

SMART GARBAGE TRACKING AND MONITORING SYSTEM

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Abstract - Waste Management has got the highest importance in this era globally but the practices of way on waste disposal are often neglected. Most communities around the world are aware of the serious consequences of improper solid waste management practices but the negative attitude of implementation gives rise to chaotic situations. Domestic solid waste is the most visible consequence of this economic development. However, considerable amounts of this waste could be recycled and reutilized if separated. Efficient Solid waste management is one of the key factors in the development of a nation. But still, in many countries, it is not considered that into the subject of development. A reliable waste collection service is must needed and the waste collection vehicles need to be appropriate to the local situation, while more vehicles are required to cope with the ever-increasing volumes of wastes generated in each area. Rapid growth in population and urbanization, industrialization process and rural to urban migration, the waste management is becoming more and more critical now. Considering all above issues, we have proposed an idea which can make solid waste up to some good extent. The proposed system ensures to make the waste management channels free of hassle by providing the solution of real-time path monitoring of garbage vans. Also, the monitoring of garbage bins overflow is necessary for hygiene control. After the bin is full the specific vehicle is reached to that exact. This system overcomes social problems for the garbage assortment and the overflow of litter bins. The techniques which we are used for the decentreal-world acquaintance of Smart garbage collection.

Key Words: Waste Management, Urbanization, Migration, Recycled, Reutilized, Industrialization

1. INTRODUCTION

Efficient solid waste management is one of the key factors in the development of a nation. But still, in many countries, it is not considered that into the subject of development. The system will be designed to ensure that the waste management will be easy by providing the solution of real-time path monitoring of garbage vans. Also, the monitoring of garbage bin overflow is necessary for hygiene control. After the bin is full the specific vehicle is reached to that exact area. After the data reaches the server it will be stored in some database for additional interpretations. This was accomplished with the use of an ultrasonic sensor; the status of the bin is sent to the user and the garbage truck driver. In our project, the social

problems for the garbage assortment and the overflow of dustbins will be overcome.

2. PROPOSED ARCHITECTURE

2.1 Ultrasonic Sensor

The Ultrasonic Sensor sends out a high-frequency sound pulse and then checks how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone). The speed of sound is approximately 341 meters (1100 feet) per second in air. The ultrasonic sensor uses this information along with the time difference between sending and receiving the sound pulse to determine the distance to an object.

2.2 Power Supply

We use 12 V power supply in our project. It is mainly used to provide DC voltage to the components on board. A 12 VDC output is obtained from a 120 VAC or 240 VAC input using a combination of transformers, diodes and transistors.

2.3 NodeMCU

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to Wi-Fi networks. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, we can simply hook this up to our Arduino device and get about as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

2.4 MIT App Inventor

App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to

create application software (apps) for two operating systems (OS): Android and iOS.

2.5 Firebase

Firebase provides the best back-end server, great database and analytics solution and useful integrations with other products. Most of all, it's free to use and has affordable subscription options. The real-time functions in Firebase are not only suited for, but designed for large data sets. The fact that records stream in real-time is perfect for this.

2.6 Ubidots

Ubidots is an Internet of Things (IoT) data analytics and visualization company which turns sensor data into information that matters for business-decisions, machine-to-machine interactions, educational research, and increased economization of global resources.

For the Internet of Things, or any control system, the dashboard or IoT dashboard is the key HMI (Human-Machine Interface) component that organizes and presents digital information from our physical world into a simply understood display on a computer or mobile device. With the help of IoT Dashboards, users and operators can (remotely) monitor and control specific assets and processes, and depending on safety requirements, access and control an environment from anywhere in the world.

3. IMPLEMENTATION AND WORKING

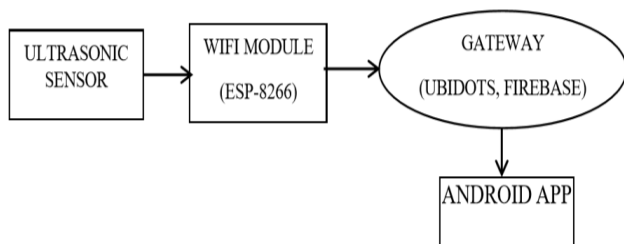


Fig -1: Block diagram of smart garbage segregation, tracking and monitoring system for a single bin

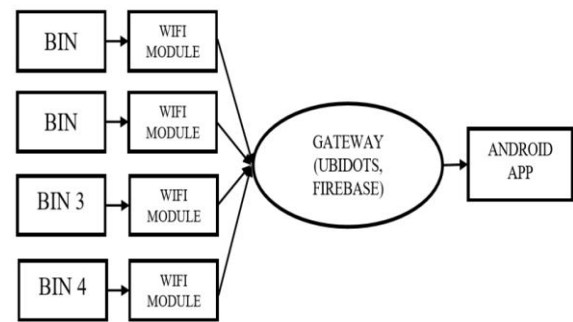


Fig -2: Block diagram of smart garbage segregation, tracking and monitoring system for many bins

The project is designed in such a way that,

- The bins are implemented with ultrasonic sensor to check the level of the garbage in the waste bins. This sensor captures the data and sends it to the database.
- The data is represented using a database, which indicates the bin status whether it is full or empty and then the notification is sent to the garbage truck driver and the user when the bin is full with garbage.
- An android application is developed using MIT App Inventor which shows consistent level and location of the bin.
- When the bin is full it displays it in the app and the notification is sent to the driver.

4. EXPERIMENTAL RESULTS

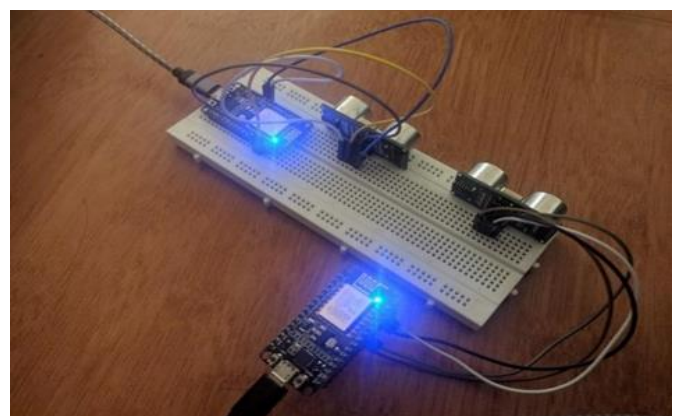


Fig -3: Snapshot of the circuit connections

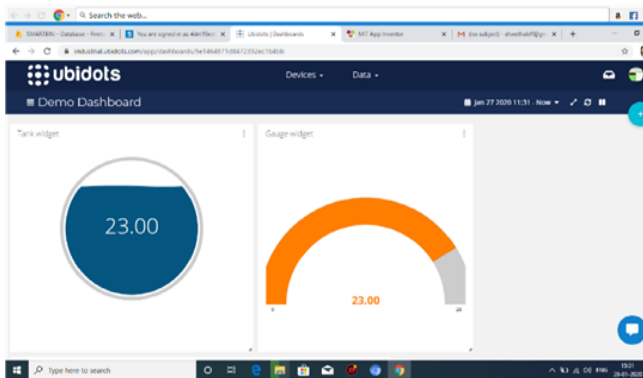


Fig -4: Snapshot of the bin status in Ubidots

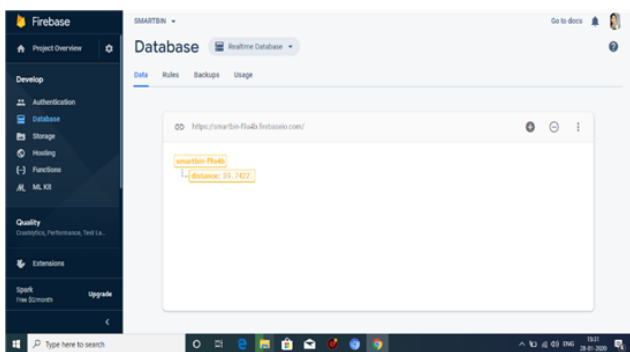


Fig -5: Snapshot of results in Firebase



Fig -6: Snapshot of the app

- Ultrasonic sensor shows the status of the garbage level either full or not.
- User and driver are able to know the status and monitor the bin using the app.

- Alert notification will be sent to the driver when the bin is full.

5. FUTURE SCOPE

Future progress in this project could be more increased accuracy by improving the sensor technologies used. Moreover, the waste segregation can be made more efficient by adding more distinguishing concepts of daily life waste. The user and application interference could be made more user friendly and engaging.

6. CONCLUSIONS

This paper has described the development of a solid waste monitoring system in a smart way, which is based on NodeMcu microcontroller. This system will be very useful in improving the efficiency of solid waste disposal management especially in the flat residential areas, where the garbage piles at the bins are one of the residents' major concerns owing to its ability to continuously measure the garbage level in the bin and alerting the municipality for immediate collection. Considering the outputs from the conducted tests show that all the functionality and working of the system has performed correctly. The proposed system also provides an improved database for waste collection time and bin level at each location. The proposed system is suitable to be implemented in all flat residential areas, cities and other areas due to its practicality, reliability and reasonable cost.

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