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Smart Waste Management System - An Innovative Way to Manage Waste

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***Abstract:** In this paper, we present the smart waste management system using IOT. The system is designed to cover all the aspects of waste management lifecycle and play an important role from the Smart City point of view. With rapid increase in population, the issues related to sanitation with respect to garbage management are degrading immensely. It creates unhygienic conditions for the citizens in the nearby surrounding, leading to the spread of infectious diseases and illness. To avoid this problem, IoT based "Smart Waste Management" is the best and trending solution. This proposed system calculates the shortest route for collection of waste using google maps and also gives prior information of the status of the bin, so that the bin can be cleaned on time and safeguard the environment. "This paper proposes an advanced waste management system with smart bins that alerts the authorised collector by sending alert messages for efficient garbage collection in Cities."*
***Keywords:** Arduino uno 3, raspberry pi, Ultrasonic sensor, Smart Bins(SB), Esp8266 wifi module, server for database.*

I. INTRODUCTION

In India, the present smart waste management system is not as optimised as required. As of now we regularly see that the dustbins are placed on the roadside and dustbin is overflowing. This overflow of dustbin is due to the increase in the population and the wastage from hotels, industries etc. This overflow of dustbin will make our environment ugly and cause many disease to the public.To avoid this situation we planned to design "Waste Management System Using IOT. A big challenge in the urban cities is that of waste management as there is a rapid growth in the rate of urbanization and thus there is a need of sustainable urban development plans. To avoid all such situations we intend to propose a solution for this problem "Smart waste management system", which will alarm and inform the authorized person when the garbage bin is about to fill. Then message will be send to the authorized person to collect the garbage from the particular area. The authorized person will sends the message from his android application to the garbage collectors by notifying him the route where bin is about to fill. This will help to reduce the overflow of the garbage bin and thus keeping the environment clean.

II. COMPONENTS

A. Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

B. Arduino Microcontroller

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. Secondly, Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Furthermore, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.

C. Breadboard and Jumper Wires

A breadboard is a construction base for prototyping of electronics. "Breadboard" is also a synonym for "prototype". Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs). In our scenario we have used breadboard for connecting wires. We have used jump wires also called as jumper wires. In our system, Jumper wires are used for making connections between items on your breadboard and Arduino header pins.

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D. Raspberry pi

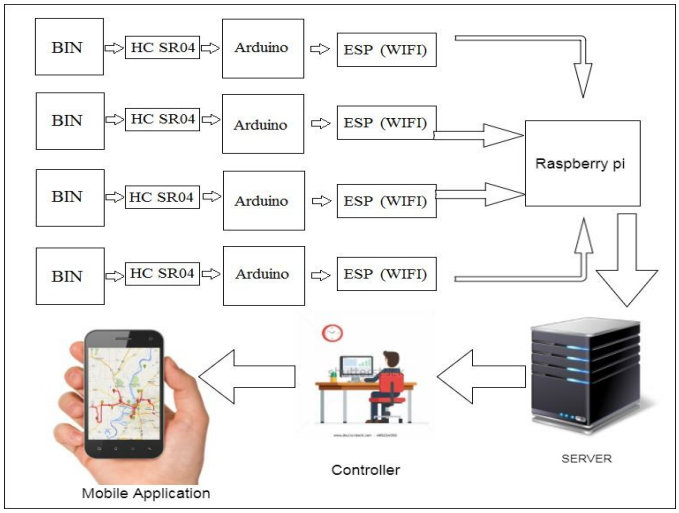
The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

E. Serial Wifi Wireless Transceiver Module

ESP8266 is a chip which is wireless network microcontroller module. It will be a system-on-a-chip (SoC) with capabilities for 2.4 GHz Wi-Fi, general-purpose input/output etc.

III. ARCHITECTURE

To achieve a smart waste system, we have used components such as ultrasonic sensors, microcontroller, raspberry pi as explained above which are capable of notifying waste level status. In our system the sensors placed in the bin sense the level of the garbage in that bin. On reaching the the threshold a command is generated through which the authorized person will come to know about the location where the bin is about to fill. The authorized person conveys this notification to the garbage collectors with the help of an android application. The architecture can be clearly understood with the help of the below figure. According to the figure, the Ultrasonic sensors attached in the bins send the level of trash in their respective bins to arduino board. Arduino board sends this data with its unique bin number attached to it to the raspberry pi. Data is sent to the raspberry pi via wifi using ESP8266 wifi module for arduino and onboard wifi on the raspberry pi Raspberry pi sends data to a server which manages the data on city level. This data is then used to calculate optimized path for the trucks to follow. This Data is sent to the trucks via the system admin.



In the cloud, the real time analysis has to be carried out to generate various reports like- area generating maximum waste, seasonal or function reports on waste, segregation reports etc. which can help the authority with better strategies for waste management. The proposed architecture assumes a backup server be provided by the cloud service provider. Along with the real time analysis, the optimized route for collecting the garbage will be found using Google maps. This will provide the advantage of saving fuel costs.The authority would view all the reports, optimized routes and all the data related to the garbage bins. The person accordingly will direct the garbage collectors for the collection of garbage and make efficient plans for the garbage management.

IV. IMPLEMENTATION METHODOLOGY

A. Hardware Components Implementation

In this scenario, Every bin will be given a unique id. A database will be maintained containing the information about which dustbin to be placed in which area by their corresponding ids. The bin will have ultrasonic sensor from which the level of garbage can be detected. In detail, Ultrasonic sensors are used to detect the level of bin. An ultrasonic sensor is installed in the waste bin and detects the fill level regardless of what has been deposited inside. As we studied the definition of ultrasonic sensor earlier we know that Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. In this case, the object is the waste and the sensor is used for measuring the level of bins. The level of garbage will be depicted in terms of distance between

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the sensor and garbage in dustbin. In this scenario, Every bin will be given a unique id. A database will be maintained containing the information about which dustbin to be placed in which area by their corresponding ids. The bin will have ultrasonic sensor from which the level of garbage can be detected. In detail, Ultrasonic sensors are used to detect the level of bin. An ultrasonic sensor is installed in the waste bin and detects the fill level regardless of what has been deposited inside. As we studied the definition of ultrasonic sensor earlier we know that Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. In this case, the object is the waste and the sensor is used for measuring the level of bins.The level of garbage will be depicted in terms of distance between the sensor and garbage in dustbin.

A. Admin Implementation

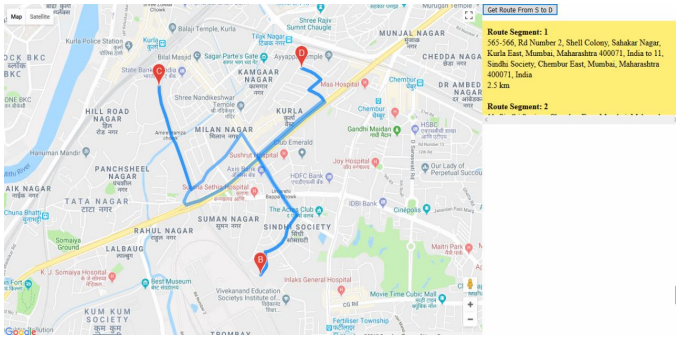
From the collected data, admin will get to know about real-time garbage level, and he will be able to monitor the trucks and their operations on collecting waste from the locations. Admin has responsibility to add any new bin locations and any new truck information which is used to run and maintain this system efficiently. For this admin there is a web portal in which admin has access to information about the level of trash in all the bins and the updation of all the bin information and truck information is done using this web portal. This web portal is made using html, javascript, jquery and bootstrap for client side processing and php for server side processing. Database is implemented using mysql.

B. Route Optimisation

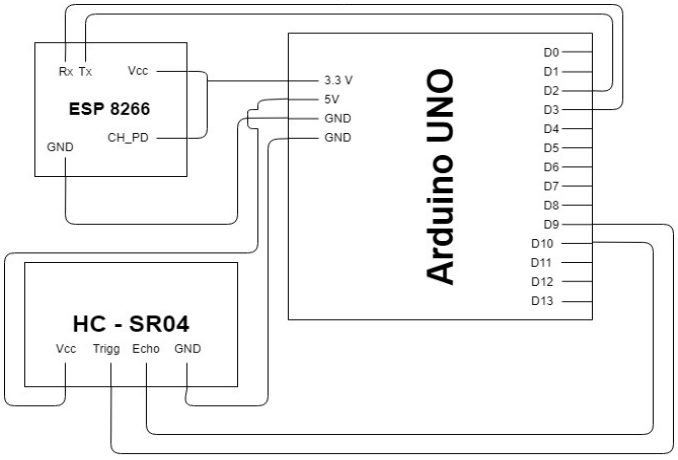
Google Apis are used in our application for 2 applications. Locator and Route Optimisation.
Locator Application is used for seeing the overview of all the bins and adding any new bins.
Route Optimization is done using Google Maps Directions and Waypoints Api.
This Gives us the optimized route to from the origin of the truck to the dumping area with stops at places where the collector has to collect the trash.

V. IMAGES OF IMPLEMENTATION

Route Generation



Circuit Diagram



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Prototype Installation

VI. COST COMPARISON AND FEASIBILITY STUDY

Cost comparison on expenditure of three cities with respect to areas and population detailed below. Three cities are New York, Bangalore, and Mumbai.

Population :

NYC -> 8.538 million

Bangalore-> 8.426 million

Mumbai -> 18.41 million

Area

NYC -> 789 km2

Bangalore-> 709 km2

Mumbai -> 603 km2

Expense on Waste Management Annually:

NYC -> $ 2200 Million

Bangalore -> $ 13 Million

Mumbai -> $ 40 Million

Per km2 amount spent on waste management Annually:

NYC -> $ 2.7 million (Rs. 17,55,00,000)

Bangalore -> $ 0.018 million (Rs. 11,91,775)

Mumbai -> $ 0.066 million (Rs. 43,11,710)

According to above statistics New York city spends 151% more on Waste Management than Bangalore and spends 40% more than Mumbai per square kilometer area. For Development of our country there has to be more funds allocated and better techniques to manage waste. Our Proposed System would require funds to set up but would save cost on collection which would be better for long term. Also this system would result in more efficient system which is required in our cities.

VII. CONCLUSION

This paper shows the implementation of smart Trash management system using ultrasonic sensor, arduino micro controller, and other required components.This system ensures that the garbage is cleared as soon as it is garbage level reaches its maximum. This Project aims for the betterment of smart city and technology solutions are provided to manage the waste in the cost effective manner by savings the fund for collection and transportation. The information is processed with very less human intervention the collection of levels and storing and generation of route is done automatically therefore there is less chance of error. Google provides the best algorithm for the route optimization and navigation for the truck drivers to follow. Therefore our System improves the current waste collection and transportation to reduce costs and keep the environment cleaner and also our smart waste management system makes the garbage collection more efficient and hygienic.

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REFERENCES

[1] R. Dhaya, Preethi Pattabiraman, Shaik Shahrukh and J. Aravindh, "Smart Waste Management Using Internet of Things (Iota)", Middle-East Journal of Scientific Research 24 (10): 3358-3361, 2016
[2] Mrs.D.Anuradha, A.Vanitha, S.Padma Priya, S.Maheshwari, "Waste Management System Using Iot", International Journal of Computer Science Trends and Technology (IJCST) – Volume 5 Issue 2, Mar – Apr 20
[3] Parkash, Prabu V, "IoT Based Waste Management for Smart City", International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 2, February 201
[4] MR. RANJITH H D, MS. HARSHITHA CHANDRASHEKAR NAIK, MS. AKSHATA RAJASHANKAR NAIK, MS. HARSHITHA K P, "IOT BASED AUTOMATIC WASTE MANAGEMENT ", PROJECT REFERENCE NO.:39S_BE_0384, MANGALORE INSTITUTE OF TECHNOLOGY AND ENGINEERING, MANGALUR
[5] Alexey Medvedev, Petr Fedchenkov, Arkady Zaslavsky, Theodoros Anagnostopoulos, Sergey Khoruzhnikov, "", Lecture Notes in Computer Science book series (LNCS, volume 9247
[6] M. Saranya , Dr.S.Dhinakaran, "Implementation of Traveling Salesman's Problem Using Neural Network", International Journal of Computer & Organization Trends –Volume3 Issue4 – May 201
[7] Chaitanya Pothineni, "Travelling Salesman Problem using Branch and Bound Approach", http://cs.indstate.edu
[8] insung Hong, Sunghoi Park, Beomseok Lee, Jaekeun Lee, Daebeom Jeong, and Sehyun Park, "IoT-Based Smart Garbage System for Efficient Food Waste Management", The Scientific World Journal Volume 2014 (2014), Article ID 646953, 13 pag
[9] Suchitra M, Zehru Nissa Shah, "Costs and benefits of India's waste disposal options", downtoearth.org.i
[10] Carol Kellermann, "Managing New York City Garbage Is Exceptionally Expensive", huffingtonpost.com

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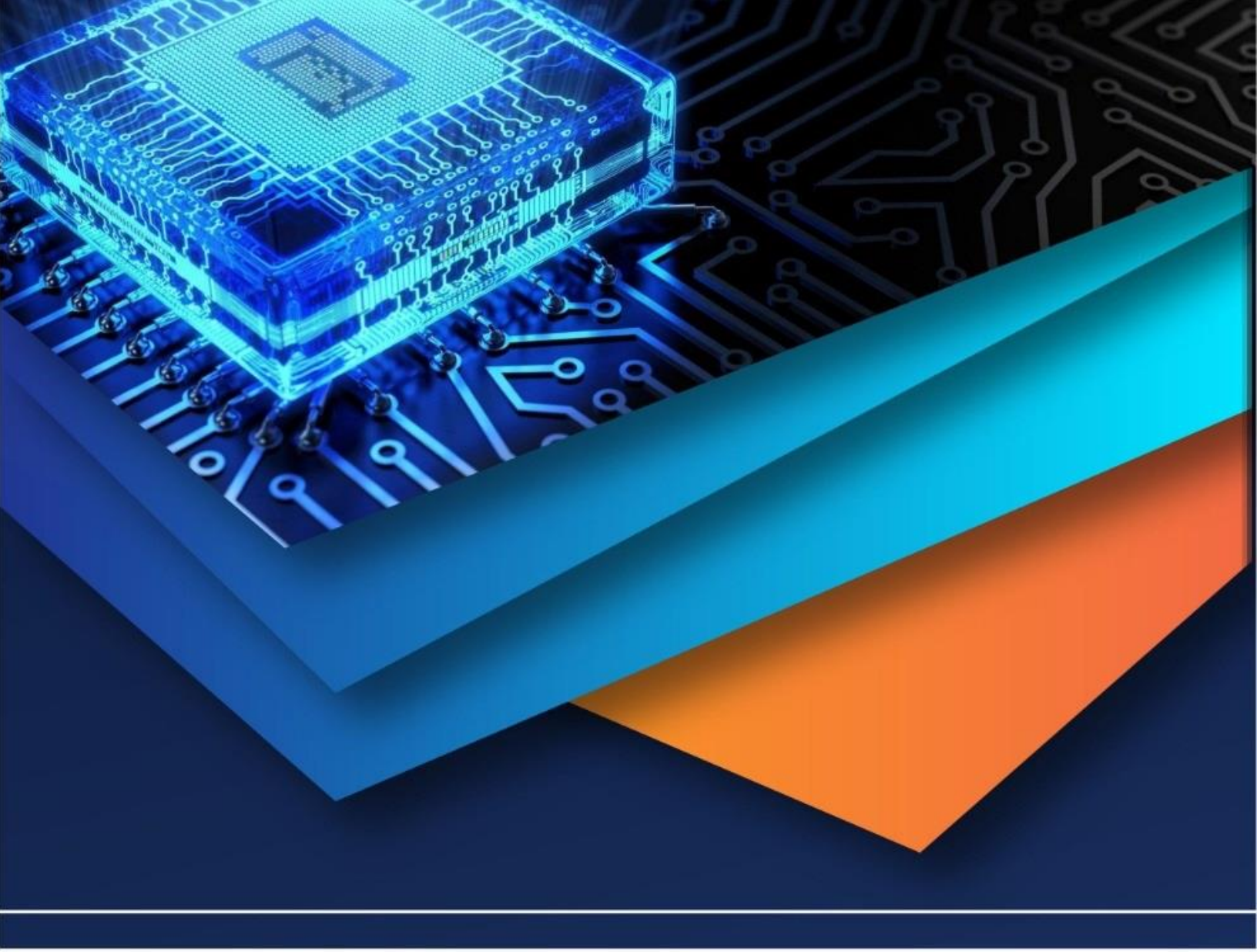

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