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IOT – BASED WIRELESS SENSORS FOR ENVIRONMENTAL MONITORING AND SMART GARBAGE MONITORING

Aravindhan R[1], Arun S B[2], Saran Venkatesh S[3]

[1,2,3]*UG Student, Dept. of Electronics and Communication Engineering, Coimbatore, Tamil Nadu, India*

Abstract - *A system where the garbage management is effectively monitored with minimal intervention of manual effort is known as smart garbage management. In smart garbage management, the data is collected with the help of sensor, processed with a controller and is interfaced with the wireless technology. The data which is processed is checked for criticality and based on the need, the data is sent to the authorized persons with the help of internet. The sensor plays a major role in monitoring the humidity in a particular region. The sensed data is sent to the nearest control station. A GPS is interfaced with the sensing module to track the location and the nearest control station.*

Key Words: Sensor, GSM Module, Raspberry Pi, Smart Garbage Management.

1. INTRODUCTION

The major concern in the current situation is to keep a city clean with minimum effort and maximal gain. The failure of the garbage management would lead to a serious polluting factor which would adversely affect the health condition of people and the environment. The current system available depends on a maximum manual effort to manage the waste. At most cases, this management is challenging as there would be a variation in pollution density. This variation in the density of pollution makes it difficult to determine the area which requires immediate attention. Hence some areas which would require immediate attention is left unattended. This factor contributes to a high rate of pollution. In the manual maintenance of waste, the accuracy of need and the speed of action is very less when compared to the automated smart garbage management system. The smart garbage management system plays a vital role in maintaining environmental health. The system comprises of sensors which help is collecting the data at its peak of accuracy. The data thus fetched needs to be processed. The processed data is fed into a controller which helps to control the functionality of the system by transmitting the data according to its importance to the nearest control station. A GPS tracker is positioned in the smart garbage management which tend to track the location which requires immediate attention. IOT is a technology which is used to transmit the processed data and location to the control center via the internet.

2. EXISTING SYSTEM

2.1 ARDUINO WITH GSM MODEM IN GARBAGE MANAGEMENT:

This system uses a platform based on Arduino UNO which acts as a controller and processor to fetch the data. The information thus obtained is transmitted to the concerned authority with the help of a GSM modem. This system the sensor was placed on the top of the bin. Once the bin is filled the sensor senses the data and the data is shared to the control station to empty the bin.

2.2 MICROCONTROLLER WITH IR WIRELESS SYSTEM IN GARBAGE MANAGEMENT:

This system uses a micro-controller which is interfaced with the wireless technology and a sensor to collect data and the data is sent to the centralized system. The data is shared with the authority via the webpage. This system used a weight based sensor to reduce cost.

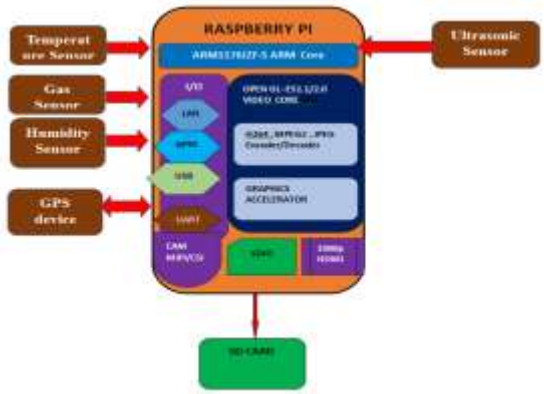
2.3 ULTRASONIC SENSOR WITH GSM MODEM IN GARBAGE MANAGEMENT:

This system used an ultrasonic sensor to fetch the data based on bin condition. The data is passed to the control center with the GSM modem. The system uses a MATLAB based GUI to transfer the data to the destined authority. The system consists of a slave and a master unit. The slave unit was the bin and the master unit was the control center.

3. PROPOSED SYSTEM

This system is based on IoT technology which incorporates the data processed from raspberry pi and the sensors. Based on criticality the processed information is shared to the destined control center via the internet. The data is accessed in the web and the alert is also shared to the authority via SMS. This system uses a GPS module. The need of the GPS module is to track the location that which requires immediate attention.

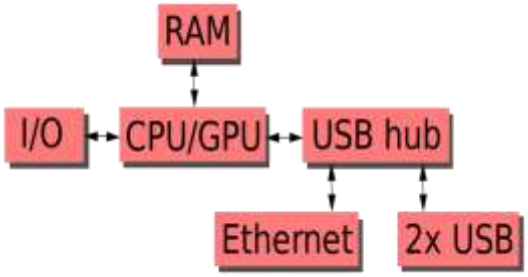
3.1 BLOCK DIAGRAM



Block diagram shows the interface of hardware modules used in IOT based smart garbage management. The Raspberry PI acts as a master unit in processing and controlling the data obtained from various sensors. The GPS module is used to track the location and coveys the information both to the master unit and the control center. The controller function is fed to the raspberry pi with the help of SD card duped with code. The code used in this system uses Python language which is supported by Raspbian Jessie OS. The information is passed to the authorized center which is viewed on the web. The protocol used is HTTP and UTP.

3.1.1 RASPBERRY PI MODEL B

The Raspberry Pi Model B has an inbuilt WiFi, Bluetooth and USB boot capabilities. It has 1.2GHZz 64bit quad-core processor.



The block diagram shows the capabilities of the Raspberry Pi. It has an I/O port which is used to connect with other hardware devices. The module consists of the Central processing unit which is used to process the data fed. It's generally 3 times faster than the Ethernet.

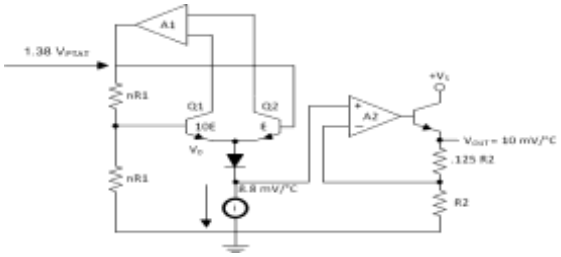
3.1.2 GPS DEVICE

The GPS device is used to track the location based on the information received from GPS satellites. GPS receiver receives the data transmitted from the GPS satellites. The transmission and signals are sent at the same time. Based on the difference in time taken for reception from transmission of signals the distance is calculated and the location is spotted.

3.1.3 SENSORS

The system uses four different sensors to determine the accurate need and time to clean a particular area. The different sensors used are:

TEMPERATURE SENSOR



The functional diagram represents the temperature sensor used which is LM35. The output voltage is linearly proportional to the temperature sensed. It has a very low self-heating capacity and draws very less power of about 60 micro Ampere current from the power supply.

HUMIDITY SENSOR

The diagram shows the humidity sensor DHT 11. It has high reliability and long term stability. The sensor incorporates a resistive element and a wet NTC. It works on a 5V supply voltage.

GAS SENSOR

The gas sensor used is MQ6. This is an LPG gas sensor. It is used is detecting the gas leakage in consumer and in industry levels. The sensor requires a supply voltage of 5V. The sensor is used to detect gases like LPG, iso-butane, propane. The sensor is highly sensitive. A potentiometer is used to adjust the sensitivity of the sensor.

ULTRASONIC SENSOR

Ultrasonic sensors use the ultrasonic waves to measure the distance. The distance is calculated based on the transmitted and received signals. The distance is calculated with the formula L=1/2*T*C.

3.2 FLOW CHART

The flow of the smart garbage management system is that the environment is continuously monitored with factors such as temperature, humidity, gas level with the help of sensors. The ultrasonic sensor is used to detect the distance up to which the area is affected. The values thus collected are processed and the condition is checked. If the values exceed the threshold value then the GPS is triggered to track the location. The location thus tracked is sent to the nearest control unit with help of IOT technology. The values are monitored and the area is tracked via the web page.

4. CONCLUSION AND FUTURE WORK

The smart garbage management system is the most required technology to maintain environmental health. The system detects the area where the garbage needs to be monitored and the required action is taken to clean up the place immediately by transferring the information collected to the nearest control center. The system will be improvised by implementing an automated recycling process which would reduce pollution to a greater extent.

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