

Automated Stench Analysis for Smart Cities

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Abstract— Stench is the biggest problem faced in India. The smell emanating from the public toilets and landfills causes health issues. Waste management refers to the collection, transportation, disposal and monitoring of waste. Curb side collection, incineration is the most common method used to dispose the waste. The gases released from landfills cause diseases like asthma, cholera, various skin diseases etc. The gases emitting from the garbage are methane, carbon monoxide, carbon dioxide, nitrogen etc. the main gas emanating from the public toilets is ammonia. The severity of these gases can be known by deploying the sensors in garbage disposal areas (or public toilets) and notified to the concerned authorities.

Index Terms— Landfill gas, GSM, stench, Internet of Things (IoT), Data analysis.

1 INTRODUCTION

Smart city is one of the latest innovations rigorously pursued by the government of India. It includes smart transportation, latest technologies, better living conditions, smart waste disposal, etc. Though we can see significant improvements, the biggest problem faced by our country at present is waste management. India being one of the most populated countries, waste management has become one of the key challenges. Even in this modern era, we can see people disposing garbage, defecating in open places, burning waste materials, etc. When too much garbage is dumped in a particular place, it causes foul smell, due to which sickness and diseases start to spread. If people complain about it to authorities, the garbage will be moved to another piece of land which is probably a landfill.

This paper focuses on tackling the problem of filth in the public places. It is mainly concerned with identifying the malodour, analyzing it and reporting to the concerned civic authorities. To implement this, we are using IoT and data analysis.

The Internet of Things (IoT) is the inter-networking of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators and network connectivity that enable these objects to collect and exchange data. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grid, smart homes, smart cities, intelligent transportations, virtual power plants and so on.

Data analysis, also known as data analytics, is a process of inspecting, cleansing, transforming and modeling data with the goal of discovering useful information, suggesting conclusions and supporting decision making.

2 LITERATURE REVIEW

Waste management is one of the major problems that the world is facing today, irrespective of developing or developed country. The main issue in the waste management is that the garbage bins overflow even before the authority could clean on the decided schedule. This in turn leads to various hazards like bad odour and may cause diseases if it exists for a long time. Although there have been many innovations in this regard, such as the smart waste management using Arduino [4], smell is still a persisting problem in countries like India.

As per the estimates of Central Pollution Control Board (CPCB), at present, in India 62 million tonnes of waste is generated every year. Of this, 43 million tonnes are collected, out of which, 11.9 million tonnes are treated and 31 million tonnes are dumped in landfill sites. The malodour produced from the garbage creates health problems like vomiting, headaches, nausea, children unable to sleep, breathing difficulties, discomfort for elderly people, etc [1]. The existing smart bin system can be used for the smart waste management [4]. However, awareness about cleanliness and usage of smart bins should be created among the people.

The Landfill Gas (LFG) contains different gases like methane and carbon dioxide, which make up to 90 to 98% of the LFG [2]. This gas is produced due to the breakdown of the organic waste of the bacteria. Methane, which is a greenhouse gas, has 20 times more potential compared to carbon dioxide. It can be transformed to carbon dioxide to minimize the environmental impacts. Besides, plants can be installed at the landfill sites to extract the methane, so that it can be used as a fuel to electric energy generation. So far, the LFG recovery has been shown economically feasible at 7 landfills located in Delhi, Mumbai, Kolkata, Ahmedabad [3].

3 PROPOSED SYSTEM

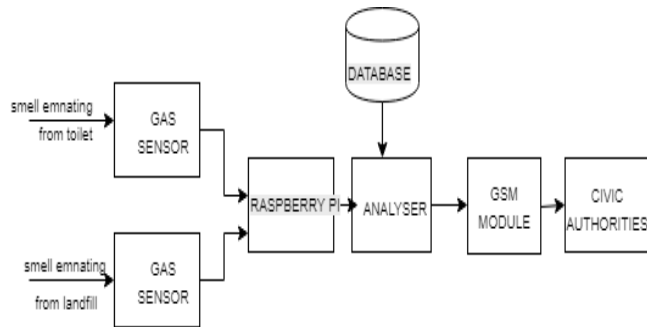
The proposed system has the following objectives:

- Identification of toxic gases released by burning waste materials in public or garbage disposal areas, which affect the health of children and senior citizens.

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- To detect the foul smell emanating from garbage (landfills) and escalating this problem to the concerned authorities.
- To analyze the stench emanating from the public toilets.

4 IMPLEMENTATION



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4.1



The Raspberry Pi is a series of small computers which does not include the peripherals. An SD card inserted into the slot on the board acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA TV set, a more modern monitor or a TV using HDMI port.



4.2 Gas Sensors

Fig.3 Gas sensor

Gas sensors are used to detect and analyze the gases. They are usually chemical sensors that convert information from the surrounding environment into electric signals. There are many gas sensors available today. MQ-135 is used to detect ammonia and carbon dioxide, MQ-4 is used to detect Methane.

4.3 MCP3008



Fig 3.MCP3008 ADC

MCP3008 is an analog to digital converter (ADC) which combines high performance and low power consumption in a small package, making it ideal for embedded control applications.

4.4 GSM Module

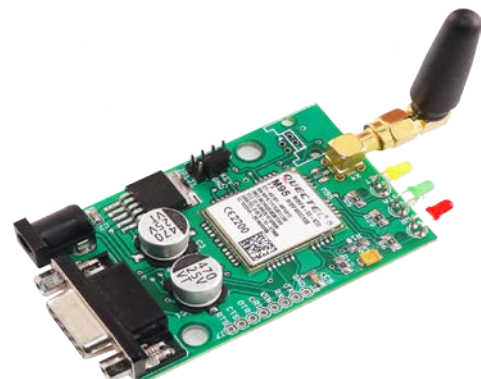


Fig.4 GSM Module

Global System for Mobile communications (GSM) is a chip or circuit that is used to establish a connection between a mobile or a computing device.

7 CONCLUSION AND FUTURE WORK

From the studies, it has been noticed that the toxic gases emanating from landfills and public toilets affect the health of the people living nearby. Hence the proposed system tries to detect the gases which are dangerous and cause diseases or health effects.

As a future work, the existing smart waste management system can be combined with the proposed system to get better results. Also, the electricity authority can be informed, when the amount of methane released in any landfill is sufficient enough to install methane extraction plant there. This will increase the generation of electricity which is economical for our country. It can also be used for other purposes like cooking.

8 REFERENCES

- [1] Martine Vrijheid, "Effects of residence near hazardous waste landfill sites: a review of epidemiologic literature", Environmental Epidemiology Unit, Dept of Public health and policy, London School of Hygiene and Tropical Medicine, London, United Kingdom, Vol 108, March 2000
- [2] Nurul Alia Mohd Rosli, Nadia Kamarrudin, Ku Halim Ku Hamid, Suffiyana Akhbar and Noorsuhana Mohd Yusuf, "Greenhouse Gas Emission of MSW landfill site", IEEE Business Engineering and Industrial Applications Colloquium, 2013
- [3] Sindhoor S, "IoT based garbage alert system", IJCSMC, vol. 5, Issue 9, September 2016, pg. 150-160
- [4] Dr. N. Sathish Kumar, B. Vijayalakshmi, R. Jenifer Prarthana, A. Shankar, "IoT based smart garbage alert system using Arduino UNO", 2016 IEEE region 10 conference (TENCON)