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IoT Based Smart Waste Monitoring and Management System

CH.Sairuchitha, N.Navya Reddy, R.Samiksha, B.Shivaprasad

U.G Student, Department of Electrical & Electronics Engineering, Anurag Univeristy, Hyderabad, India

ABSTRACT: To keep our surrounding environment clean and healthy only two things are needed, the first one is the awareness of people and the other one is proper monitoring and management system of corresponding authority. In our country, due to a lack of public awareness and proper management from an authority, the environment is becoming polluted day by day. A vast implementation of technology has appeared in a waste management system in developed countries so that they can handle this huge work very easily. The authority of our country uses outdated technology, for that reason their process cannot adapt to our ever-increasing population and problems. To make our existing waste management system efficient and effective, we have proposed a viable solution named Smart Waste Monitoring and Management System based on the socio-economic status . The proposed project is a website-based dustbin and air quality regulation system which can be used to establish an efficient and smart garbage management protocol. The proposed website contains real-time data visualization of the garbage level inside and the irritating gas level around the dustbin. Our proposed system is a solution that has a perfect collaboration of manpower and effective technology.

I. INTRODUCTION

A country's level of development is measured by the rate of urbanization. In the previous century, people are moving towards urban areas from rural areas to lead a peaceful and convenient life. According to the report of the United Nation (2018), today, 55% of the world's population live in urban areas and which is likely to grow to 68% by 2050.

However, several problems arise in the cities among them waste disposal system is the biggest concern. Improper disposal of waste causes environmental pollution which leads to various vector-borne diseases. Every single day in our city the common scenario is that dustbins placed at the roadside or near to locality are overloaded. The maintenance of those dustbins is inadequate and the public of our country both educated and uneducated are not conscious about the cleanliness of their surroundings. Most of the people throw their wastes outside of the dustbin. Internet of things in short IoT is a network that helps us to automate everything. IoT involves in most of our daily activities. The main objective of IoT is to make our lives more efficient and secured.

The proposed project is a website-based dustbin which can be used to establish an efficient and smart garbage management protocol. To detect the garbage level of the dustbins, we have used an ultrasonic sensor. Dustbin monitoring operators can inform the nearest waste collectors by tracking their position using Wifi module if the waste level of trash bins crosses its predefined mark. Proper monitoring and management system can create a better environment and increase the awareness of people. A website-based monitoring system is the easiest way of surveillance and creates the opportunity for accountability on both sides.
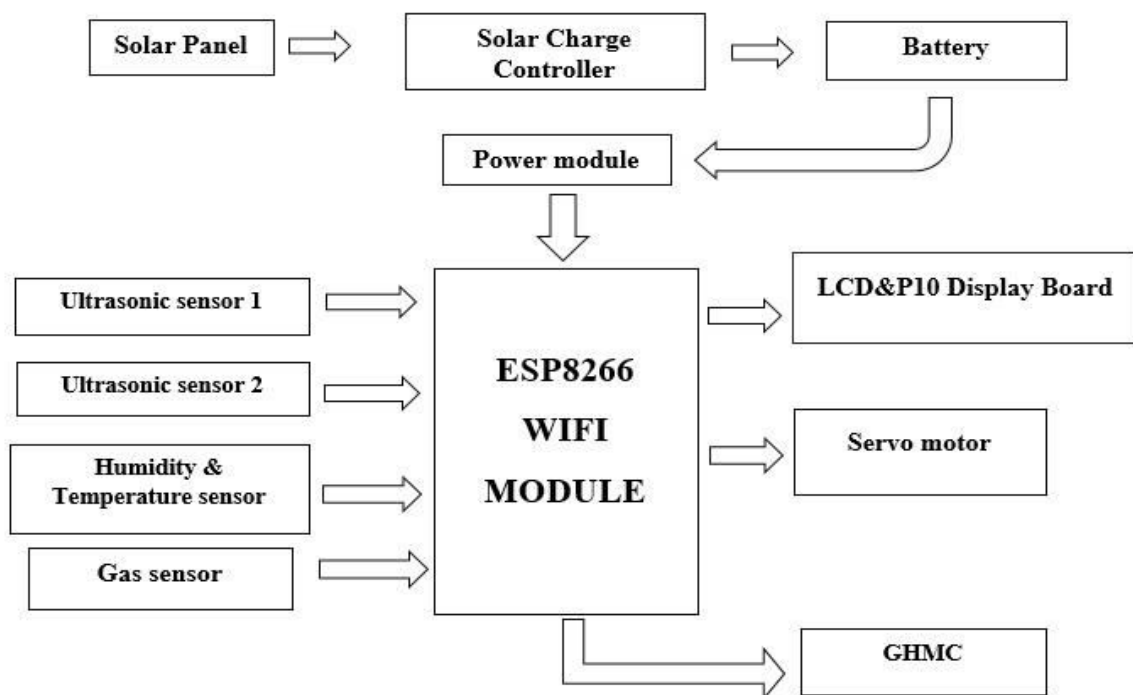
II. RELATED WORK

In recent years, IoT has gained well-deserved attention in information technology (IT) as it seeks to create intelligent systems for social relevant applications to make lives more comfortable. Thus, a lot of research has been put in to place for proper monitoring and collection of the waste throughout the world. Recently, people start using technology for monitoring and collecting the waste in an efficient way. The recent research has been done for efficient IoT based smart bin for clean environment in which bin is equipped with ultrasonic sensor and microcontroller with separate Ethernet shield for transferring of data. The paper addresses the development of smart wireless waste management system, which uses the Wifi module technology for smart bins. To the best of our knowledge, previous work did not estimate cost effectiveness, time saving solution for garbage monitoring and collection. This work presents an IoT based real time monitoring of garbage monitoring so that it can be collected on time. The proposed system is cost effective and more efficient as validated by results.

III. OBJECTIVES

The objectives of the project are to construct a hardware circuitry and webpage which will have the following properties:

➢ Collecting information about trash bins using different sensors.

➢ Send the collected information through Wi-Fi to the webserver.

➢ **Real-time monitoring**: Track waste levels remotely and accurately using IoT sensors to optimize collection routes and schedules.

➢ **Predictive Maintenance:** Use IoT sensors to detect issues such as bin malfunctions or damage, enabling proactive maintenance to ensure uninterrupted waste collection.

➢ **Data-driven Decision Making:** Analyze data collected from sensors to identify trends, patterns, and areas for improvement in waste management processes.

➢ **Environmental Sustainability:** Minimize landfill usage and reduce carbon emissions by optimizing waste collection routes and promoting recycling and composting initiatives.

➢ **Public Health and Hygiene:** Ensure timely waste collection to prevent overflowing bins, minimize odor, and mitigate health risks associated with improperly managed waste.

IV. BLOCK DIAGRAM

BLOCK DIAGRAM FOR IOT BASED SMART WASTE MONITORING AND MANAGEMENT SYSTEM

V. DESIGN
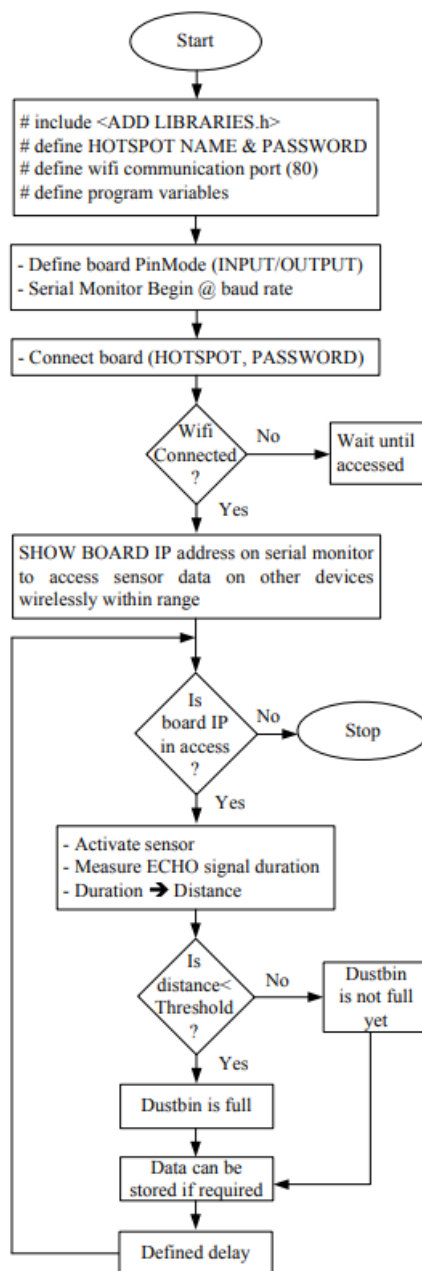
Design and flow of garbage monitoring

VI. CONCLUSION

In the developed world, waste management system is a very important issue as it related to the environment and public health. An inefficient system pollutes society and causes various harmful diseases. To ensure a better environment smart waste monitoring system should be implemented. This paper presented a smart waste monitoring and management system which can smartly handle the waste management problem. In previous work, the systems were beneficial for either waste monitoring or management which were appropriate for their country but our system is completely suitable considering the socio-economic status of Bangladesh. We have observed a few limitations of this project. Sometimes the trash bins are physically abused like kicked around by the public. The sensors which are used need to have higher withstand capability during rain and humidity. In the end, we can conclude that our proposed system is economical than the existing system and it can be implemented in the big cities as well.

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