



Smart Routing Approach Based On A-Star Algorithm for Garbage Collection

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Abstract- Rapid increase in population, has led to improper waste management in metropolitan cities resulting in increased pests and spreading of diseases. In case if the waste is not disposed within a stipulated time, it tends to create serious health hazards and reflects negatively on the infrastructure. The existing garbage disposal system, where it is collected from the streets, houses and other establishments once a day, is not able to effectively manage the waste generated, resulting either in spill over or the bin exist in unfilled condition it leads to waste fuel consumption to the vehicle if the bin is unfilled.

Hence here we proposed an efficient method to dispose this waste has been designed with Wireless Sensor Networks (WSN). We proposed a model in which the collection of garbage is made real time. A network is established using wireless sensor nodes with each dustbin attached to a sensor circuitry (Ultrasonic sensor, gas sensor), which continuously senses the status of the dustbin and sends a signal to the nearest Road Side Unit (RSU) when it is full. The RSU further transmits the same signal to other RSUs until it reaches the Garbage Collecting Vehicle (GCV) which arrives at the place where the dustbin is located and collects the garbage. Also we used the shortest path finding algorithm to navigate the Garbage Collecting Vehicle to the destination.

I. INTRODUCTION

Now-a-days increase in population, industries and changes in living lifestyle increases the amount of solid waste. Currently, world cities generate about 1.3billion tonnes of solid waste per year. This volume is expected to increase to 2.2 billion tonnes by 2025. Waste generation rates will more than double over the next twenty years in lower income countries. The global impacts of solidwaste or growing fast. Solid waste is a large source of methane.

This paper aims in structuring a state of the art review on Internet of Things (IoT).IoT describes a world where just about anything can be connected and communicate in an intelligent fashion. With the IoT, the physical world is becoming one big information system. The IoT computing concept that describes the idea of everyday physical

objects being connected to the internet and being able to identify themselves to other devices. In this project the majority of process is done with the help of sensors in IoT. Sensors are deployed everywhere and these sensors convert raw physical data into digital signals and transmit them to its control center. By using this information sever can identify the level of the bin and detect the abnormal gases. This conceptual structure would be helpful in real time scenario.

II.LITERATURE REVIEW

[1]A decision support approach for postal delivery and waste collection services by Lorenzo Abbatecola, Maria Pia Fanti, Agostino Marcello Mangini and Walter Ukovich.This paper gave us the details about Urban Decision Support System such as the optimal planning of the vehicle



assignment and routing in different services.

[2] Internet of Things for Smart Cities by Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Michele Zorzi. This paper provides the information about comprehensive survey of the enabling technologies, protocols and architecture for an urban IoT.

[3] Design and construction of microcontroller based wireless remote controlled industrialelectrical appliances using ZigBee technology by Lu Mai, Min Zaw Oo. It gave the idea of intelligent device control and secure environmental working conditions by interfacing various sensors and devices to the PIC 16F877A microcontroller and ZigBee modules with PIC controller for data transmission.

[4] Distance measurement of an object or obstacle by Ultrasound sensors using P89C51RD2 by A.K. Shrivastava, A. Verma, and S.P. Singh. This paper gave the overview working of distance measurement of an obstacle by using separate ultrasonic transmitter, receiver and a microcontroller is presented.

[5] Smart Garbage collection indicator using RF (ZigBee) and GSM technology. This paper gave the details for the module required for transmission of the data to the receiver side and also the main channel follow of the project. Initially we used GSM technology for our project but later on decided to use Wi-Fi module for the ease of data transmission.

[6] In vehicular ad hoc networks (VANETs), because of the nonexistence of end-to-end connections, it is essential that nodes take advantage of connection opportunities to forward messages to make end-to-end messaging possible. Thus, it is crucial to make sure that nodes have incentives to forward messages for others, despite the fact that the routing protocols in VANETs are different from traditional end-to-end routing protocols.

[7] Smart garbage collection bin overflows indicator using IoT by Vishesh Kumar kurre. It

gave us the overall working of the IoT based waste collection bin.

III. PROPOSED SYSTEM

There are some factors that must be considered when designing a smart bin system. The system is invented to be low-priced, scalable and it should be user friendly that is why we use ultrasonic, gas sensor and PIC 16F877A microcontroller to minimize the cost.

SYSTEM ARCHITECTURE

a. microcontroller PIC 16F877A:

PIC is the specialized microcontroller chip. It contains 14.3kbytes flash memory, 368 bytes data SRAM, 256 bytes data EEPROM. It has watch dog timer with on-chip RC oscillator, power saving sleep mode. It has a total number of 40 pins and there are 33 pins for input and output.

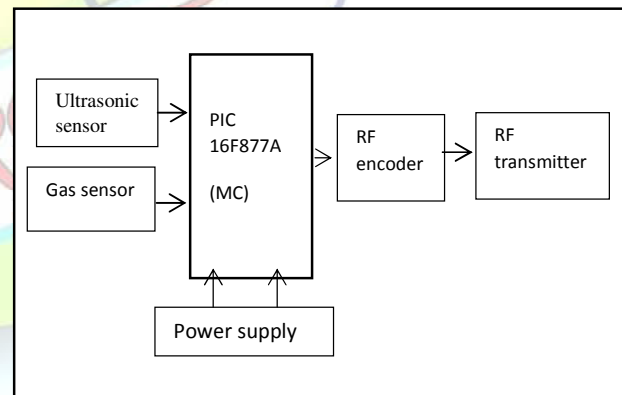


Fig 1: Smart bin

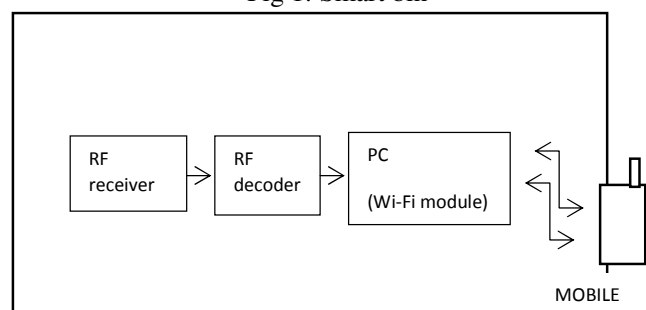


Fig 2: Server



b. ZigBee Transceiver:

ZigBee transceiver provides bi-directional communication. It is a low cost, low power, wireless mesh network standard. It has a defined rate of 250kbit/s. It has high data throughput.

c. Gas sensor:

Gas sensor is capable of sensing decomposing gases. It operates in the voltage range of 5V-12V DC. When a gas interacts with this sensor, it is first ionized into its constituents and is then absorbed by the sensing element. This absorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current.

d. Ultrasonic sensor:

Ultrasonic sensor is ideal for non-contact level sensing. It emits high frequency, "ultra" sonic acoustic waves. Its frequency is 20 kHz to 200 kHz. It uses electrical-mechanical energy transformation to measure distance from the sensor to the target object. It uses sound waves rather than light, making them ideal for stable detection of uneven surfaces, liquids, clear objects, and objects in the dirty environments.

e. A-Star algorithm:

A-Star algorithm is a computer algorithm that is widely used in pathfinding and graph traversal, the process of plotting an efficiently directed path between multiple points, called nodes. It enjoys widespread use due to its performance and accuracy.

f. Wi-Fi Module:

802.11 b/g/n protocol, Wi-Fi Direct (P2P), soft-AP, Integrated TCP/IP protocol stack. Wi-Fi Module helps us to send the details of the dustbin at the receiver side.

IV. CONCLUSION

This project work is the implementation of smart bin management system using Ultrasonic sensor, Gas sensor, PIC microcontroller, ZigBee transceiver and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches the maximum or when the unwanted gas is detected. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. A-Star algorithm reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient. These dust bin model can be applied to any of the smart cities around the world. A waste collection and monitoring team which is deployed for collection of garbage from the city can be guided in a well manner for collection.

V. FUTURE ENHANCEMENT

Smart bin helps us to reduce the pollution. Many times garbage bin is overflow and many animals like dogs, rats enter inside the dustbin. This creates a bad scene. This project can avoid such situations. With minimal improvements in this project can be directly applicable for real time application.

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