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INTELLIGENT DUSTBIN FOR SMART CITY

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ABSTRACT : Solid waste is the majority in our waste generation, so its disposal and proper management is a top priority. Most of the societies in India now have made it compulsory to segregate wet and dry waste, but you know how the average Indian citizen is – ignorant and so eagerly looking forward to breaking the rules. Many times in our city we see that the garbage bins placed at public places are overloaded which creates unhygienic conditions for people and at the same time it creates a great problem for its proper management and disposal. Also, its segregation at the primary level is difficult. So we came up with an innovative solution to the abovementioned problem by creating some advancements in a traditional bin for efficient segregation and proper as well as timely disposal of solid waste. In this paper we have proposed a system which timely detects the type of waste i.e. dry or wet waste and segregates it, also it reduces the problem of overloading of the bin and the whole system is run by itself by some mechanism attached which generates electricity and runs the system or contemporary the system can also be run by using solar panels.

INTRODUCTION :

As the world is in a stage of up-gradation, there is one problem we have to deal with is Garbage! Inefficient waste collection systems lead to environmental pollution, which in turn results in the breeding of insects, animal scavengers and rodents, and giving rise to a range of diseases. The traditional method includes burning of the waste if not collected in time. The burning of waste causes air pollution to great extent. Uncontrolled release of methane by anaerobic decomposition of waste also adds to social health issues.

Normally, the municipal/corporation authorities maintain dust bins at specific places in the domestic areas where the residents are instructed to dispose of their household wastage. Though the authorities are instructed to clear away the wastage within a specific period, they end up clearing them after few days by the time, the dustbins start over overflowing and smelling. Therefore, degradation of the waste also causes bacterial & viruses to grow, thereby affecting public health.

Solid waste collection is one of the costliest services provided by a city to its residents. Between 75-80% of the solid waste management budget is spent on collection and transfer costs. Therefore, the productivity of collection and transfer operations are of significant concern to the city administrators.
Currently, we find the trucks landing at our doorstep irregularly. These trucks discard their further path if they get filled at some point. Eventually delaying collection of waste in some regions. This leads to waste accumulation in such regions. To avoid this, we have come up with a new system for scheduling trucks for waste collection. The proposed system finds out the shortest path to collect the waste so that waste collection can be maximized with less fuel consumption and the collection of waste will take place efficiently.

Owing to this problem, we have designed an advanced system which helps in the segregation of solid waste and also in the efficient management of it. The trucks will get the shortest route to travel further saving the fuel and cost for it.

LITERATURE REVIEW:

In the current system, trucks are used to collect waste and if trucks are overloaded then these trucks discard their further route of waste collection, hence no waste collection in some areas. Due to this, we have seen people emptying their overloaded dustbins in open spaces. Though large numbers of research have been done on a different aspect of solid waste management, a few works have been done on bin monitoring. In authors consider a wireless sensor network for monitoring the bin status. But the researchers used Argos mote whose geographical coverage is only up to 430m and the system is considering a single parameter for the bin status. The researchers collected bin data using GSM/GPRS communication from the bin to the server, which includes GSM/GPRS connectivity to each bin causing a large increase in operating cost. In authors discussed Radio Frequency Identification (RFID), Geographic Information Systems (GIS), Geographic Positioning System

(GPS), transportation model, a waste collection with a bin monitoring application. In some studies have been done on real-time bin monitoring but with some limitations. The main problems of the existing solid waste collection process and management system are as follows:

i) Lack of information about the collecting time and area.
ii) Lack of the proper system for monitoring, tracking the trucks and trash bins that have been collected in real-time.
iii) Loss of productivity due to inefficient utilization and unauthorized use of vehicles.
iv) There is no quick response to urgent cases like a truck accident, breakdown, long-time idling.

A simulation-optimization model for allocating trucks to disposal sites which leads to reduce traveling and waiting time costs. In authors designed the electronic system which consists of a biosensor sensor, weight sensor, and height sensor to detect overflow of the waste in the dust bin and the extent of pollution caused by unwanted toxic gases from the bin. In authors propose a dynamic routing algorithm, which handles the issues when a truck gets overloaded or damaged and needs replacement, they assume two kinds of trucks for waste collection, the Low Capacity Trucks (LCTs) and the High Capacity Trucks (HCTs). A robust routing method for top-k query processing in MANETs. In this method, top -k bins are included for addressing. In authors proposed a Top-k query-based dynamic scheduling model as a solution to solid waste collection in Smart Cities.

SYSTEM ARCHITECTURE:

The bin management system includes some IOT components as listed below :

1. Ultrasonic Sensor : An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using

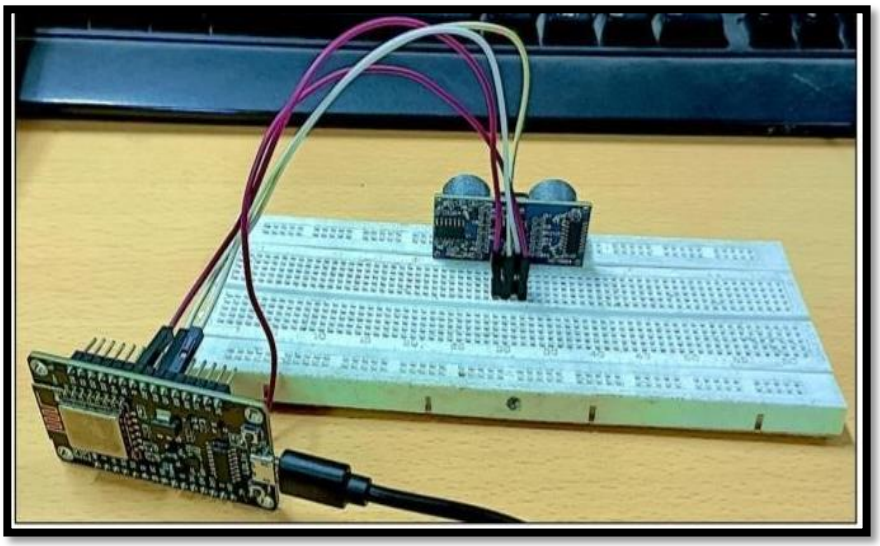
piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).

2. LCD display: LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. It displays the level of garbage on it. Also it indicates that how much percentage of dustbin is filled.

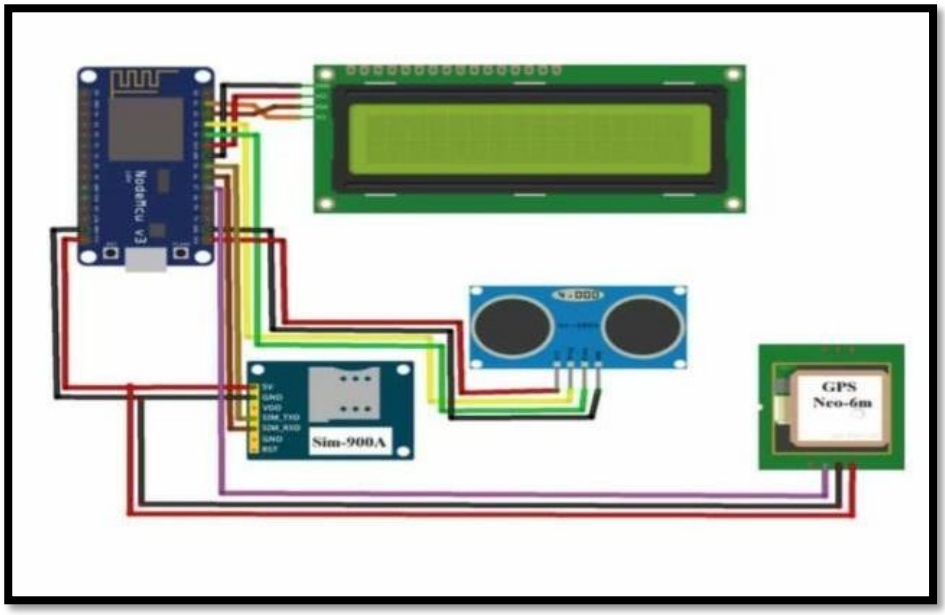
3. NodeMCU : NodeMCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the Wi-Fi protocol. In addition, by providing some of the most important features of microcontrollers such as GPIO, PWM, ADC, and etc, it can solve many of the project's needs alone. All the components are connected with this component.

4. LED : LEDs (light-emitting diodes) are small, bright, power efficient lights commonly used in electronic products. An LED light is a polarized part, meaning it has to be connected to a circuit in a certain way to work properly. Specifically, each LED has a positive leg and a negative leg. These can be identified visually by length: the negative leg has been made shorter. It gets on in the night time and when the dustbin is filled completely.

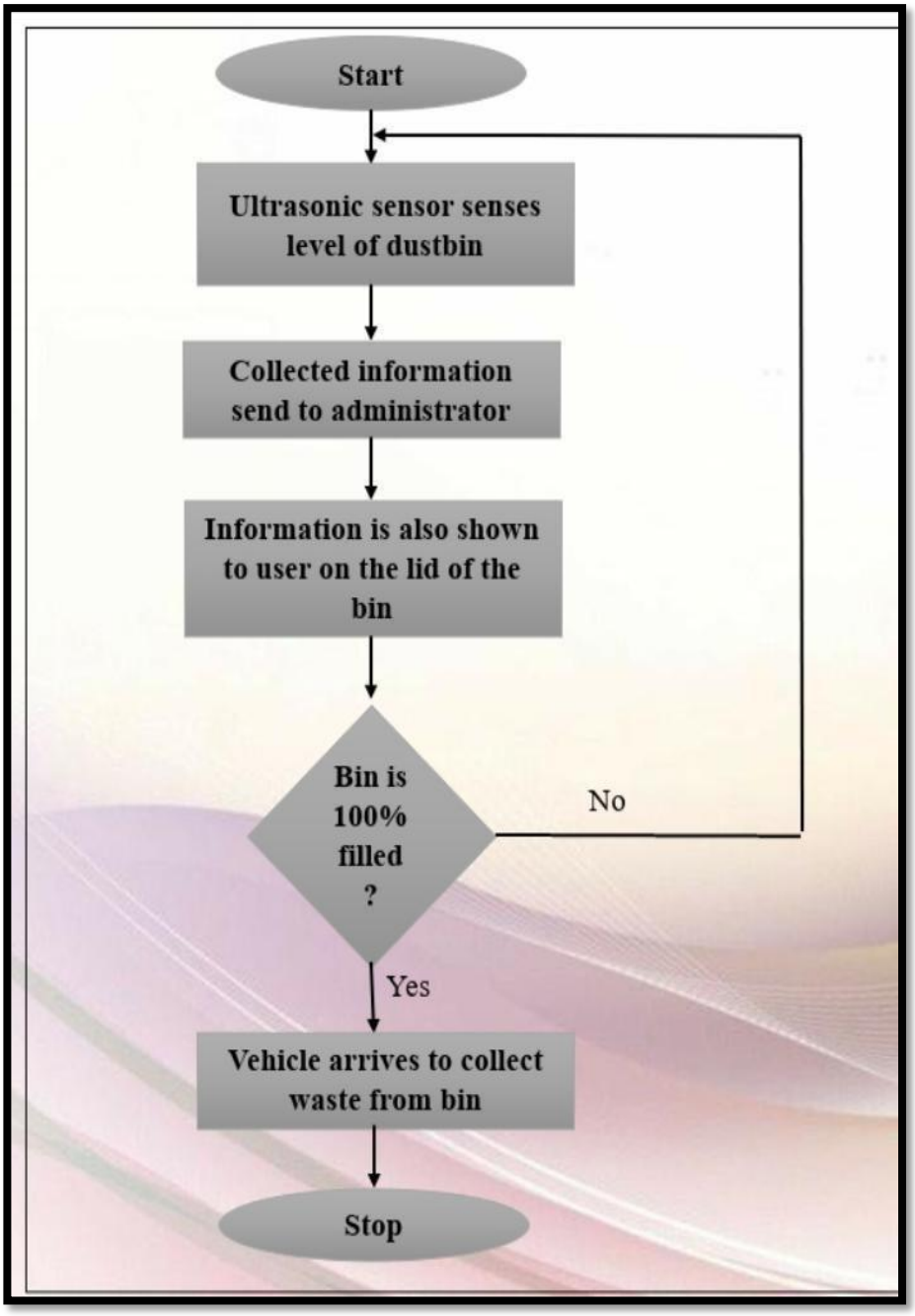
HARDWARE COMPONENTS:



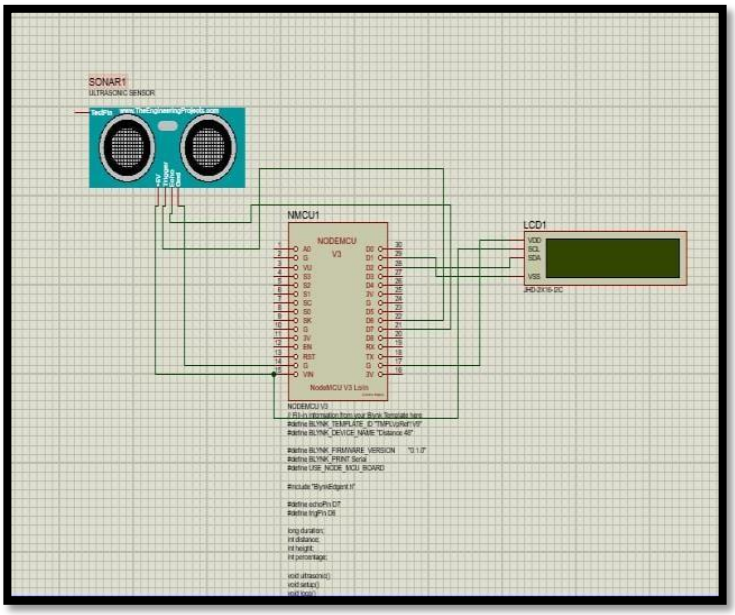
CIRCUIT DIAGRAM:

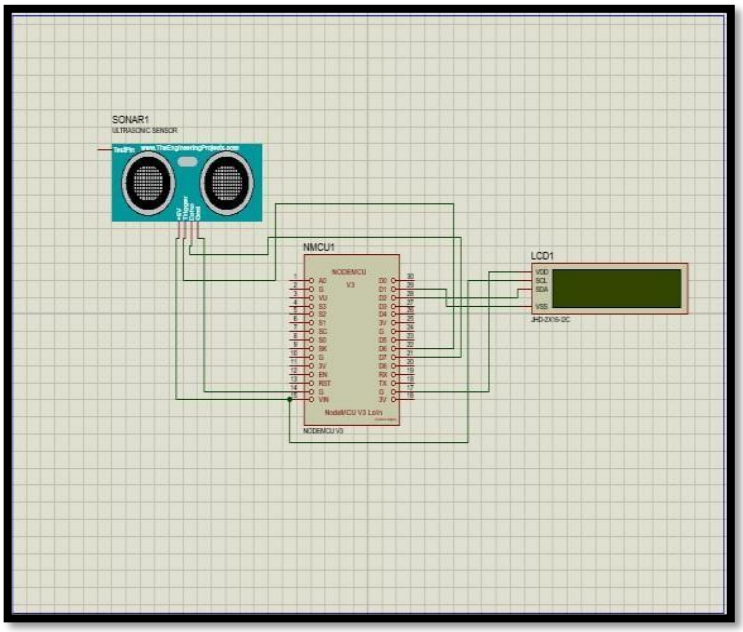


FLOWCHART:


Start
Ultrasonic sensor senses level of dustbin
Collected information send to administrator
Information is also shown to user on the lid of the bin
Bin is 100% filled ?
No
Yes
Vehicle arrives to collect waste from bin
Stop

SIMULATION IMAGES:





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