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IOT-BASED SMART WASTE MANAGEMENT SYSTEM

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Abstract: Along with the development of the Internet of Things (IoT), waste management has appeared as a serious issue. Waste management is a daily task in urban areas, which requires a large amount of labour resources and affects natural, budgetary, efficiency, and social aspects. Many approaches have been proposed to optimize waste management, such as using the nearest neighbour search, colony optimization, genetic algorithm, and particle swarm optimization methods. However, the results are still too vague and cannot be applied in real systems, such as in universities or cities. Recently, there has been a trend of combining optimal waste management strategies with low-cost IoT architectures. In this paper, we propose a novel method that vigorously and efficiently achieves waste management by predicting the probability of the waste level in trash bins. By using machine learning and graph theory, the system can optimize the collection of waste with the shortest path.

I. INTRODUCTION

Internet of Things (IoT) is a leading technology that integrates various devices and objects to make them smart and connected resulting in data exchange and enhancing the lifestyle of an individual. Things enabled with IoT can help in commanding the various devices connected through voice or action. The interconnection via the internet of computing devices is embedded in everyday objects, enabling them to send and receive data. The goal behind the Internet of things is to have devices that self-report in real-time, improving efficiency and bringing important information to the surface more quickly than a system depending on human intervention.

The idea was often called “embedded internet” or “pervasive computing”. But the actual term “Internet of Things” was coined by Kevin Ashton in 1999 during his work at Procter & Gamble. Because the internet was the hottest new trend in 1999 and because it somehow made sense, Ashton called his presentation “Internet of Things”. IoT devices can exchange data with other connected devices and process data either locally or remotely**. Sensors and actuators embedded in physical objects are linked through wired and wireless networks.**

II. SYSTEM ARCHITECTURE

The **system architecture** is the model that conceptually defines the views, structure, and behaviour of the system. System architecture in other words is the representation and description of how the system works and communicates with other system components in general. The whole system is composed of the components and the subsystems that overall work together to make the system it should be in the first place.

As defined above, the diagrammatic representation of the system architecture is called the **system architecture diagram**. This diagram gives us the abstract view of the components and their relationship with the system that makes the system work.

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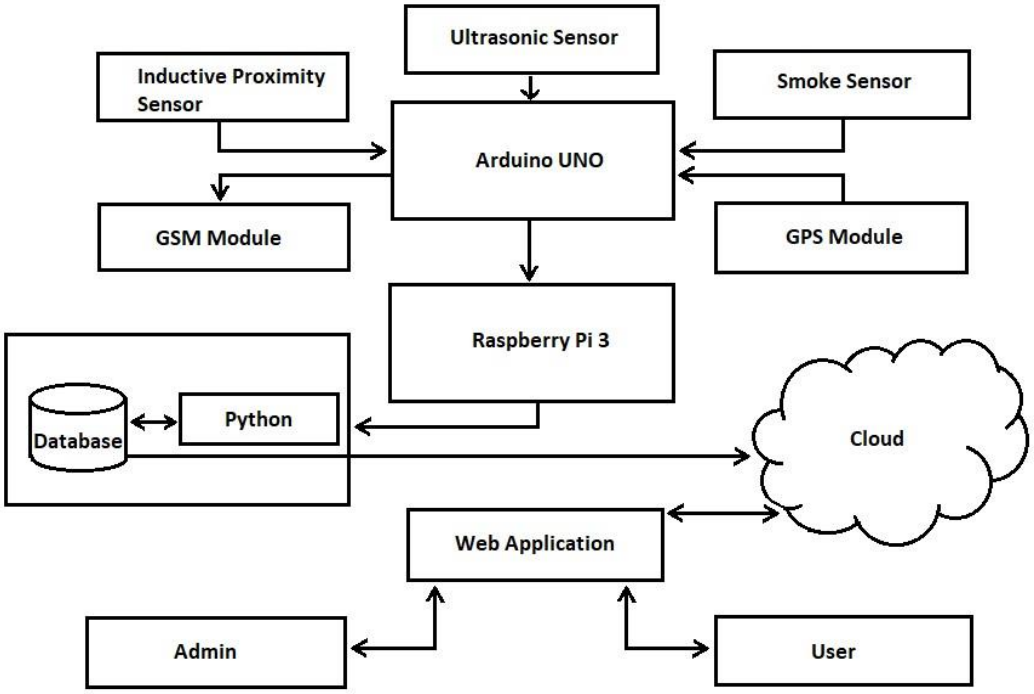

Fig2. System Architecture

III. METHODOLOGY

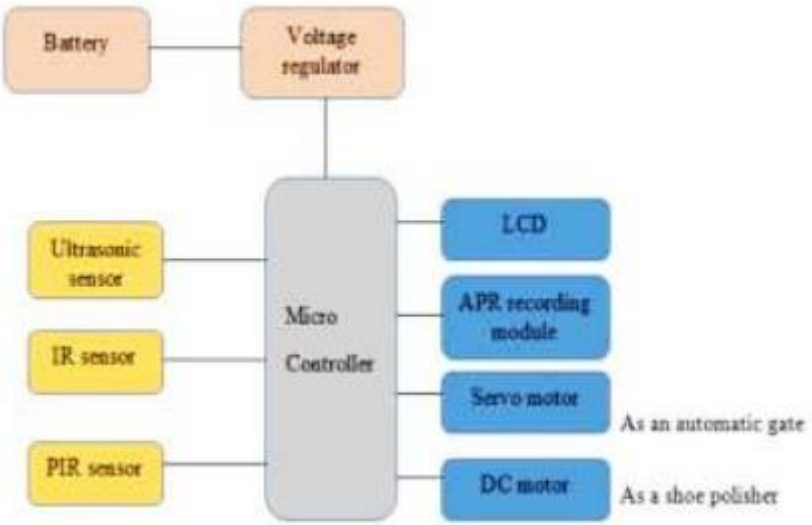

Fig 3. Block diagram

The automation of the smart dustbin is achieved through the use of a power supply, Microcontroller (ATmega328P), APR module, PIR sensor, servo motor, and ultrasonic sensor all programmed using Arduino IDE. In addition, DC motor and IR sensor are used for the incentive that is shoe polisher. A block diagram of the control circuit is shown in Figure.

V RESULTS

Results basically refer to any particular output that comes as a result of the completion of the activities that have been performed as part of the project or a particular project component.

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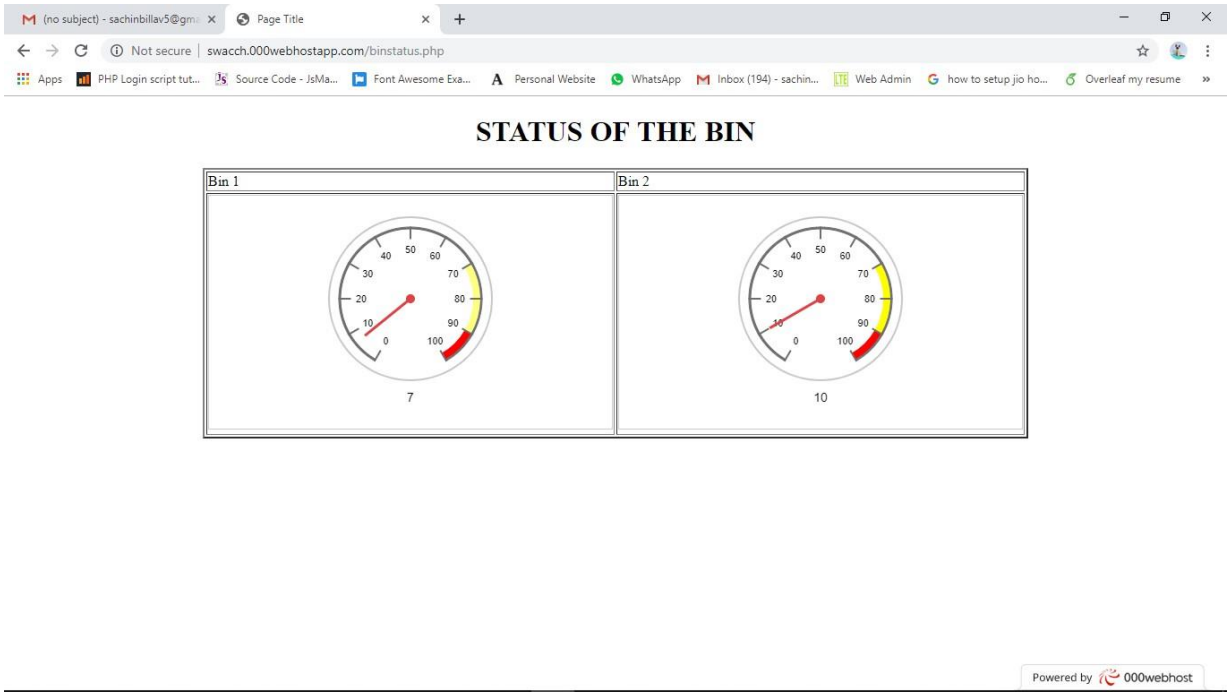
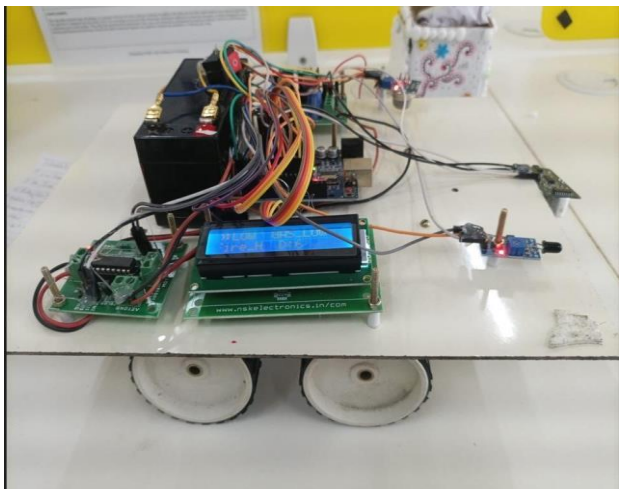
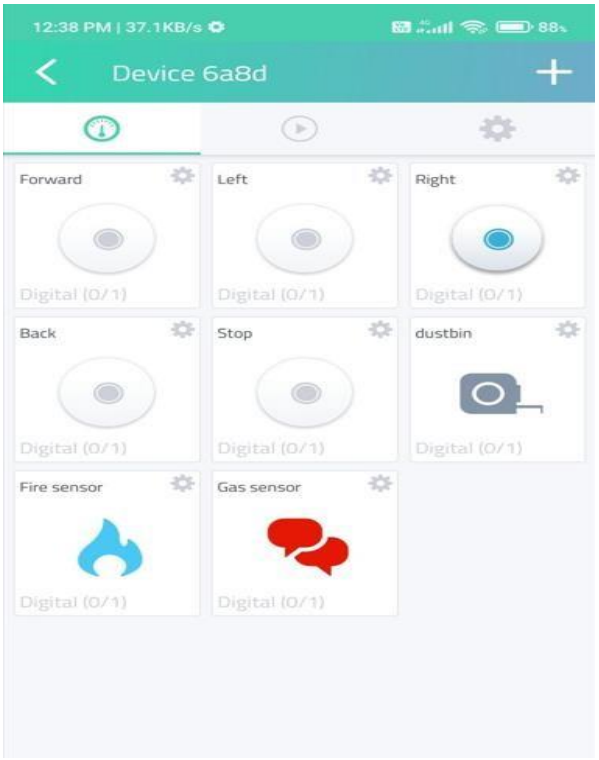


When bin contents are above the threshold level administrator receives the real-time notification. The administrator can view the status of a particular smart bin which includes the current level of garbage in the bin, date and time of the last update and its location. The administrator receives the text message when contents in the bin cross the threshold level. The received message has the location details as well as a link to the map where the smart bin is located. When the administrator clicks on the URL received via SMS, it directs him to the bin location of the map



Model



Performing functions through the Cayenne App

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IV. CONCLUSION AND FUTURE ENHANCEMENT

Rapid population and the increasing industrialization are considered to be the major causes of pollution. Garbage left in the streets and overflowing dustbins pose extreme health hazards to the surrounding people. Advancement in technology can be utilized to overcome these problems.

This project is initialized to aid smart city concept and swatch Bharat Abhiyan. It uses cheap and reliable Raspberry pi as central control board and is interfaced with Arduino and sensors for smoke detection, Dustbin status, GPS module for identifying location and all the sensors data are stored in online database in real time, it also makes use of web and SMS notification in order to make the system more efficient and reliable

Waste disposal is a burning issue and there is a sample potential in future development for various aspect of this research projects. The receptacle designed for segregation at source can be further developed in terms of materials and design for use in different waste situation and characteristics.

Cost and portability aspects can be taken up for further development through research which would enable its use for a larger and varied audience. The efficiency of the model has plenty of potential for research. The design of the waste management model has been carried out to cater to the current waste situation and optimized to meet the objective of providing an affordable waste solution.

In future system can be upgraded with many sensors which may be feasible, and maybe some advancement of technology new sensors will be added to the system to meet requirements and to perform more different segregation. Adding the shortest route to reach the location of the bin along with the SMS notification. A smartphone application can be developed to make it more user-friendly, ease of use and efficient.

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