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Garbage Monitoring System Using IOT & Thingspeak Cloud Platform

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ABSTRACT: In modern world the waste management can face a problem of overflowing garbage. Many times, we see that the dustbin placed at public places are overloaded. It creates unhygienic environment for the people. To avoid such things, we have implemented a project "Garbage monitoring system". These dustbins are supplied with low price embedded device that helps in tracking the amount of garbage in the dustbin. A unique field name is provided for each garbage can which helps to identify the location and the status of the bin.These details will be sent to the concern authorities, with the help of message an immediate action can be made to clean the garbage in the dustbin.

KEYWORDS: To detect the level of garbage using Raspberry Pi PICO-W with ultrasonic sensor

I. INTRODUCTION

In order to preserve the environment from all the garbage that is spread over the world which causes some harmful diseases in the surroundings, due to the accumulation of the municipal solid waste it leads to environmental pollution. A proper maintenance of waste is necessary for economical and effective removal of municipal solid waste. People are depositing their waste within the garbage can. We are fitting ultrasonic sensor, at the highest of garbage can.The ultrasonic sensor can detects the level. If the garbage be overflow, automatically alert will be sent using wifi module to the registered range, intimating that the rubbish value has reach the extent of about 5cm nearby ultrasonic sensor. The garbage cans are filled, and the data is sent to the concerned authority for the further process. We used the wireless connection for the real time information. It is the main part of the communication system which has less price, good performance and which can be implemented easily. If any of the person is making an attempt to deposit their waste within the garbage can, even though the threshold value crosses the range then the LED will glow. This method helps to reduce amount of time used, fuel, and money. There will be lots of rural places which can be benefited from this technique in future.

II. RELATED WORK

Title: Smart Waste Management System Using IoT
Authors: Divyansh Kumar, Nikhil Garg, et al.
Summary: This paper proposes a smart waste management system based on IoT technology. It discusses the architecture, components, and working of the system, which involves sensor-equipped waste bins, a central monitoring system, and optimization algorithms for waste collection.

Title: A Survey of Internet of Things (IoT) Solutions for Garbage Monitoring
.Authors: Anshul Sharma, Akashdeep Singh, et al.

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Summary: This survey paper provides an overview of various IoT-based solutions for garbage monitoring. It discusses the challenges, existing solutions, and future directions in the field of smart waste management using IoT technology.

Title: Smart Bin: A Cost-effective and Efficient Waste Management System using IoT
.Authors: Chinmay Chakraborty, Aritra Roy Gosthipaty, et al.
Summary: This paper presents the design and implementation of a smart waste management system using IoT. It describes the architecture, sensor technology, communication protocols, and data analytics techniques employed in the system.
.
Title: A Smart Garbage Monitoring System for Efficient Waste Management
.Authors: B.B. Zaidan, A.A. Zaidan, et al.
Summary: This paper proposes a smart garbage monitoring system based on wireless sensor networks (WSNs) and cloud computing. It discusses the system architecture, sensor deployment strategies, data collection, and analysis techniques.
.
Title: IoT based Smart Waste Management System
Authors: Rishabh Jain, Khushbu Sharma, et al.
Summary: This paper presents an IoT-based smart waste management system that utilizes ultrasonic sensors to monitor waste levels in bins. It discusses the system architecture, sensor integration, data communication, and real-time monitoring features

III. METHODOLOGY

Developing a garbage monitoring system using the ThingSpeak platform involves several steps, including hardware setup, data collection, data processing, and visualization. Below is a methodology outlining the key steps to implement such a system:

Identify Requirements: Determine the specific requirements of your garbage monitoring system, including the types of data to be collected (e.g., fill level, temperature, humidity), monitoring frequency, and desired features.

Hardware Selection: Choose appropriate sensors and hardware components based on your requirements. Commonly used sensors for garbage monitoring include ultrasonic sensors for fill level measurement and temperature/humidity sensors for environmental monitoring.

Hardware Setup: Connect the selected sensors to a microcontroller board such as Arduino or Raspberry Pi. Ensure proper wiring and configuration of the hardware components.

ThingSpeak Account Setup: Sign up for a ThingSpeak account if you haven't already. ThingSpeak is a platform for collecting, visualizing, and analyzing IoT data.

ThingSpeak Channel Creation: Create a new ThingSpeak channel for your garbage monitoring system. Define fields corresponding to the data you'll be collecting (e.g., fill level, temperature, humidity).

Thonny Programming: Write the firmware code for the microcontroller board (e.g., micropython) to read sensor data and send it to the ThingSpeak channel using ThingSpeak's API. Make sure to include proper error handling and data formatting.

Data Transmission: Configure the microcontroller to periodically transmit sensor data to the ThingSpeak channel over the internet using Wi-Fi or Ethernet connectivity.

Data Visualization: Use ThingSpeak's built-in visualization tools to create custom charts and graphs for visualizing the collected data. You can also set up MATLAB analysis to perform more advanced data processing and visualization.

Alerts and Notifications: Set up ThingSpeak to send alerts or notifications (e.g., email, SMS) based on predefined conditions (e.g., when fill level reaches a certain threshold).

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Testing and Calibration: Test the garbage monitoring system in a real-world environment to ensure proper functionality. Calibrate sensors if necessary to improve accuracy.

Deployment: Deploy the garbage monitoring system in the target environment (e.g., public trash bins, recycling centers). Ensure proper installation and ongoing maintenance.

Data Analysis and Optimization: Continuously analyze the collected data to identify patterns, trends, and areas for improvement. Use this information to optimize the garbage collection process and reduce operational costs.

By following this methodology, you can develop a robust garbage monitoring system using the ThingSpeak platform, enabling efficient management of waste collection and environmental monitoring.

IV. EXPERIMENTAL RESULTS

STEP-1: Installing the micropython code in the raspberry pi pico-w board by using thonny IDE in given figure 1.

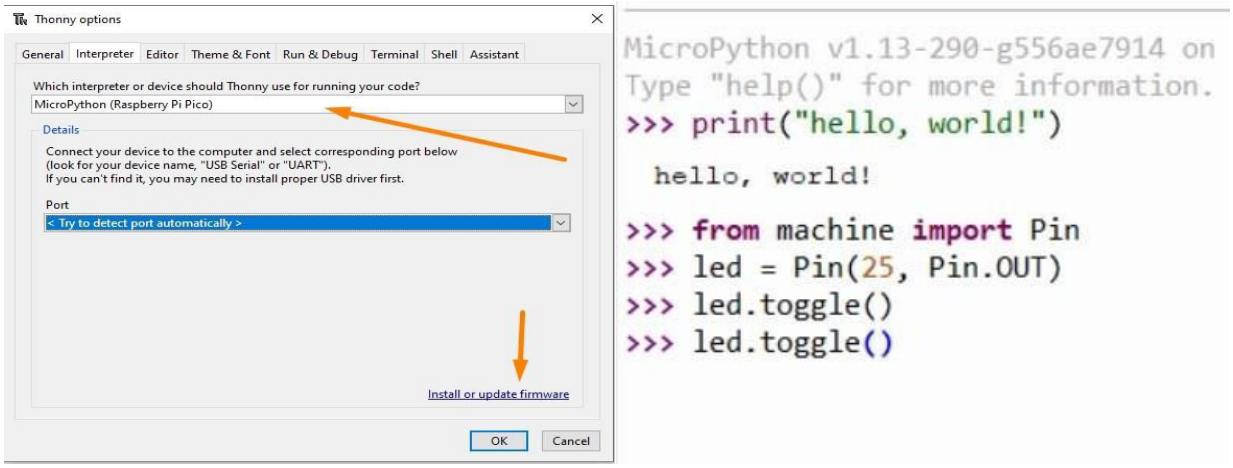

Figure:1

STEP-2:Interfacing the ultrasonic sensor to the raspberry pi pico-w in figure 2.

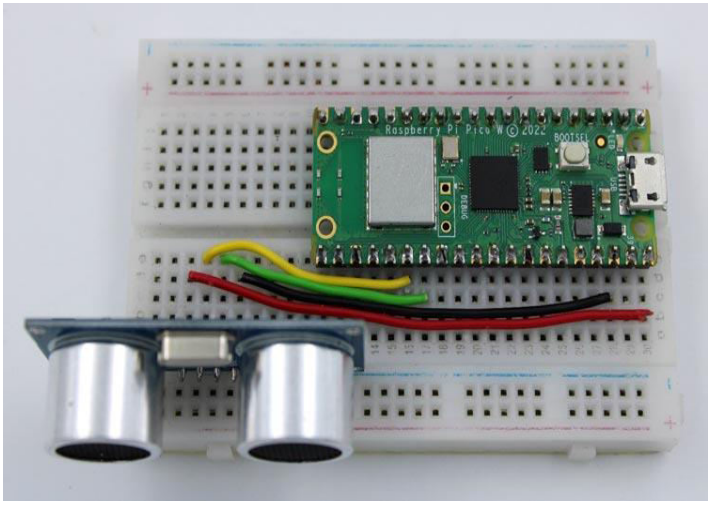

Figure:2

STEP-3:By using Thingspeak platform,creating the new channel for sending the data in cloud.figure 3

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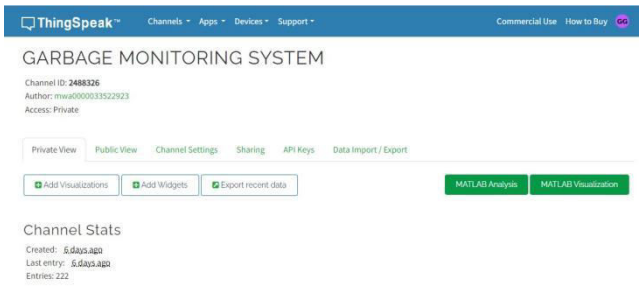

Figure:3

STEP-4: After creating the channel,we can add the several fields for receiving the data from the sensors.figure 4

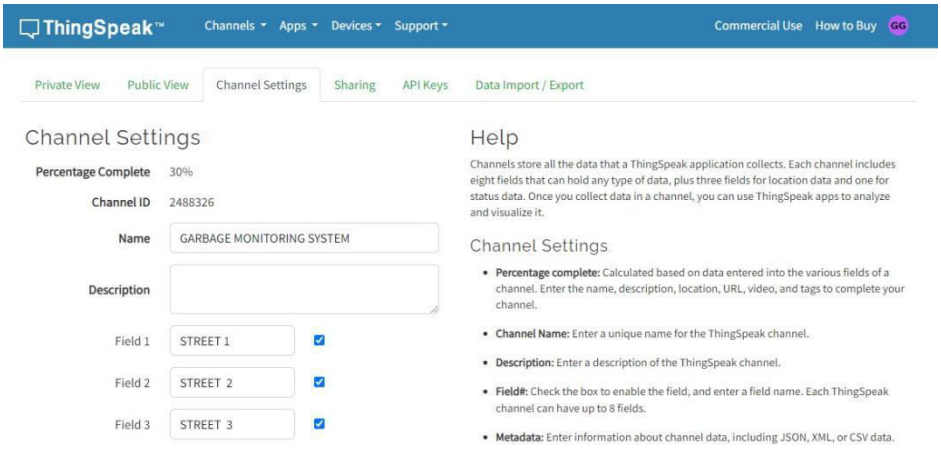

Figure:4

STEP-5: give the power supply and connect the raspberry board in wifi. then, fitting in dustbins by given created fields(figure 4). it will detect the level of garbage.If the garbage is overflow,then the sensors can send the data to the thingspeak platform.It gives the alert by glowing of the light as Red.

Figure:5

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V. CONCLUSION

In conclusion, the integration of IoT technology with the ThingSpeak cloud platform offers a robust solution for garbage monitoring systems. By leveraging IoT sensors embedded within waste bins, real-time data on fill levels and other parameters can be collected and transmitted to the cloud platform for analysis. ThingSpeak provides a scalable and flexible infrastructure for storing, visualizing, and analyzing this data, enabling municipalities and waste management authorities to make informed decisions regarding waste collection and disposal.

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