Smartbin System A New Approach for Waste Management

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Abstract: Solid waste management becomes most critical issue in our country with the increase population rate. It leads no. of health, social, environmental issues. In this paper we present an underground smart bin system that mainly based on sensor technology. The sensor unit includes ultrasonic, weight, temperature, gas and humidity sensor that indicates the status of the bin. By obtaining this information the cleaner authority can takes necessary actions for removing the garbage in a proper and safe way. This prevents overflowing of garbage in the roadside dustbin which ends up giving bad smell and illness to people.

Keywords: Arduino UNO, LabVIEW, Sensors, Servomotor.

I.INTRODUCTION

India faces major environmental challenges associated with waste generation, inadequate waste collection, transport, management and its disposal. Due to the increase population growth, urbanization and the lack of public awareness towards the waste management the volume of municipal waste is increasing very highly. The most important priorities are to ensure a clean and healthy globe and to protect the urban environment. A national campaign called "Swachh Bharat Abhiyan" is initiated by the Government of India which covers 4,041 cities and towns to clean the streets, roads and infrastructure of cities, smaller towns and rural areas [1].Specially, in the developing countries, not only waste monitoring but also management is becoming a serious problem for their urbanization and economic development. The factors found by researcher are mainly economical, technical and administrative those affect the municipal solid waste management [7].

Dustbin is a basic need in everywhere. In public place, dustbins are being overflowed as well as the garbage spills out resulting in pollution and also increase disease. Hence, the management of waste through underground developed infrastructure can be looked as an important evolution in the modern society.

Technology makes human's life easier. All the equipments we used in our day to day life are related to different types of technology. It's like sensor technology, communication techniques etc. In present day's sensors are deployed everywhere and these sensors convert raw physical data into digital signals and transmits them to its control centre. By this way we can maintain the waste management system properly. In this project sensor plays a vital role by sensing the condition of the bin and giving the data for the cleaner authority which displayed in a LCD display. The authority gets the result and they can take necessary action before it harms people and environment. The ultrasonic sensor is used for automatic opening and closing of bin door, weight sensor indicates weights and gives alarms before it gets overload, humidity sensor indicates the humidity level, the temperature sensor indicates temperature and the gas sensor which gives signal if any toxic gas is present inside the bin. The design of underground dustbin system helps the municipal authority for immediate

cleaning of dustbin by giving the status of the dustbins and gives us one of the most efficient ways to keep our environment clean and green.

II. EXISTING SYSTEM OF WASTE MANAGEMENT AND ITS DRAWBACKS

Being healthy is the most important fact to live our life happily. Current waste management systems are not sophisticated enough to achieve a robust and efficient management mechanism. Municipal Corporation placed the garbage bins openly and due to the irregular removal of garbage it overloaded and spread near the bins. Bad waste management can easily result in air pollution and soil contamination. They have an adverse effect on human health [2]. The air pollution generally leads to various respiratory problems like COPD, asthma etc. Breeding of mosquitoes and houseflies occur mainly in garbage which are a major cause for various diseases like malaria, dengue, etc. A city with poor sanitation and smelly environment can never be a healthy place to live in. Hence an Underground dustbin system is more efficient for preventing the overloading of garbage and thereby preventing widespread of disease to great extent and helps to maintain a clean environment in the city.

III. NEED FOR IMPROVEMENT IN WASTE MANAGEMENT SYSTEM

- With the increasing population rate and the urbanization of the areas, the management of waste becomes a key issue for the health.
- Efficient and energy saving waste management, reducing air pollution and vehicle exhaust emissions.
- Sometimes the collected waste is simply burned by the roadside. It can pollute air and drinking water, and spread disease to people living nearby.
- Even with great route optimization, the workers still physically go to the dustbin to check the waste levels. Because of this, trucks often visit containers that do not need emptying, which is the wastes of both time and fuel.
- Waste management prevents any harm to human health and the environment by reducing the volume and hazardous character of residential and industrial waste.
- Improving proper waste management will reduce pollution, recycle useful materials and keep environment clean.

IV. BLOCK DIAGRAM OF THE SYSTEM

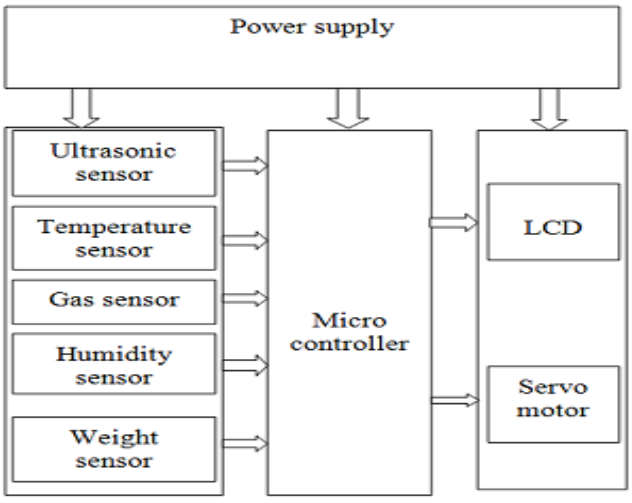

Fig 1: Block Diagram

As shown in the block diagram the system consist of three parts –

1. Input
2. Controller
3. Output.

The inputs are the analog sensors, which are- toxic gas sensor, humidity sensor, temperature sensor, weight sensor and an ultrasonic sensor.
The controller receives signals from the sensors; it compares these signals with set point data and operates the controlling signal using on-off control action.
Two servo motors are act as final control element in the output of the system. One is used for opening the bin door, if all the sensors are in normal condition and ultrasonic sensor detect the presence of any human being near the bin. A 16×2 LCD is also available in the output for displaying the information of the parameter being measured.
Another one will help to lifting up the container. When the containers get filled and the municipal authority came to clean it; the motor will run and the container goes up.

V.WORKING

This system is proposed for roadside dustbins. The sensor plays the most vital role in this system. Ultrasonic sensor is used to sense the position of a human being near the bin. Under the normal condition of all other sensors when a person is detected near the bin, a signal will send to the servomotor through the controller and the door will be automatically opened for the set time and after that the door became closed. Temperature sensor is used to detect the temperature level inside the bin, gas sensor gives the information if any toxic gas is produced inside the bin, humidity sensor is used to detect humidity level and the weight sensor is used to indicate the weight of the garbage. Arduino UNO is programmed in the way that if any critical condition is recognized by the system the door of the bin will closed until authority takes it necessary action. All the information of the parameters is displayed in LCD.

Flow Chart of the System:
Fig 2 shows the flow chart of the system.

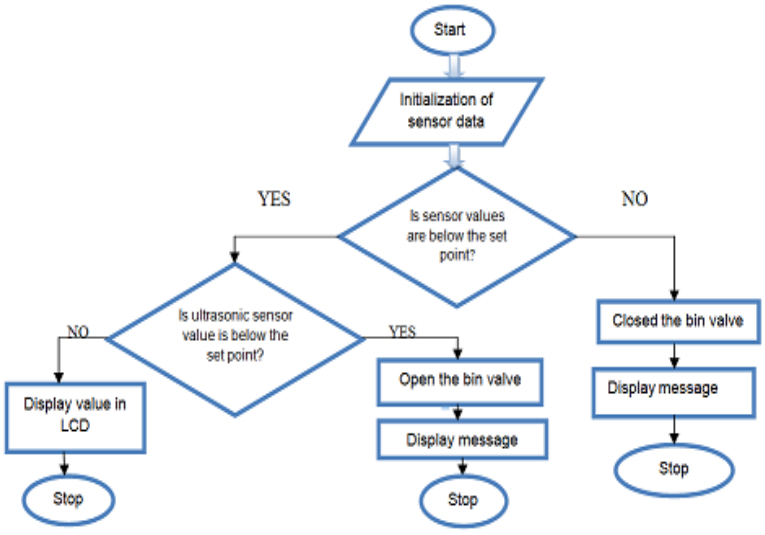

Fig 2: Flow Chart

VI. SIMULATION OF THE PROJECT

Simulation is done using labVIEW software and it is shown in the fig 3.

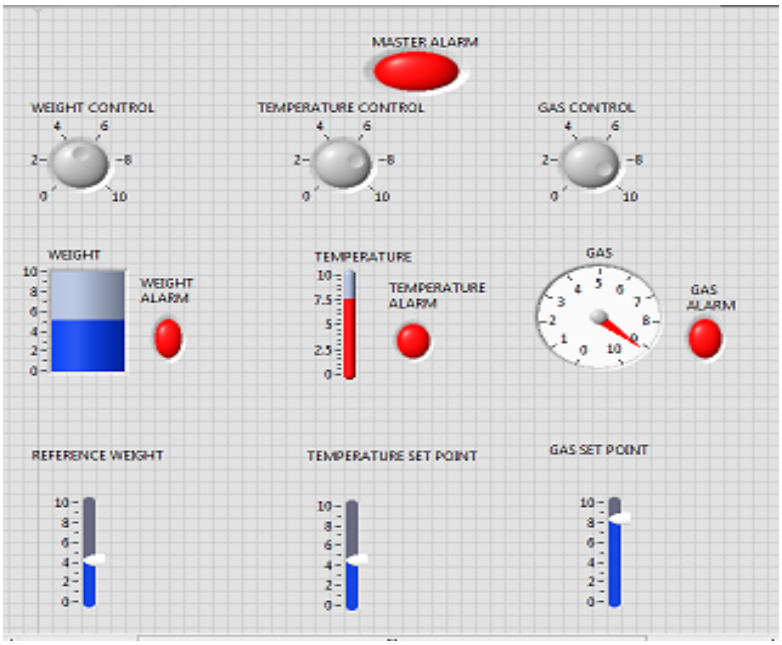

Fig 3: LabVIEW front panel diagram

As shown in the fig 3, a “set point” is given for each of the parameter and this set point can be controlled manually. When any one of the parameter value is increased above the set point value, the system trigger an alarm system to gain the attention of the operator.

Hardware model is shown in fig 4-

Fig 4: Actual Hardware Model

VII. RESULT AND DISCUSSION

The proposed system mainly based on sensor technology and the sensors sense their respective parameters as per the program.
After the implementation of hardware we observe the following results for the system-

1. Weight of the garbage, temperature, humidity level and toxic gas inside the bin are detected.
2. Real time data can be obtained.
3. Avoid the situation of garbage overflowed.
4. Safe and secure system for the environment and society.
5. Since the system can be monitored through Lab VIEW, which make the system more versatile. Fig 5 shows the lab VIEW interfacing of the system.

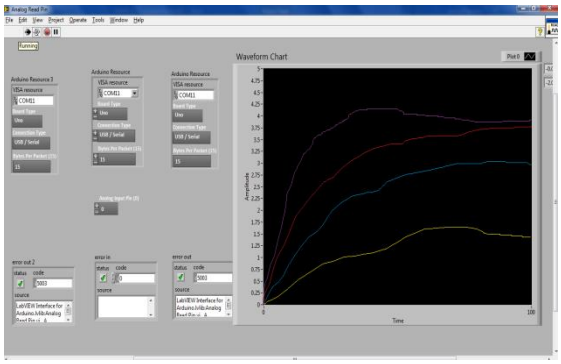

Fig 5: Lab VIEW interfacing

As seen in the figure four signals can be obtained in the graph from four analog sensors.

- Humidity- purple color
- Gas- red color
- Temperature- blue color
- Weight – yellow color

The graphs are obtained in Voltage magnitude form, which can be further calibrated and converted into its actual unit.

VIII. CONCLUSION

Due to lack of proper maintenance, the waste management becomes more critical issues for our society. Improvement of the existing municipality waste management system using different technology is most important which maintains the system properly. This project focuses on building a model of underground waste management system which keeps our city clean and healthy and keeps the cleaning authority updated by providing status of the bin.

IX. REFERENCES

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