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A Prototype of IoT Enables Smart Compost System using Node MCU Coupling with Blynk Platform

(A Project Submitted in IJISRT of Electrical and Electronics Engineering)

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Abstract:- As per the report of environmental protection agency, the percentage of waste material thrown on the open field increasing year by year. Because of these pollutions increases as these wastes material emitting the methane gas and other harmful gases. These gases go into air as we inhale it goes to human body and it create pollution in environment. These gases are the alarm to the global warming because of this it starts heating the planet. Nowadays we are realizing that in summer season temperature increases year by year. The best option to done with the waste as we throwing on landfills is to do composting. Composting means put a waste in close unit and let the microorganism breakdown to make humus like product. This product can be used as a fertilizer for plants and soils. In this system, with the help of Arduino, temperature sensor, gas sensor, humidity and moisture sensor compost will be monitored. According to reading of these parameters controlling actions are to be taken. If the moisture or temperature goes below the level, then it will automatically open the water pipe and air pipe. It closed after moisture level reaches to some predefined value. We can monitor all these parameters remotely with the help internet.

I. INTRODUCTION

Composting means breakdown of microorganism at particular temperature to form a nutrient full product for plant. There are many ways to do composting. We can start compost at our home too. If we seriously think about it compost is form from the wastes product we throw away as garbage. The main problem is that what we throwing as garbage waste our municipalities collect daily and thrown on some landfills. Landfills mean wholes on the ground. After throwing it on landfills they leave the waste as it is for years and years. As a result it starts decomposing and this type of decomposing is anaerobic composting. Anaerobic composting means microorganism breaks without oxygen. Since the waste is open and microorganism breakdown in air as a result it starts emitting methane gas and it is harmful for our environment. As methane gas emits continuously from the waste it eventually with heating our planet year by year. So composting is good option instead of filling the lands with garbage's and it is counted in solid waste management.

II. LITERATURE REVIEW

The term Internet of Things was introduced by Kevin Ashton, who was the director of the Auto-ID Center of MIT in 1999 [1]. The initial technical realization of IoT was achieved by utilizing RFID technology for the identification and tracking of devices and storing device information. However, IoT utilizing RFID technology was limited to object tracking and extracting information of specific objects. The current IoT performs sensing, actuating, data gathering, storing, and processing by connecting physical or virtual devices to the Internet. For IoT applications performing these functions, a variety of researches on IoT services including environmental monitoring [2, 3], object tracking [4], traffic management [5], health care [6], and smart home technology [7, 8] are being conducted. Owing to the characteristics and merits of IoT services, waste management has also become a significant issue in academia, industry, and government as major IoT application fields. An indiscriminate and illegal discharge of waste, an absence of waste disposal and management systems, and inefficient waste management policies have caused serious environmental problems and have incurred considerable costs for waste disposal. To handle these problems, various researches into waste management based on IoT technology have been conducted, from studies on RFID technology to studies on waste management platforms and systems [9– 11]. However, there remains a lack of research into waste management based on IoT technology or on the application of developed waste management systems in Republic of Korea.

III. METHODOLOGY OF THE COMPOSTING SYSTEM

For this kind of applications a major issue is consistency. In order to make the system robust some consistency testing was necessary. Power consumption is also an issue when dealing with remote monitoring devices. Due to complex issues with GSM module, it wasn't possible to activate/deactivate the module in timed intervals. To deal with the problem, a second microcontroller was used to power up the GSM module when necessary. With this approach we achieved great consistency but sacrificed a bit in power consumption and compactness. The measurements are taken automatically every one hour. This is a time interval also used by other researchers and is considered sufficient for monitoring composting processes. Several consistency tests have been performed running the system and then powered it down at different timeframes and

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specific points. The tests were performed in a controlled indoor environment as well as outdoors. The accuracy of the sensors has also been tested by using certified lab measuring equipment. When problems have been located the sensors have been replaced or adjusted.

IV. PROPOSED SYSTEM

The above figure represents the system architecture of "Smart Composting System using IoT". It shows the various parameters of the composter to be controlled i.e level sensing, motor controlling, etc. to each end user through web platform. The composters are installed near the apartments and individual houses which exchanges information to web through wireless link. The construction of the system is divided into two sections namely, In this section, the level sensor sends the level information to raspberry pie which processes the signal and accordingly gives the control signal to motor and heater. When the composter is filled with garbage the raspberry pie turns on the motor. Here the motor shaft is connected to mixer blades which is used to crush the garbage into smaller units. Now the next step of composting is to heat the garbage to a specified amount of time. Accordingly, the raspberry pie controls the heater. With this continuous process the waste is decomposed.In this section, the web platform is used in order to exchange the control information with the processor. The web platform used here for human interface is ThingSpeak. The information is going to be checked continuously and this information will be exchanged with the database using protocol and if the predefined level is detected then the status of the composter is send by IFTTT protocol so that the necessary actions can be taken. Thus allows user to very efficiently monitor the system without any need of continuous human observation.

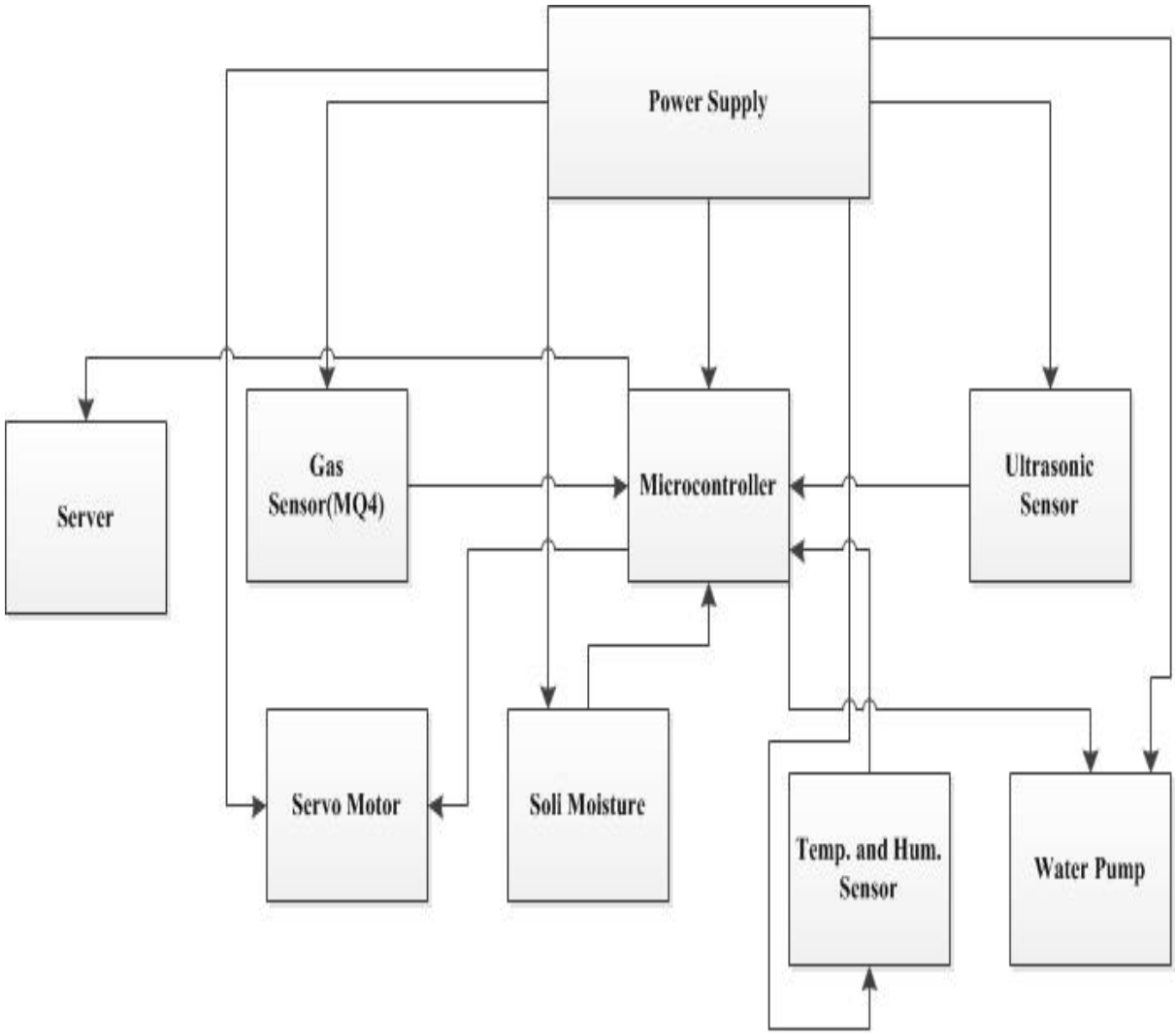

Fig. 1: Block Diagram of Proposed System

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V. IMPLEMENTATION TECHNIQUE:

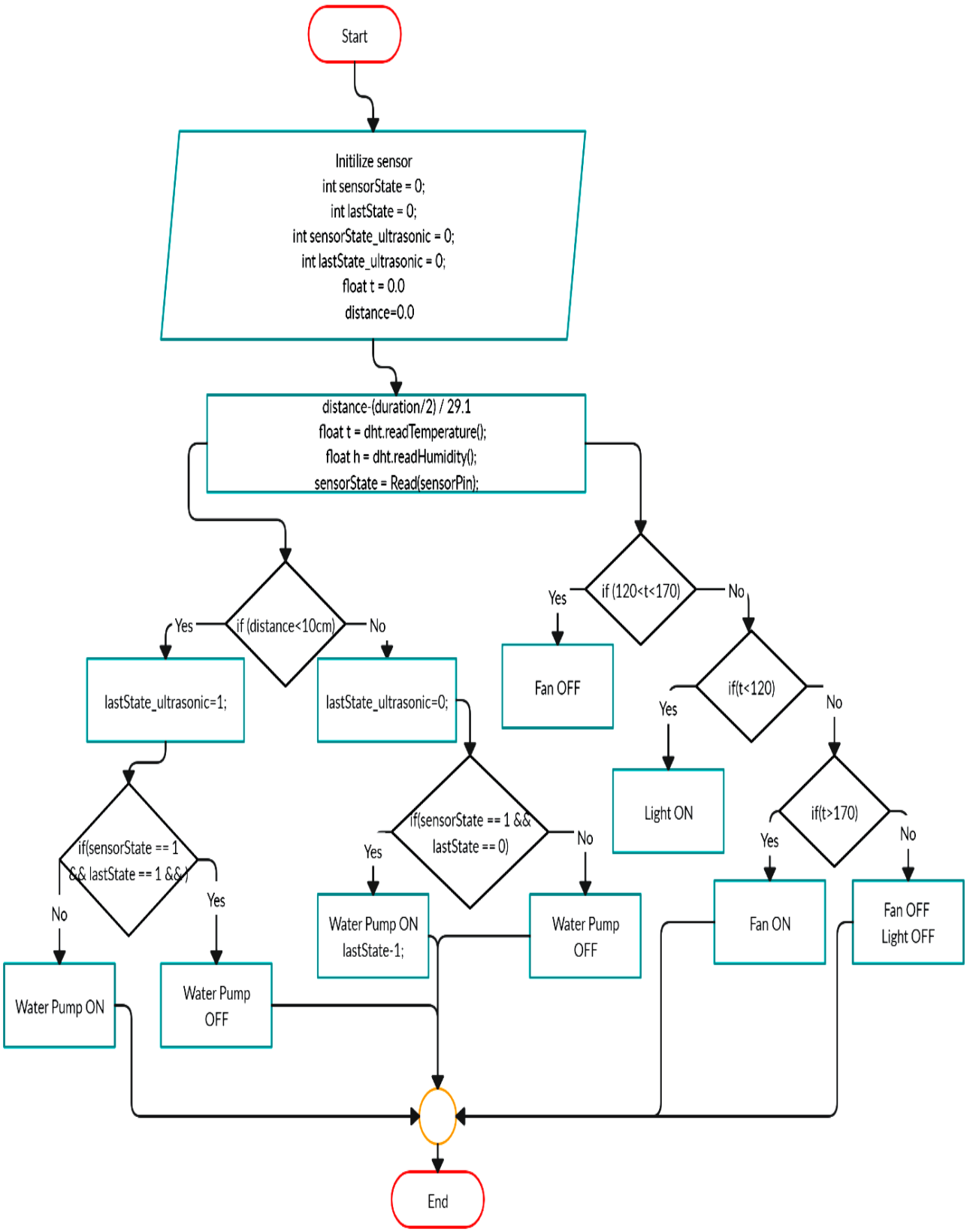

Fig. 2: Flow Chart for Implement Circuit

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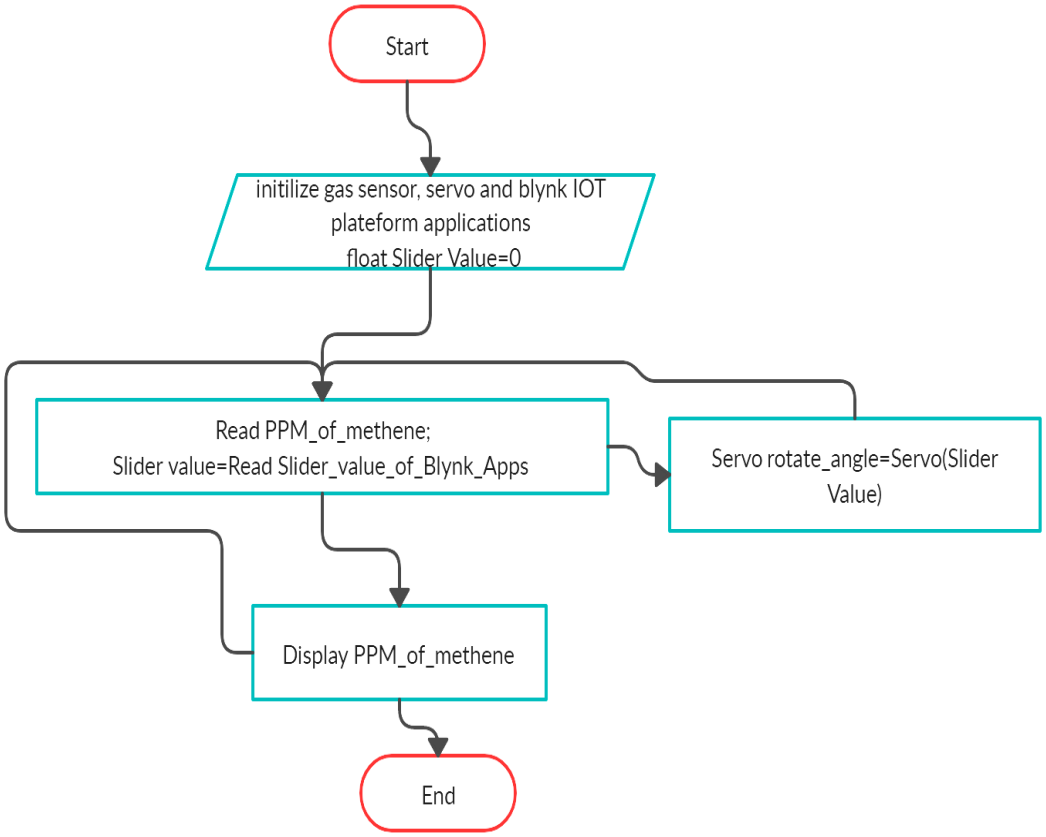

Fig. 3: Flow Chart for Implement Circuit

The flow diagram to implement this project is showed in fig 3.2.Here the microcontroller takes a decision when it collect the Water from the tank. Nutrient solution is delivered to the crop roots in the substrate and then it flooded over into the tank. The process is automatic as the pump turn ON and turn OFF function is with the help of sensor. When the pump is on starts delivering nutrient solution with the help of water to the roots. When it is off the solution gets into the tank by drain outlet. After all the solution is gone into the tank the process is repeated.

VI. DESCRIPTION OF PROJECT

In this section, we ensure that farmer and fields will get all nutrients from the composting solution. Composting system can accomplish various type of necessaries by its allowing self-production in everywhere which is not available for conventional composting. In our project, the parameters are controlled automatically. Also, we assured that the conditions of the fertilizer and control the parameters remotely by using IOT technology. Here we have considered the Arduino micro controller with various types of sensors such as Temperature and Humidity sensor, Gas sensor, Ultrasonic sensor and Moisture sensor for essence. ESP8266 is a Wi-Fi module to communicate by using internet of things with the server. The GSM module is to communicate and relay is used to automatically turn on/off the water supply from the pumping motor.

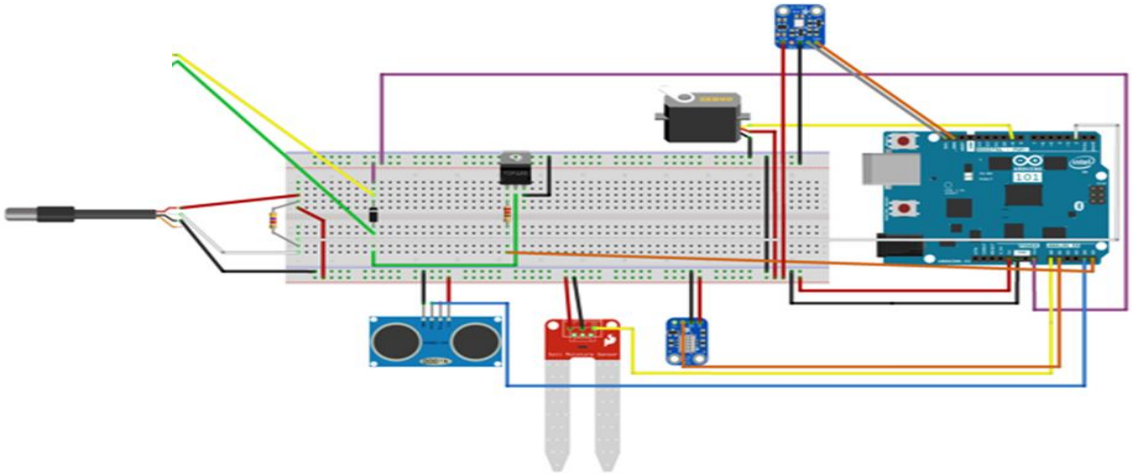

Fig. 4: Schematic Circuit Diagram

VII. IMPLEMENTED CIRCUIT

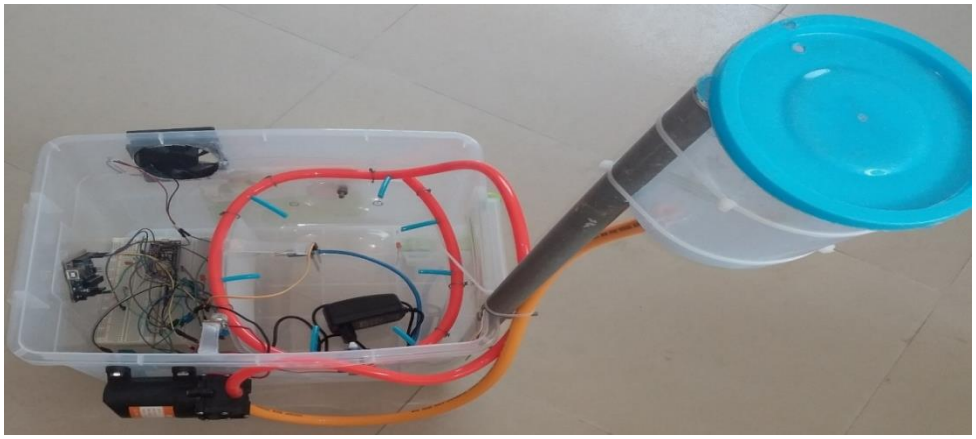

Fig. 5: Implemented circuit

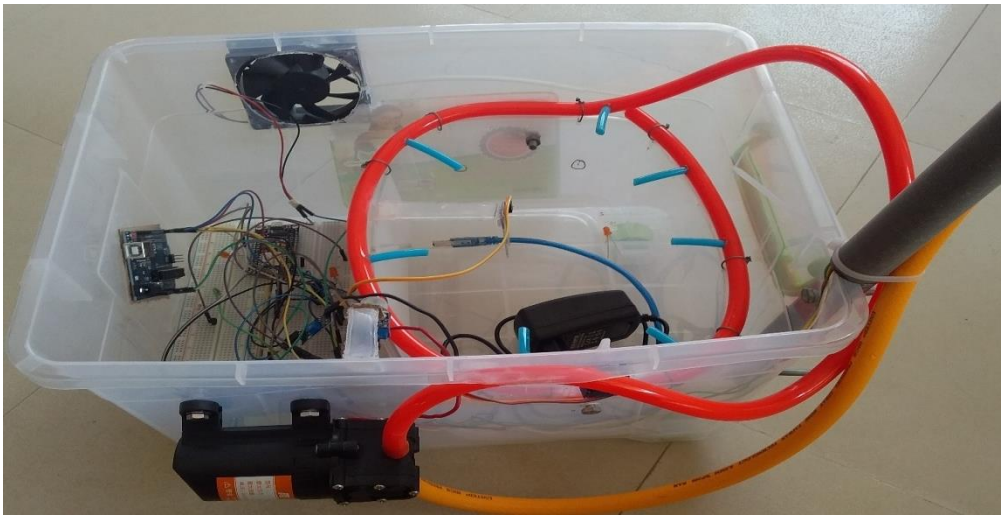

Fig. 6: Implemented circuit 2

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VIII. MONITORING AND CONTROLLING

For controlling and monitoring the smart composting method, IoT based API's called Blynk and Thing speak is used. Blynk is a platform which supports with android or iOS application to control Arduino over the internet. The data such as temperature, humidity and parameters are received from the system by NodeMCU module by using various types' sensors and sent to the blynk application through ESP8266 Wi-Fi module over the internet. Thing speak is also an open source cloud based API for storing and retrieving data from the things using the HTTP protocol over the internet. The method for data received by the Blynk application is same as for receiving in the Thing speak application.

IX. RESULT DISCUSSION

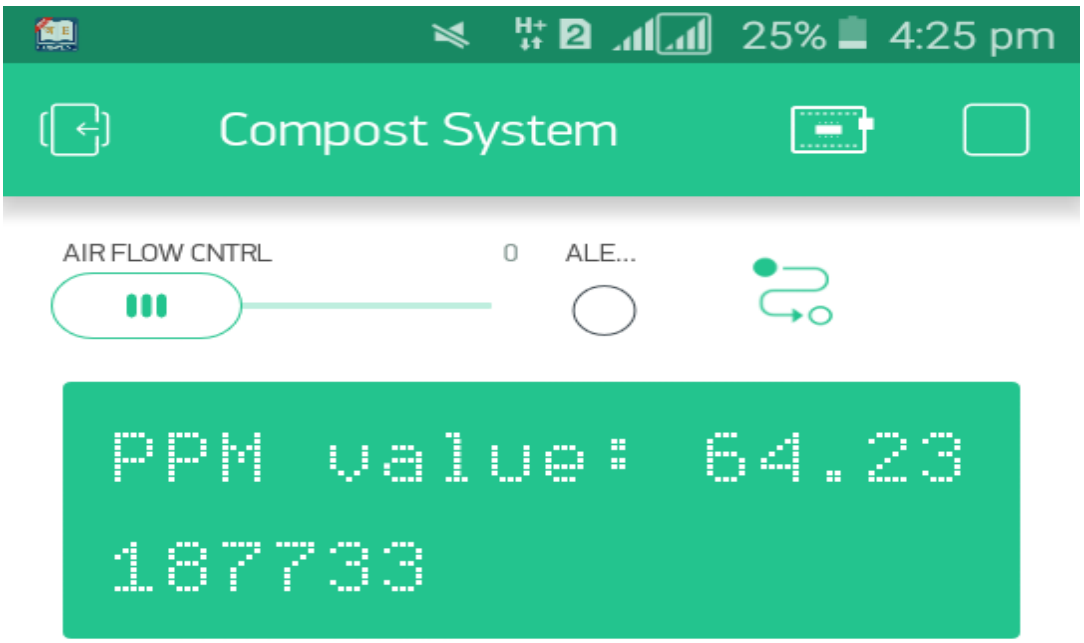

Fig. 7: PPM value of methane

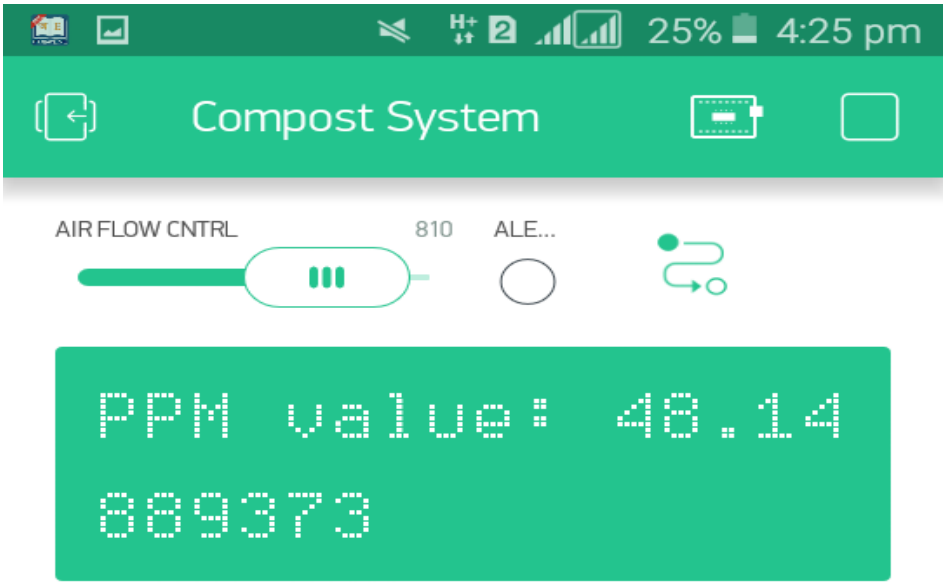

Fig. 8: Blynk App Customization forcontrolling this project

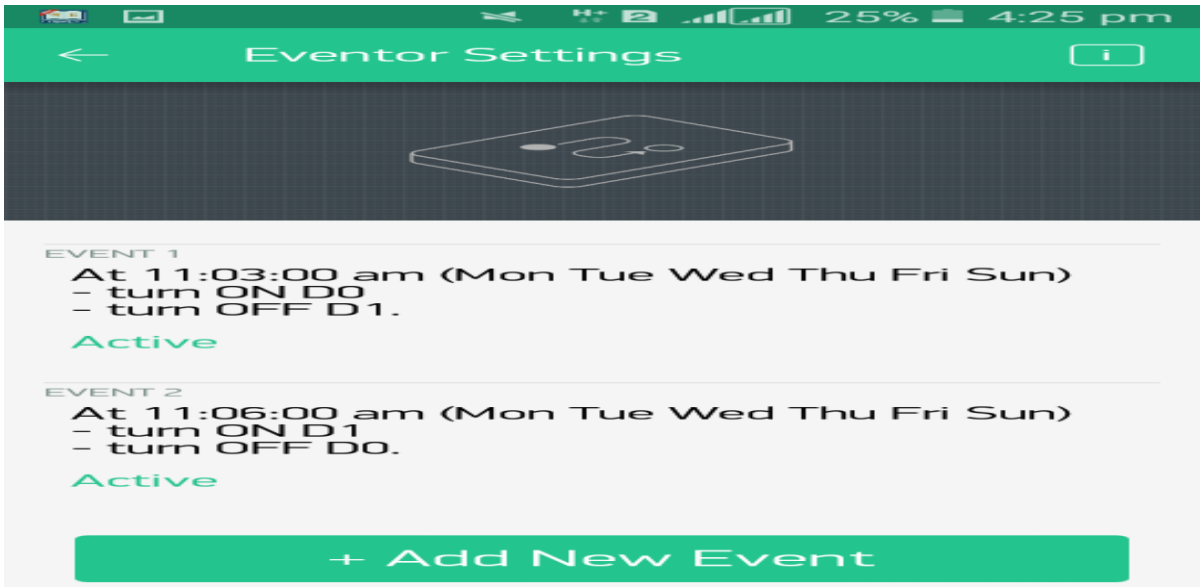

Fig. 9: Event Create by using Blynk Application for reminder setting

X. LIMITATION OF THE PROJECT

- Time until compost is ready.
- Sensor readings (temperature, moisture, methane, Compost bin status, total pounds composted)
- Actions needed (stir compost, add water, etc)

XI. CONCLUSION

Now a days, Smart Compost system keeping vital role in composting. Progress has been achieved in large scale and results obtained in several countries all over the world and have proved that this technology is thoroughly practical and has very definite advantages over this smart process. The main advantages of this system, need few days of processing, and totally controlled by using smart devices, smart compost system can be used where composting is so high cost and need more time than this procedure. Thus it not only a profitable undertaking, but one which has proved of great benefit for humanity. So this process much more beneficial making affordable cost or disable cost compost for the agriculture. Eventually I can challenge this method so exact and totally digital, logical. And there is no harmful impact over the atmosphere and vigorously friendly for environment.

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