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IOT SOLUTIONS FOR SMART CITIES: GARBAGE BIN MANAGEMENT SYSTEM AND REPORTING TO MUNCIPAL AUTHORITIES

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ABSTRACT

After a dedicated survey and keen observation, it was found that the developing eastern countries are lagging behind in context of cleanliness and hygiene. Deadly Swine Flu is an ongoing example .In order to cope up with the situation, Shree Narendra Modi, PM of India has presented a unique example of a way to achieve cleanliness by launching a campaign popularly known as SWACCHHA BHARAT ABHIYAN (Clean India Mission) in which every individual irrespective post and authority, has to maintain clean surrounding. But it is almost impossible to do so in the contemporary busy world. And here comes the miracle of science and technology.

This project IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of microcontroller, W i- Fi modem for sending data and a buzzer. The web page is built to show the status of the garbage for monitoring by the authorized personal. The web page gives a graphical view of the garbage bins and highlights the garbage collected in color in order to show the level of garbage collected. The system activates the buzzer when the level of garbage collected crosses the set limit.

INTRODUCTION

Internet and its applications have become an integral part of today's human lifestyle. It has become an essential tool in every aspect. Due to the tremendous demand and necessity, researchers went beyond connecting just computers into the web. These researches led to the birth of a

sensational gizmo, Internet of Things (IoT). Communication over the internet is grown from user-user interaction to device - device interactions these day s. Typically, IOT offers advanced connectivity of devices, sy stems, and services that go beyond machine to machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is implemented in nearly all fields of automation enabling advanced applications like a Smart Grid. The term-thingsin the IoT refers to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, or field operation devices that assist fire- fighters in search and rescue. Current market examples include smart home and smart cities

The world is in a stage of upgradation, there is one stinking problem we have to deal with. Garbage! In our daily life, we see the pictures of garbage bins being overfull and all the garbage spills out. This leads to the number of diseases and insects and mosquitoes breed on it.

The waste generation in big cities is increasing rapidly from the last two decades. As per the studies conducted globally, it is expected that the annual solid waste generation will reach around 3.40 billion tones by 2050 that would lead to an approximately cost of $635.5 billion in the management of municipal waste management For the management of waste in smart cities, there are many factors that play a significant role to make the waste management more challenging, for an example, rapid growth of population, shifting of population from small cities to big cities, economic development, growing rate of consumptions of goods, geographical location, system administration, improper way of collection and disposal of waste, inefficient way of waste generation predictions and lack of smart technologies used to support the municipal solid waste management (MSWM) . Improper management of waste in cities results in a huge loss to any smart city, for an example, the economy and precious human life losses have been reported due to sudden free catching in an open waste dumping yards situated in the congested areas of city. It is further noted that any type of waste like solid, liquid or containerized gas that may

easily catch free can cause injury, diseases, economic loss and environmental damages There are two most critical factors that contribute to the generation of waste material at large scale are as (1) growing population in cities and (2) the average mean living standards . While we need to control these two factors, it is also important to come up with an efficient system, techniques and methods to support MSWM and other incidences such as early free detection in a smart city.

PROBLEM STATEMENT

The nation and world are facing a huge problem today of disposal, segregation, and recycling of solid waste and improper management of these wastes are hazardous and dangerous to human health and ecological system. The generation and disposal of waste in large quantities has created a greater concern over time for the world which is adversely affecting the human lives and environmental conditions. Wastes are the one which grows with the growth of the country. A voluminous amount of waste that is generated is disposed of by means which have an adverse effect on the environment. The common method of disposal of the waste is by unplanned and uncontrolled open dumping at the landfill sites. This method is injurious to human health, plant and animal life. This harmful method of waste disposal can generate liquid leachate which can contaminate the surface and ground waters; can harbor disea se vectors which spread harmful diseases, can degrade the aesthetic value of the natural environment and is an unavailing use of land resources. Segregation of waste is important for proper disposal of the vast amount of garbage modern society produces in an environmentally sensible.

The rapid increase in volume and types of solid and hazardous waste due to continuous economic growth, urbanization, and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. The ultimate destination of solid waste in India is at disposal. Thus, a practical answer could be separating the waste at disposal level. There is no such system of segregation of dry and metallic wastes at the household level. So proposing system which aims to sort the waste into two major classes, namely metallic and non- metallic. So proposing an automated sy stem to automate the solid waste identification,

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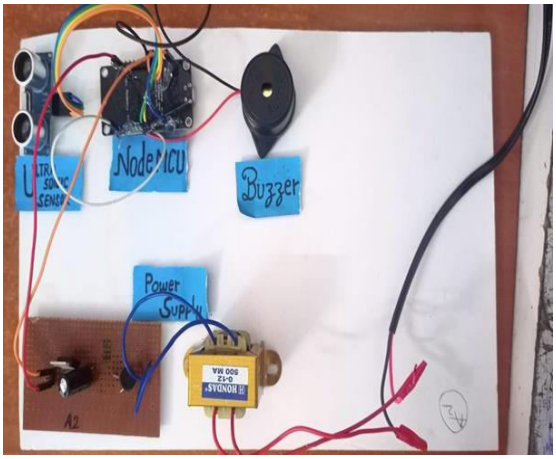
localization and collection process. The proposed system is involved in identifying key impact factor in the waste collection process and provide a systematic and automated solution to optimize the process to achieve higher efficiency. The proposed architecture is introduced to handle the waste collection process. The final outcome is a complete framework which compromises the inputs, outputs, guide and enables. The mainobjectiv e is to implement an optimized automated waste collection system with the use of a vast sensor network capable of gathering waste data and by implementing an optimization algorithm in waste collection.



The testing is a process of checking the working of software and hardware products. Testing of software is called software testing and testing of a hardware product is called hardware testing. Software testing is the process of testing the software or application developed by developers or programmers. Software testing is the process of checking whether the developed system is working according to the original objectives and requirements. Software testing process commences once the program is created and the documentation and related data structures are designed. Software testing is essential for correcting errors. Otherwise, the project is not aid to be complete.

The system should be tested experimentally with test data so as to ensure that the system works according to their required specification. When the system is found working, test it with actual data and check performance. Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design, and coding. Hardw are testing is a process of testing the hardware products developed by hardware developers. The most commonly used testing's unit testing and system testing.

the concern municipality in the street. Since the discrete unit of interaction happens only through message in between municipality and public, the message plays a vital role in communication, the information regarding the waste level is

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calculated and the appropriate message will be sent to the concerned authority. The message will be in the form of percentage of waste filled in the dustbin. The value given by the ultrasonic sensor is converted into percentage by embedded c language dumped in the control board. The message delivered will be in the formof text and the message contains levels of waste and provides suitable information regarding to the levels of wastes like "Immediately clean the bin" because the dustbin was 95% full. Based on the messagereceiv ed by the municipality corporation, further actions will be carried out. Without any human interactions, this sort of sending messages confers safety and beneficial in many areas. As it is one of the fastest ways of communication, the actions can be taken initially so that several difficulties facing has been reduce.

Advantages:

- Very simple circuit.
- Helps monitor garbagelevels
- Uses very small amount of electricity.
- Ultimately helpsinbetterplanningofgarbage pickups. Can help in reducing overflowingbins.
- Reducestripsto areas where the binsstill have a lot of capacity.

Disadvantages:

- Cannot detect liquid waste.
- Only detectsthetop of the garbage level. It wouldn't realize if there is space left.
- GSM module needs a 12v source.

CONCLUSION

Rapid population and the increasing industrialization are considered to be the major causes of pollution. Garbage left in the streets and overflowing dustbins pose extreme health hazards to the surrounding people. Advancement in technology can be utilized to overcome these problems.

This project is initialized to aid smart city concept and swatch Bharat Abhiyan. It uses cheap and reliable NodeMCU as central control board and is interfaced with sensors for Dustbin status in online database in real

time, it also makes use of web in order to make the system more efficient and reliable.

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