and the display mode is used to obtain the password from the worker in order to clean the dustbin (password will be generated randomly everytime the dustbin is filled atleast 70% and will be sent to the worker on his mobile phone) and also for the submission of new mobile no. in case of the worker is changed.
 - d) Node MCU: It will be connected to the internet to fetch the data to the broker / MQTT protocol / Server.
2. **Server** - A third party service using MQTT protocol will be used to get and publish the data to the GSM module.
Dustbin will act as the publisher and GSM module will act as the subscriber. The data published through the Wi-Fi module of the dustbin will also be published to the GSM module.
3. **GSM module**- The data will be published by the server will be gathered by the GSM module and will be sent to the worker's mobile no.

Dependencies/Shows Stopper:

1. Minimizing Waste litter.
2. Low cost Anti-Theft bin.
3. Efficient and secured waste management and disposal.
4. Precise information display.
5. OTP generation.
6. Efficient information display with LED indication