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Implementation of Smart Segregation Bins Using IoT

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Abstract: Swachh Bharat Abhiyan Clean India Mission and abbreviated as SBA or SBM for "Swachh Bharat Mission is a national campaign by the Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the country. Waste segregation and recycling are effective ways of reducing trash. Segregation at the source is the key in solid waste management especially when we have limited economical resources. Segregation of waste and creating awareness of different types of waste is new boom. We divide solid waste into two categories Wet, and Dry waste. According to solid waste management rule, 2016 it is responsibility of generators to segregate waste into these three categories. The main objective of this project is to design a system using Arduino Mega for automatic segregating of waste at source and capable of cleaning. Moisture sensor categorize the waste based on its threshold value and Ultrasonic sensor estimates the distance and the status of the bin will be send through IFTTT (If this then that) for sending SMS. This bin can be used at places like offices, apartments, shopping malls etc. This system will be useful in making Waste Management in smart cities automated without the human intervention.This project uses Segregation, Solid Waste Management, IFTTT, Advanced Bin Segregator.
Keywords: IR Sensors, IFTT, NodeMCU

I. INTRODUCTION

In today's world common problem faced in waste collection and dumping is mainly: overflowing garbage bins and waste segregation as per its type. Nearby 62 million tons of waste is generated each day by 377 million people living in urban India of which 45 million of waste is left untreated and disposed of unhygienically causing severe health problems and environmental degradation. A rage of not able in flation in the municipal solid waste generation has been registered. Worldwide due to over population, industrialization and economic growth and overflowing landfills are impossible to reclaim because of the improper disposal of wastes on out skirts of cities causing vital environmental entanglement in terms of water pollution and global warming causing a reduction in average lifetime of the manual segregator. In India, rag pickers and conservancy staff play a crucial role in the recycling of urban solid waste and have higher jejuneness due to infections of the skin, respiratory system, gastro intestinal tract, and other allergic disorders.

The economic value of the waste generated is realized after it is recycled completely and there are different techniques available to recycle and reuse the municipal solid waste. When the waste is segregated into basic categories such as wet, dry and metallic, it has an intense perspective of improvement, and accordingly, recycled and reused. Thus, in this paper, we have done a comprehensive survey of different existing techniques for automation of waste segregation.

II. LITERATURE REVIEW

The municipal corporation's community garbage cans are causing a slew of health, environmental, and social problems. This might be due to a variety of factors, including inadequate planning. The positioning of dustbins across the city, as well as the collection method, are both troublesome waste created by the municipal corporation, as well as citizens who are unaware of how to properly utilise dustbins. Various major concerns, such as filthy environments, air pollution, and unhealthy lifestyles, are producing significant problems. The environment is harming people's health. One application displays the status of the garbage can, while another displays the segregation of waste whether the waste is a dry waste or wet waste. The waste can be identified by using various sensors such as Moisture sensor , IR sensor and Ultrasonic sensor. IR sensors will be responsible for taking care of the limit of the bin if the bin is full, the system will be able to send a "CAUTION" message to the worker or the supervisor, using online software IFTTT and Thing Speak mentioned above which will help in quick and effective management and proper continuation of dumping the wastages in the bin

III.   RESEARCH GAP

There is a lot of current research being done on the application of IoT based smart segregation bin. Particularly in automating the bins.

Here are some examples of recent research

1) A review article published in International Utility Conference and Exposition (IUCE) in year 2022 titled "A Smart Garbage Bin With A Mobile And Fill Level Tracker App" by Theodosia N.A. Ayi-Annum discusses the current applications and trends of IoT and application of smart bin . The article highlights that IoT techniques have been used to automate the bin, segregate the waste, and send message through application. [1]

2) A study published in 2022 in the 6th International Conference on Devices, Circuits and Systems (ICDCS) to determine the properties of garbage and segregate them accordingly. The study, titled "A Smart Automated Garbage Management System to Replace Human Labor," used IoT to develop a fully automated bin. The results showed the effective segregation of waste without human labor. [2]

3) Another study published in 2022 in the International Conference on Augmented Intelligence and Sustainable Systems (ICAISS) compared various IoT methods to efficiently manage the waste. The study, titled "Design and Implementation of Efficient Wastage Management System using IoT". The results showed that the waste was effectively managed and segregated using IoT.[3]

4) Use of IoT applications: This project consist of various types of sensors to detect the different types of garbage based on their properties such as wet, dry, metallic, non-metallic etc.

5) Level indication :- This project consist of a 16x2 LED display to indicate the level of dustbin filled .

6) Indications variety :- The garbage bin is filled completely is indicated by buzzer which starts buzzing when garbage cross a certain limit, also the message in the form of SMS is to be sent for informing the fullness of the bin.

7) Overall, our project represents a novel and innovative approach to improving the efficiency and accuracy of the garbage bin by combining it with IoT concept and its applications.

IV.   PROBLEM STATEMENT

Waste isolation is extremely pivotal due to the fact that if all waste accoutrements similar as polythene bags, old cabinetwork, and e-waste get mixed up in the tips, could lead to impurity of the land and water through oohing dangerous substances into the atmosphere. Also, non-segregation also affects climate change, conceivably leading to failure conditions. Therefore, it's essential to separate waste before disposing into the tip. The recyclable corridor of the waste can be reclaimed into useful coffers after the isolation process. It has a large meaning for the current society which is facing the problem of resource deficit. still, it solves further than half of our task and the main problem that we face in managing solid waste would lessen vastly, If we insulate waste at the source itself.

V.   METHODOLOGY

A. Block Diagram
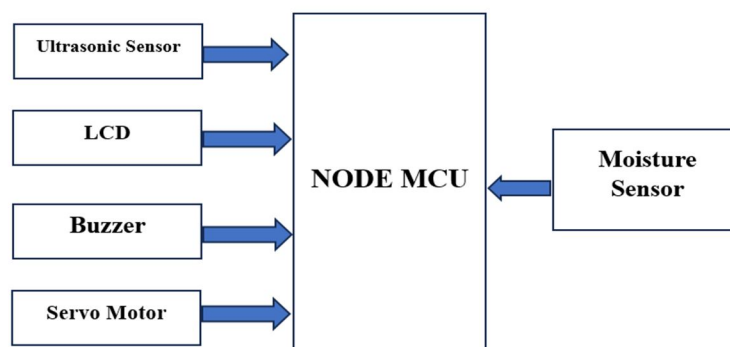
B. *Software and Hardware Required*

1) *Thing Speak:* Thing Speak is an IoT analytics platform service that allows you to aggregate, visualize and analyse live data streams in the cloud. Thing Speak provides instant visualizations of data posted by your devices to Thing Speak. With the ability to execute MATLAB® code in Thing Speak you can perform online analysis and processing of the data as it comes in.

2) *IFTTT:* If This Then That is a service that allows a user to program a response to events in the world of various kinds. There is a long list of kinds of events to which IFTTT can respond, all detectable via the Internet.

3) *Node MCU:* The Node MCU (Node Micro Controller Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266.

4) *LCD16X2:* The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

5) *Servo Motor:* A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft; this feedback allows the servo motors to rotate with great precision.

6) *Soil Moisture Sensor:* Soil moisture sensors measure the volumetric water content in soil.

C. *Simulation*

It is a IoT based project that is which We are using different types of sensors like moisture sensor, Proximity sensor, and ultrasonic sensor. These sensors will be programmed on NODE MCU for excellent and accurate output, the complete setup will be installed in such a way that the bins which are used for dumping the garbage and the bins will be segregating the wastes according to its type (wet waste, and dry waste).The sensors are responsible for judging the type of waste dumped in the bin like, moisture sensor will capture the waste and detects the moisture value, if the value of moisture is lower than the threshold value hence it's a dry waste and if the value of moisture is higher than the threshold value hence its a wet waste. The ultrasonic sensor will indicate the level of the dustbin. If the bin is full, the system will be able to send a "CAUTION" message to the worker or the supervisor, using online software IFTTT and Thing Speak mentioned above which will help in quick and effective management and proper continuation of dumping the wastages in the bin. It will have done with the help of Node MCU, it is a Wi-Fi module that will help in sending the sensor values to Thing Speak, via connecting with the Wi-Fi.
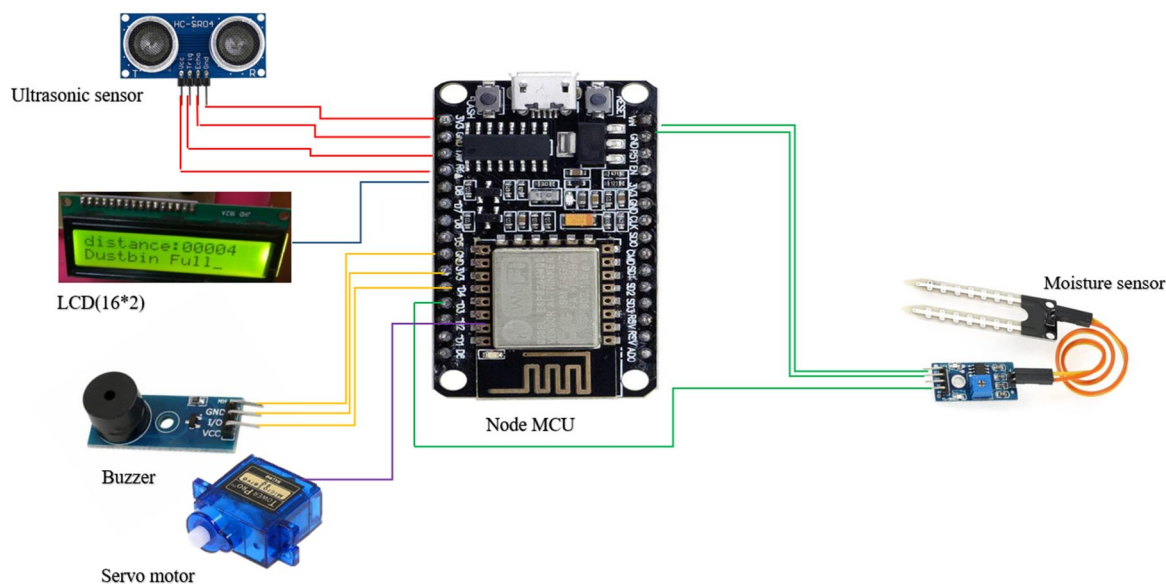
Node MCU Code for Functioning

Fig 1.1 Circuit Diagram

D. Benefits
1) Effective Garbage Segregation
2) Constant Instructions to Each User
3) Level Indications
4) Speech Based Operation
5) Garbage Full Indication
6) Easy to Use Automatic Operation

E. Drawbacks
1) Requires Maintenance
2) Requires Power Supply

F. Future Scope
1) The waste materials can be isolated into biodegradable, non-biodegradable, and metals by utilizing more sensors.
2) The disposed of things can be handled to remove or recoup materials in a powerful manner and assets or convert them to energy as usable warmth, power, or fills.
3) The huge scope presentation of programmed squanders the executives in towns, stages, emergency clinics, enterprises, and so forth Constant observing and controlling of waste administration by utilizing IoT.
4) A forecast framework by dissecting the offered information to anticipate the variety in the measure of waste and to change the circumstances of the executives.

VI. CONCLUSION

We have studied various ideas proposed for proper waste segregation. A stabilized system is needed to prevent harm caused to the environment due to improper disposal.The study shows that IoT-based techniques are mostly used for waste segregation but the cost of implementing an IoT-based system is very high. We can use AI (Artificial Intelligence) in the future to make it more effective and efficient.By continuously using this system to find the maximum height of rubbish in a dustbin that is placed in it. If a dustbin is nearly 70 percent, a mail notification can be sent immediately. It helps to keep the environment clean and without causing any kind of disease.

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