Solar Powered IOT Based Smart Solid Waste Management System

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Abstract - The Solar-Powered IoT-based Smart Solid Waste Management System is a groundbreaking solution designed to tackle the escalating challenges of growing waste generation in developing urban areas. Utilizing a network of sensors in garbage bins, it provides real-time monitoring of fill levels, gas formation, and fire risks.Powered by solar energy, the system ensures uninterrupted operations with minimal environmental impact.Through IoT infrastructure, it establishes efficient communication between waste management authorities and citizens, leading to shorter collection times, cost reduction, and increased community involvement.A user-friendly interface accessible via mobile apps or web portals empowers residents to report concerns, track schedules, and stay informed.Moreover, machine learning algorithms are employed to analyze historical data and predict future waste generation patterns, enabling optimized waste collection schedules and routes.
Key Words: Solar Panel, Rechargeable Battery, ESP 8266, Ultrasonic

I.INTRODUCTION

The Solar-Powered IoT-based Smart Solid Waste Management System represents a pioneering solution to the escalating challenges of urban waste in developing landscapes.By integrating solar energy and IoT technologies, this innovative system facilitates real-time monitoring of various waste parameters, ensuring efficient communication between authorities and citizens.This holistic approach not only optimizes operational efficiency but also promotes sustainable practices, emphasizing the importance of citizen involvement in fostering a healthier, more environmentally conscious community.By leveraging IoT sensors, data analytics, and solar energy, this system offers real-time monitoring, optimization, and automation of waste collection and disposal processes. The Solar-Powered IoT-based Smart Solid Waste Management System represents a pioneering solution to the escalating challenges of urban waste in developing landscapes. By integrating solar energy and IoT technologies, this innovative system facilitates real-time monitoring of various waste parameters, ensuring efficient communication between authorities and citizens.

II.LITERATURE SURVEY:

A. Survey Paper 1: The proposed system for waste management will use various sensors for sensing the type of waste and separate the waste in different categories and actuator to inform the management to collect the waste container.

B. Survey Paper 2: This paper proposes an effective and smart solution for waste monitoring, andfire risks. A prototype is developed, consisting of mechanism to initial is use to further the waste There are several methods to segregate and manage waste automatically, some of which employ emerging technologies like deep learning while others use more conventional methods like IoT systems.

C.

III. PROPOSED METHODOLOGY:

The proposed system employs a comprehensive array of components to create an efficient and sustainable waste management solution.Solar panels harness renewable energy to power the system, promoting environmental sustainability. A robust battery ensures continuous operation, even during periods of low sunlight. An ESP 8266 serves as the central processing unit, orchestrating data from ultrasonic sensors for fill levels, gas and fire sensors for safety, and IoT technology for real-time communication. This integrated approach showcases the versatility of combining solar power, sensor technologies, and IoT infrastructure to create an effective and environmentally conscious smart waste management system. Each waste bin is equipped with sensors and IoT devices to monitor the level of waste inside. These sensors can detect when the bin is reaching capacity and needs to be emptied. The central management system collects data from all the waste bins in the area. This data includes fill-level information, location data, and other relevant metrics.System Architecture:

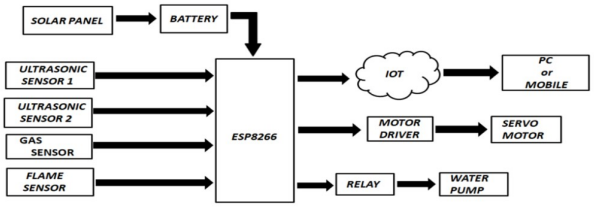

Figure 1: System Architecture of Smart dustbin

As a solar PV array performs a energized to sun, and the battery get charging. The supply through a ESP 8266 operated. They are used in digital sensor in the smart dustbin. Ultrasonic sensor are used in two sensor, one is waste fill level monitoring and another one is human detected. The motor drive is maintain in the servo motor. Servo motor is used for the control the dustbin top open or close. The dustbin filled automatically dustbin top is closed, not opened. The dustbin top is open stage is ,one method dustbin is replace or waste collect and remove. Dustbin fill in stage send the a notification in IOT through in mobile apps. Another method is dustbin inside is fire arrival first produced in gas, gas sensor detect in through notification. The labour or employee time taken delay, the fire is extising. Fire sensor detecting the fire send the notification and same time relay is operated water pumb is spraying in the water so, fire is prevented.

2. Composition for Impose Version:

A. Working of Module:

B. Carving of ESP 8266:

The ESP8266 is a System on a Chip (SoC), manufactured by the Chinese company Espress if. It consists of a Tensilica L106 32-bitmicro controller unit (MCU) and a Wi-Fi transceiver. It has 11 GPIO pins* (General Purpose Input/Output pins), and an analog input as well. This means that you can program it like any normal Arduino or other microcontroller.The on top of that, you get Wi-Fi communication so, And on top of that, you get Wi-Fi communication
totally on the ESP 8266

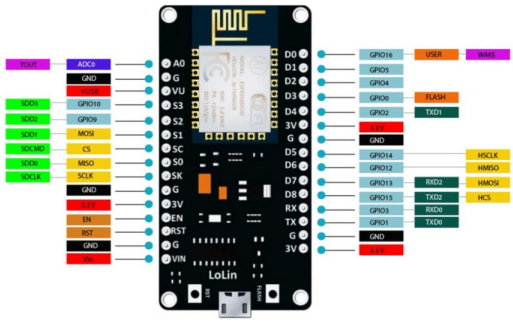

Figure 2: Pin Configuration of Arduino UnoR3

C. Carving of Motor Drives:

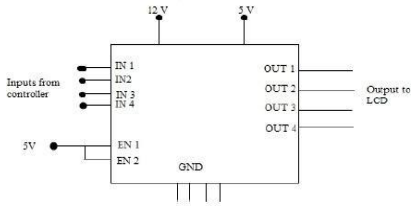

Figure 4: Carving of Piston Drive

A piston power is a megaphone which guides the feature of the motor in either direction. The motor drives operation depends upon the tracking function of the photovoltaic panel in either left or proper direction.

D. Ultrasonic Sensor:

Operating Voltage the voltage range within which the sensor operates reliably, often ranging from 3.3V to 5V. Operating Current the amount of current consumed by the sensor during operation, usually specified in milliamps (mA). Response Time the time it takes for the sensor to detect an object and provide an output signal, often measured in milliseconds. There are Four pins in the ultrasonic sensor. Input pin(vcc), Ground pin (GND), Trigger pin(trig) and Eco pin(Eco).

E. Fire Sensor:

Ionization smoke detectors use a small radioactive source to ionize air molecules, creating a small electric current. Photoelectric smoke detectors use a light source and a light-sensitive sensor. When smoke particles enter the detector, they scatter the light, causing the sensor to trigger the alarm. Regular maintenance and testing of

fire sensors are essential to ensure their proper functioning and remove dust and debris, and replacing batteries as needed

Channels API:

Charts API:

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Open - Source API:Apps:

Thing Blynk Apps are apps that make it easier for devices to get righ to fentry to sources on the web such as social networks, net services, and APIs.

Thing Speak:

- Obtain Started
- Join Up for New User Account–https://www.Blynk.com/account/new
- Fabricate an medium with the aid of deciding on Events and then Create New Events
- Go after a seminar for frequent units and appeal.

Medium:

Medium is the place your utility shops and recover any kind of data. Each channel has an individual View and a general View. The Private View is only handy via signing into yourThingSpeak.com person narrative. The Public View is what different audience will see when they go to your Thing Speak Channel.

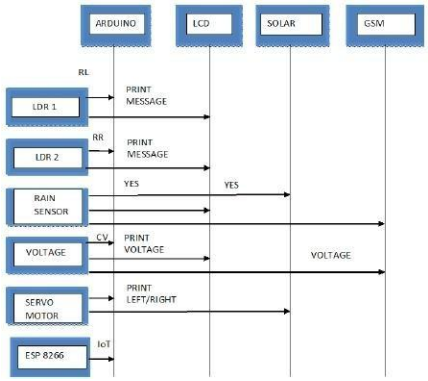

Figure 5: Sequence Diagram of the Model

IV. RESULT AND DISCUSSION

The dangerous have an effect on of EV charging station masses on the electrical energy distribution community cannot be neglected. The excessive charging hundreds of the speedy charging stations outcomes in extended load demand, reduced reserve margins.

Solar cells: 18V, Battery: 12V 10Ah, Power plant: 220V, 50 Hz AC.

Note: The solar cost controller steps down the voltage from18V to 12V. P= Power P = V*I P = 12*10 P = a hundred and twenty Watts Therefore, the time required to cost from zero to 80%is 1hour. (When10A is stored)

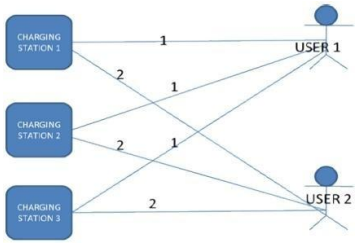

Figure 6: Charging Process Diagram

V. CONCLUSION

In conclusion, the implementation of a solar-powered IoT-based smart solid waste management system offers a promising solution to the challenges associated with traditional waste management practices. Through this project, several key findings and benefits have been identified. By incorporating solar power, the system reduces reliance on non-renewable energy sources, thus minimizing carbon emissions and contributing to a greener environment. The IoT sensors enable real-time monitoring of waste levels in bins, optimizing collection. This not only reduces fuel consumption and operational costs but also ensures timely waste collection, preventing overflow and littering. The modular design of the system makes it easily scalable to accommodate varying urban landscapes and population densities. Additionally, it can be adapted to incorporate additional features such as sorting and recycling modules, further enhancing its effectiveness. Overall, the solar-powered IoT-based smart

solid waste management system represents a forward-thinking approach towards sustainable urban development, promoting cleanliness, efficiency, and community engagement. As cities continue to grapple with the challenges of urbanization and environmental degradation, embracing innovative solutions like this holds the key to building cleaner, smarter, and more livable urban environments for future generations.

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