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IOT BASED SMART COMPOSTING SYSTEM: REVIEW**Prof. Prabodh. S. Nimat¹, Prof. Ravikiran G. Deshmukh² & Rupali J. Nirmal²**^{1,2} Assistant Professor, Department of Computer Science & Engineering,³PG Student Electronics and Telecommunication Engineering,

M.G.I.C.O.E.T, Shegaon, India

ABSTRACT

The Internet of Things (IoT) is a concept in which the network of physical objects like smart phones, sensors and actuators is formed in order to exchange data on internet. The objects connected to internet are controlled through Internet is commonly called as Internet of Things. In the present scenario, many times we see that the garbage bins are placed at public places in the cities are overflowing due to increase in the waste every day. Also due to insufficient human resource this garbage bins are not monitored efficiently. It creates unhygienic environment for the people. In order to avoid such a condition we are shading a light on IoT based smart composting system.

Keywords: *Internet of Things (IoT), sensor, Raspberry Pi 3 Model, Compositor.*

I. INTRODUCTION

Composting, which can be defined as a process of biological decomposition and stabilization of wastes under aerobic conditions. Composting process is controlled from some parameter such as temperature, moisture and oxygen content. As composting is a microbiological aerobic process, temperature characterizes the microorganisms' activity in the different stages (mesophilic, thermophilic etc). Monitoring temperature fluctuations during composting period, could allow adequate control of the process in case of diversion from required standards. Moisture content is the factor which makes the nutrients bioavailable when is around 50-60%. Lower content reduces the bioavailability and consequently obstructs the degradation process. Higher content turns the process to anaerobic resulting to methane production. The aerobic condition could be easily controlled when the oxygen content is monitored. In this paper, a complete monitoring solution for compost piles is presented. The system uses sensors to measure a set of parameters from the field and transmits them to a data server through wireless communication. Unlike the methods suggested by other researchers such as Wi-Fi connection or low radio frequency bandsa GPRS System through the GSM cellular network has been used. Data transfer speed limitation is approximately 85 kbps which is very limited for general applications but more than enough for the system. The GPRS system offers wide coverage without the use of cables or other low range wireless technologies. A web application is used in order to visualize the data that is stored and also to manage the composting piles. The major advantage of this solution is its versatility and cost. Also, using open source software and hardware makes the whole system a low cost still a reliable solution. The web application, offers live data visualization and interaction with the system. [1]

II. SCOPE

The project consists of two parts, hardware and software design. For hardware part, it mainly consists of controller/processor which is used to control the process of composting.

The composter mainly consists of heater to maintain the temperature, level sensor to maintain the level of composter and a motor to continuously mix the content in the composter.

For software part, PYTHON programming language will be used to control the hardware input and output.

We will be using different languages and scripts such as Java script, PHP, google script, HTML, MySQL, CSS, and other web services such as google, amazon etc.

The project has a wide and implementable scope. It can be further developed to create a system to keep track of the compost in more precise manner on large scale. As the project is implementable and practically possible, it will be a revolutionary product in the field of waste management.

A special GUI platform can be created for the compost collector truck driver so that he can keep track of the status of each composter in an easy way and can pinpoint the location of the composter.

III. LITERATURE SURVEY

Study of Several reports and related browsing is done for literature review, with the majority of these providing some evidence to support the theory that the introduction of smart composting is associated with a reduction in waste. A number of the reports considered the alteration of food waste to house composting as a contributor to waste reduction. In some reports, we found many waste composing methods such as Sheet Composting, Pit Composting, heap composting, etc. but these methods are monitored manually and we found the manual

home composting process as a tedious job. The Survey brought us to the conclusion that there is need of controlling the waste composters smartly which will be easier for human. Hence we came up with the idea of using IoT platform in order to reduce manual efforts. [2]



Fig1. Composting system

IV. SYSTEM SCHEMATIC AND SPECIFICATION

Smart Composting System involves integration of various components with features of their own. These components are organized around a Raspberry Pi 3 controller/processor such that it would provide us with proper results. The basic objective of the project is remote accessing of the composter. It can be achieved by the use of following major components:

- 1) Raspberry Pi 3
- 2) Motor and Heater
- 3) Level sensor
- 4) Website and Web services

Model	CPU	RAM	Usefulness
Raspberry Pi 0	ARMv6	512MB LPDDR2	Obsolete: High Power consumption, weak CPU
Raspberry Pi 1	ARMv6	512MB LPDDR2	Obsolete: High Power consumption, weak CPU
Raspberry Pi 2	ARMv7	1GB LPDDR2	Obsolete: old CPU compared to Raspberry Pi 3, onboard wireless.
Raspberry Pi 3	ARMv8	1GB LPDDR2	Excellent quad-core CPU, GPU, onboard Bluetooth/wifi

Raspberry Pi 3 model

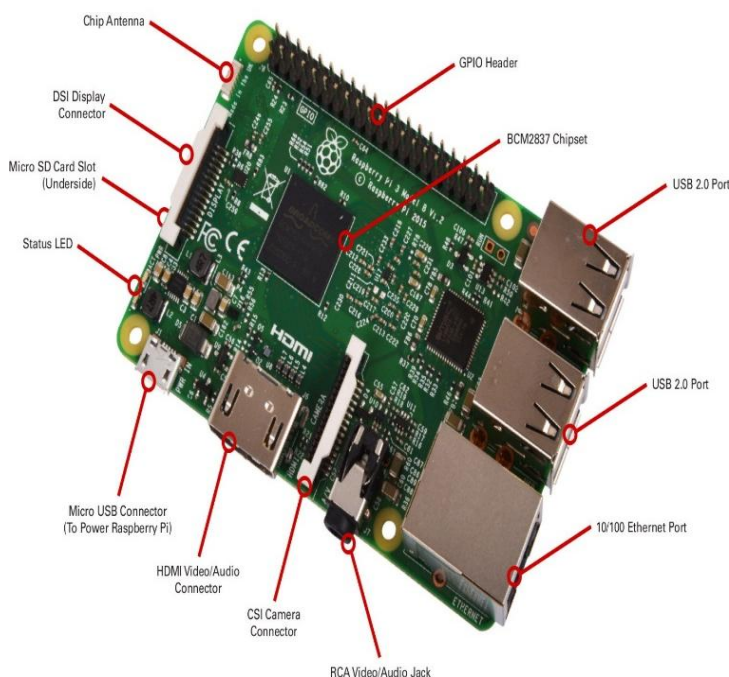


Fig2. Raspberry Pi 3 board

Its features include:

- Video: Full HDMI port
- Audio: jack and composite video
- 40 general purpose input-output pins
- Camera interface
- Display interface
- Storage: MicroSD card or via USB-attached storage
- USB: Four USB 2.0 with 480Mbps data transfer
- CPU: 1.2GHz quad-core 64-bit ARM

Specifically, Raspberry pi makes the following contribution

The size of raspberry pi is credit card size computer which is plug in computer monitor also used as a standard computer and mouse. It is very little device which is capable to use all ages of people to explore computing and also how to learn or executing programing language like scratched and python. The size of raspberry pi is credit card size computer which is plug in computer monitor also used as a standard computer and mouse. It is very little device which is capable to use all ages of people to explore computing and also how to learn or executing programing language like scratched and python. raspberry pi doesn't offer internal storage. This device is independent network connectivity. Raspberry pi is slower than a modern laptop or desktop but is still a complete raspbian computer and can provide all the expected abilities that implies, at a little power consumption level

Level Sensor

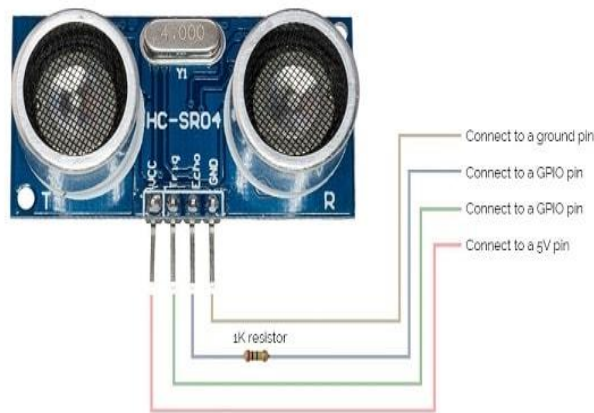


Fig3. Ultrasonic Sensor

Level sensor will continuously upload data related to the level compost in the composter. It will help in keeping the track of the level of composter and there by deciding the completion of the process when material crosses a threshold level.

Temperature and Humidity Sensor (DHT11)



Fig4. DHT 11 Sensors

- The system access is secured through a username and password of the user (farmer). Therefore the useful information and notices will be only accessible by the valid user having identity. When the user is logged in, the GUI (Graphical User Interface) will provide options for next activity. From the application, Live monitoring of the farm, previous reports or DHT sensor is a Temperature and Humidity sensor which detects the temperature and humidity and gives serial data as output.

- The DHT11 sensor will detect the temperature and humidity of the system and thereby will upload the data over the web platform.
- The temperature of the composter can also be controlled by controlling the functionality of the of the heater.
- The temperature sensor will provide data in digital form which will be provided to the SSH terminal of Raspberry Pi for processing.

Website

In this project we would be using web services for creating platform for hosting the website. There are various web service providers such as google, amazon, 000webhost, etc. which can help with the development of the website.

We used the representative table service provided by them to store the data received from different sensors. The scripting language changes according to the service provider and mainly includes HTML, CSS, PHP, JavaScript, etc

V. SYSTEM DESIGN

The following figure shows the general schematic system.

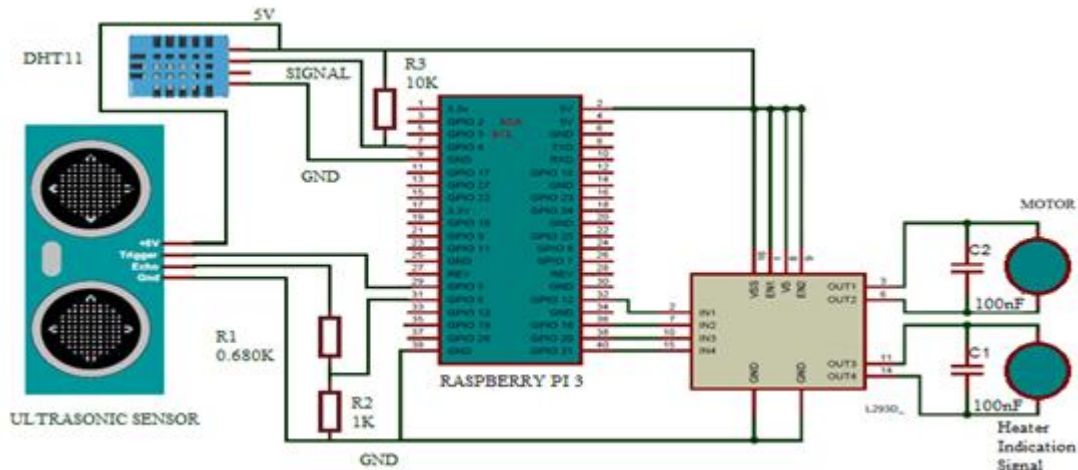


Fig5 System Schematic Diagram

VI. BLOCK DIAGRAM OF THE SYSTEM

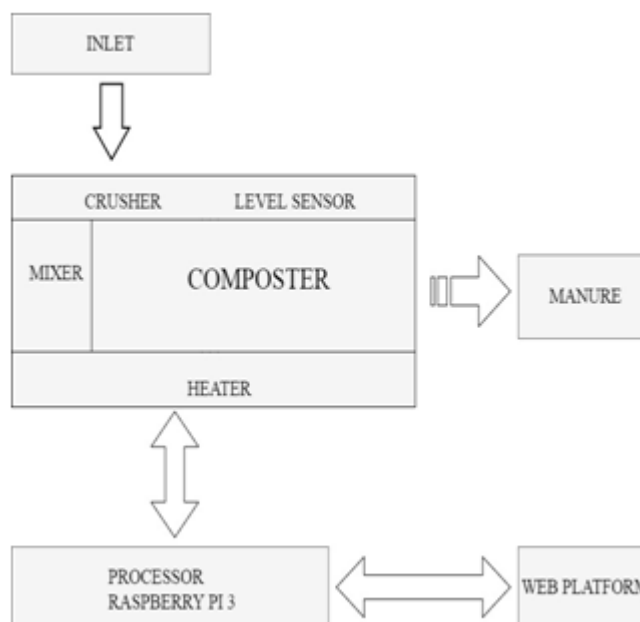


Fig. System Block Diagram

VII. CONCLUSION

This paper intends to review Smart Composting System Using IoT which can remotely control various composters in an area.

Raspberry Pi 3 is a powerful device which has inbuilt Wi-Fi and connect various devices together. The usual composters in the market provide automated process for composting. But it lacks in terms of remote operation on large scale. This system is mainly for automating the process of composting and introducing a new idea of mass remote controlling using web servers or cloud. This project is in respect with the modern trend of IoT and supports remote controlling of each and every functionality of the composter. Although the main algorithm will be developed for the controlling of single composter, the idea of controlling n number of composters would be explained over the web platform. This system can be further developed by assigning a special web server for monitoring the operations of all the composters in an area there by revolutionize the idea of waste management.

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8. First Author – Gaurav Jaware, BE ENTC, Maeers Maharashtra Institute of Technology College of Engineering, Pune ,jawaregaurav.gj@gmail.com