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Project Report On

"Smart Waste Management System "

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Abstract— In this paper, a system is introduced to manage waste in big cities effectively without having to monitor the parts 24x7 manually. Here the problem of unorganized and nonsystematic waste collection is solved by designing an embedded IoT system which will monitor each dumpster individually for the amount of waste deposited. Here an automated system is provided for segregating wet and dry waste. A mechanical setup can be used for separating wet and dry waste into separate containers here sensors can be used for separating wet and dry. For detecting the presence of any waste wet or dry can be detected using an IR sensor in the next step for detecting wet waste a moister sensor can be used. In this process, if only IR is detected motor will rotate in the direction of the dry waste container if both the sensor detects the waste then it will go to the wet container. Both these containers are embedded with ultrasonic sensors at the top, the ultrasonic sensor is used for measuring distance. This makes it possible to measure the amount of waste in the containers if one of the containers is full then alert message will be sent to the corresponding personal.

I.INTRODUCTION

Today big cities around the world are facing a common problem, managing the city waste effectively without making city unclean. Today's waste management systems involve a large number of employees being appointed to attend a certain number of dumpsters this is done every day periodically. This leads to a very inefficient and unclean system in which some dumpsters will be overflowing some dumpsters might not be even half full. This is caused by variation in population density in the city or some other random factor this makes it impossible to determine which part needs immediate attention. Here a waste management system is introduced in which each dumpster is embedded in a monitoring system which will notify the corresponding personal if the dumpster is full. In this system, it is also possible to separate wet and dry waste into two separate containers. This system provides an effective solution to waste management problem

II. EXISTING SYSTEM

- Manual systems in which employees clear the dumpsters periodically.
- No systematic approach towards clearing the dumpsters.
- Unclear about the status of a particular location
- Employees are unaware of the need for a particular location
- Very less effective in cleaning city

III COMPONENT USED

1) NODEMCU ESP8266
2) ULTRASONIC SENSOR
3) IR SENSOR
4) MOISTURE SENSOR
5) DC MOTOR
6) MOTOR DRIVER
7) SOFTWARE USED

1). NODEMCU ESP8266:

The NodeMCU (***N***ode ***M***icro***c***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Empress if Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds. However, as a chip, the ESP8266 is also hard to access and use. You must solder wires, with the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. You also have to program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

But, what about Arduino? The Arduino project created an open-source hardware design and software SDK for their versatile IoT controller. Similar to NodeMCU, the Arduino hardware is a microcontroller board with a USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other boards. But unlike NodeMCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming environments. There is an Arduino reference design for the ESP8266 chip as well. However, the flexibility of Arduino also means significant variations across different vendors. For example, most Arduino boards do not have Wi-Fi capabilities, and some even have a serial data port instead of a USB port.

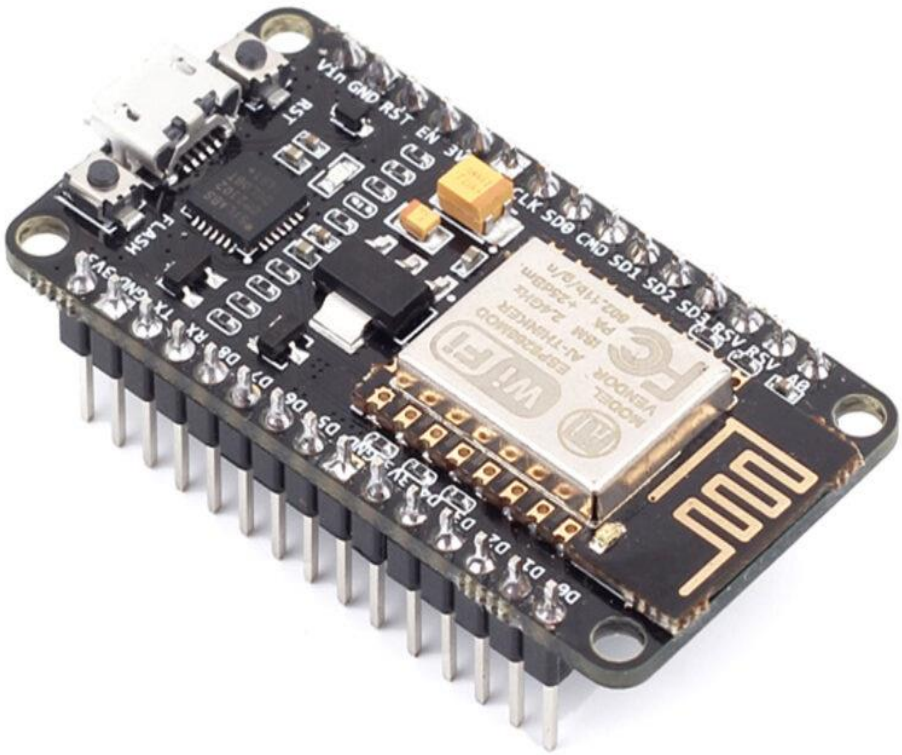


Fig 2. NODEMCU Esp8266

2). Ultrasonic Sensor: -

Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This detector could be a very-about detector utilized This detector could be utilized in several applications wherever mensuration distance or sensing objects are needed. The module has 2 eyes like accompanies like robot at the front that frames the ultrasupersonic transmitter and recipient. The locator works with the simple secondary school recipe that

$$\text{Distance} = \text{Speed} \times \text{Time}$$

The Ultrasonic transmitter broadcast a supersonic wave, this wave goes in air and when it gets questioned by any material it gets reflected back toward the sensor this reflected wave is seen by the Ultrasonic beneficiary module as appeared in the image beneath Now, to figure the separation utilizing the above recipe, we should know Speed and time. Since we tend to utilize the supersonic wave we as a whole know all inclusive speed of wave at region conditions that is 330m/s. The hardware inbuilt on the module will

compute the time taken for the US wave to return and turns on the reverberation stick high for that equivalent specific measure of your time, along these lines we can likewise realize the time taken. Presently just figure the separation utilizing a microcontroller or small scale chip. Likewise, this nondeterministic mapping case (i.e., one-to-many mapping) happens even after we normalize all parameter values to extract the structures of the web requests and queries. Since the mapping can appear differently in different cases, it becomes difficult to identify all of the one-to-many mapping patterns for each web request. Moreover, when different operations occasionally overlap at their possible query set, it becomes even harder for us to extract the one-to-many mapping for each operation by comparing matched requests and queries across the sessions.

Fig 2. Ultrasonic Sensor

3) IR Sensor:

An infrared sensor is an electronic device that emits in order to sense some aspects of the *surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types* of sensors measure only infrared radiation rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances a

Fig 3. IR Sensor

4. Moisture Sensor:

measurement Moisture sensors measure the volumetric water content in soil. Since the direct gravimetric of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

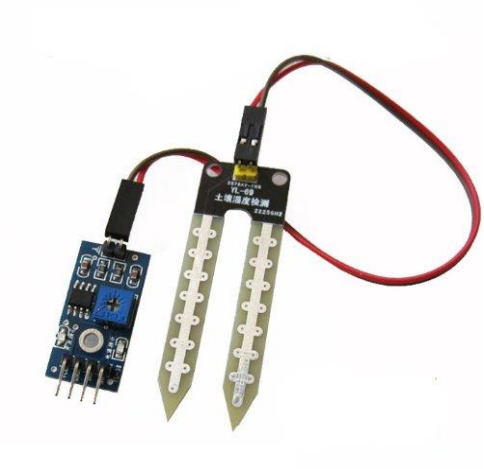


Fig 4. Moisture Sensor

5. DC Motor:

A DC motor is any of a class of rotational electrical machines that changes over direct flow electrical energy into mechanical energy. The most well-known sorts depend on the powers delivered by magnetic fields. About a wide range of DC engines have some internal mechanism, either electromechanical or electronic, to intermittently alter the course of current stream in part of the engine. we use 500rpm and 12v DC motor is used in this project. This DC motor is used for segregating the wet and dry waste. Microcontrollers can't drive the engines legitimately. So, we need some sort of drivers to control the

speed and direction of motors. The motor drivers will go about as interfacing gadgets among microcontrollers and engines. motor drivers will go about as flow speakers since they take a low momentum control signal and give a high ebb and flow signal. This high current sign is utilized to drive the engines. Utilizing L293D chip is the easy route for controlling the engine utilizing microcontroller. It contains two H-connect driver circuits inside. This chip is intended to control two engines. L293D has two arrangements of plans where 1 set has input 1, input 2, output1, output 2, with enable pin while other set has input 3, input 4, yield 3, yield 4 with other enable pin.

Fig 5.DC Motor

6) Motor Driver:

L293D is a basic motor driver integrated chip (IC) that enables us to drive a DC motor in either direction and also control the speed of the motor. The L293D is a 16 pin IC, with 8 pins on each side, allowing us to control the motor. It means that we can use a single L293D to run up to two DC motors. L293D consist of two h-bridge circuit. H-bridge is the simplest circuit for changing polarity across the load connected to it.

There are 2 OUTPUT pins, 2 INPUT pins, and 1 ENABLE pin for driving each motor. It is designed to drive inductive loads such as solenoids, relays, DC motors, and bipolar stepper motor, as well as other high-current/high-voltage loads.

Fig 6. L293D Motor Driver

7). Software used

I. Arduino IDE

The Arduino integrated development environment (IDE) is a cross-stage application (for Windows, macOS, Linux) that is written in the programming language Java. It is utilized to compose and transfer programs to Arduino compatible boards, yet in addition, with the assistance of outsider center's, other seller advancement sheets. The source code for the IDE is discharged under the GNU General Public License. The Arduino IDE underpins the dialects C and C++ utilizing uncommon guidelines of code organizing. The Arduino IDE supplies a product library from the Wiring venture, which gives numerous normal information and yield methodology. Client composed code just requires two essential capacities, for beginning the sketch and the principle program circle. The Arduino IDE utilizes the program argued to change over the executable code into a book record in hexadecimal encoding that is stacked into the Arduino board by a loader program in the board's firmware The primary code, otherwise called a sketch, made on the IDE platform will eventually produce a Hex File which is then moved and transferred in the controller on the board. The IDE condition for the most part contains two essential parts: Editor and Compiler where previous is utilized for composing the required code and later is utilized for assembling and transferring the code into the given Arduino Module.

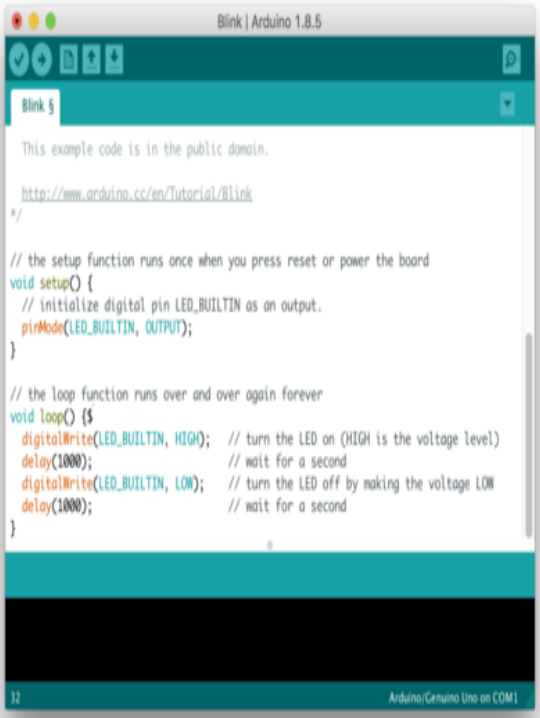


Fig 8.1. Arduino IDE

II. Thing Speak

Thing Speak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. things peak provides instant visualizations of data posted by your devices to thing Speak. With the ability to execute MATLAB code in things peak you can perform online analysis and processing of the data as it comes in. thing Speak is often used for prototyping and proof of concept IoT systems that require analytics

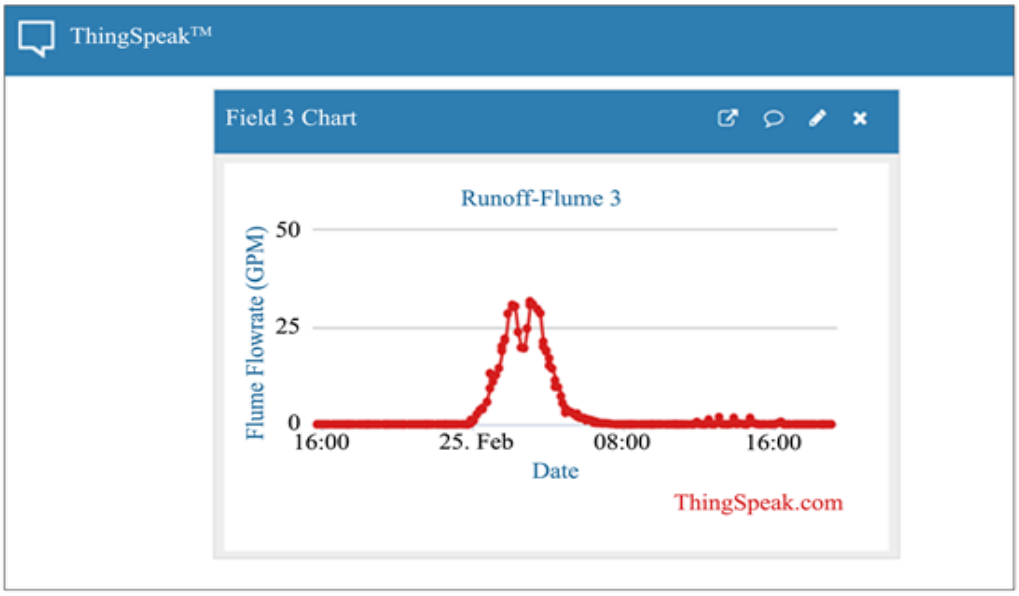
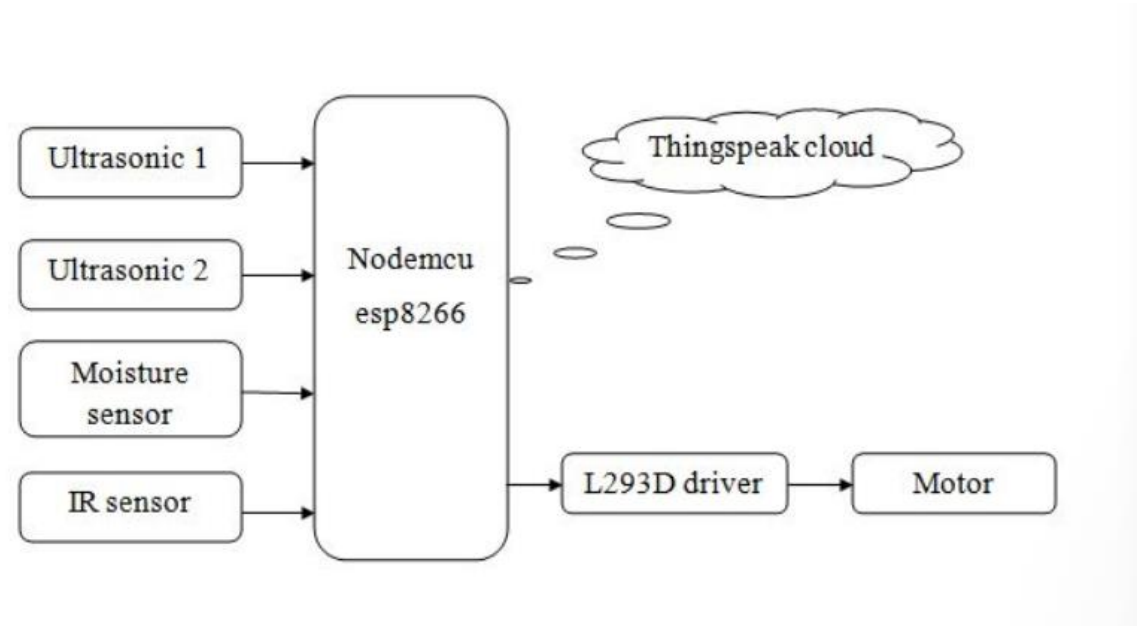


Fig 8.2.ThingSpeak

IV. *BLOCK DIAGRAM*



BLOCK DIAGRAM EXPLANATION

This block diagram consists of several sensors (Ultrasonic Sensor, Moisture Sensor, Pressure Sensor) is connected to the core controller. The core controller is accessing the sensor values and processing them to transfer the data through the internet. Arduino is used as a core controller. The sensor data can be viewed on the IOT platform of Thing speak.

V. WORKING PRINCIPLE

Most of the times, the garbage bins are overflowing with excess waste and are scattered out in the street. These scattered wastes get either decayed or burnt in that place or overflows all over which leads to serious health issues to humans. The wastes which are dumped are segregated by Humans which leads to health problems to them. To overcome this problem a well-organized waste segregation and monitoring system has been designed. It is an IoT based Waste Segregation and Monitoring system which is an innovative way to keep the cities clean and healthy. Since the population of our world is increasing rapidly, the environment should be clean and hygienic in order to lead a better life. This is a model for Waste Segregation for Smart cities. The foremost goal of this project is to automatically segregate the wastes and to perceive the level of the dustbins which is delivered through wireless mesh network. With such information, litter bin providers and cleaning contractors are able to make better decision for the efficient disposal. IR sensor identifies the objects, Moisture and metal sensors detects the wet and metal waste. Ultrasonic sensor observes the levels of bin. The waste is dropped inside the bin where the sensor identifies the type of the waste. The Bin consists of three partitions inside were each bin collects each waste respectively. The motor then rotates and respective partitions gets opened and respective wastes are collected. The status of the bin is displayed in Thing speak server.

VI. FUTURE SCOPE

Every project is always having scope for improvement, perhaps the most pressing issue of separation of waste is when their dispose simultaneously. The waste segregator can be improvised to include the separation of paper and plastic, safe segregation of biomedical waste generated at home, compact and aesthetic Mechanical design.

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