Retraction

Retracted: BIOBIN for Safe handling and disposing of Biomedical waste during COVID '19

Akila V; Gayathri B; Avila J; Thenmozhi K; Rengarajan Amirtharaja; Padmapriya Praveenkumar

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Notice of Retraction

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After careful and considered review of the content of this article by a duly constituted expert committee, this article has been found to not meet IEEE standards for quality. Specifically, the article was found to be of poor quality. Therefore, IEEE has retracted the content of this article from Xplore. When informed of the retraction, the authors did not provide a response.

BIOBIN for Safe handling and disposing of Biomedical waste during COVID ’19

Akila V[1], Gayathri B[1], Avila J[2] *IEEE Member*, Thenmozhi K[2], Rengarajan Amirtharaja[2] and Padmapriya Praveenkumar[2], *IEEE Member*

[1]Student, [2]Faculty, Department of Electronics and Communication Engineering, School of Electrical and Electronics Engineering, SASTRA Deemed University, Thanjavur –INDIA. 613401.

padmapriya@ece.sastra.edu

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Abstract—**Generation of waste during the treatment and diagnose of COVID’19 have to handled separately as per the guidelines provided by the Central Pollution Control Board (CPCB) in addition to Biomedical Waste Management (BWM) rules. The collection of this biomedical waste from quarantine wards, isolation wards, laboratory and COVID test centres etc. have to be kept separately and should be immediately handed over to the Common Bio-medical Waste Treatment and Disposal Facility (CBWTF). Hence this paper proposes an IoT enabled BIOBIN for continuously monitoring and alerting the sanitary workers involved in this collection for regular cleaning and disposing of this harmful biomedical waste promptly.**

Keywords: *COVID’19, BIOBIN, biomedical waste, IoT*

I. INTRODUCTION

Waste collection, handling and management have been a hazardous task to the sanitary workers in this pandemic era. Various methods have been followed and introduced to handle this biomedical waste. It includes recycling, incineration, reduction and separation at the source. This section provides the various methodologies adopted by various researchers in handling and tracking waste. M. Arebey, et al.,2009 proposed a solid waste tracking system. The system consists of radiofrequency for identification, Global System for Communications and geographical information system. It helps in overcoming the problem faced in the usage of finding the shortest route. This, in turn, results in less fuel cost and a cleaner environment. Therefore, the proposed system proves to be efficient in the process of solid waste collection and management [1].

J. M. U. Aguila, et al., 2019 proposes a Smart Waste Bin measures the waste level using ultrasonic sensor and measures the volume of the bin using a load cell. The details about the volume and the waste level of the bin are sent to the municipality [2]. W. Chang, et al., 2019 proposes an intelligent system for monitoring liquid waste barrels named iCAP [3].

E. Al-Masri, et al., 201 [4] proposes an IoT (Internet of things) based serverless waste management system, which can in real-time monitor and track the violations that happen in the process of waste collection. N. A. Muhamad Faudzi, et al., 2018 presents the MIB (My Intelligent Bin) system to find out and overcome the problems faced during waste collection. QR code scanning and android application platforms are used in MIB for effective real-time tracking of wastes [5]. M. Gokhale , et al.,2018 proposed an “Intelligent Receptacle” wireless system that can monitor the waste level of the bin and send necessary message to the mobile application and web page [6]. P. Ravindhiran, et al.,2017 states that the proposed movable waste-collecting robot can help in automating the process of waste collection. This method can make the process of waste management more efficient [7].

F. Noonan, et al, 2018 describes the method of automation of paper tracking system in pharmaceutical companies by using IoT(Internet of Things), RFID (Radio-frequency identification), and cloud technologies. This method helps in keeping track of creation, collection, and processing of wastes. It proves to be more efficient than the traditional method of paper tracking system in pharmaceutical companies [8]. Solid-waste collection system consists of technologies like a geographical information system, Positioning System, frequency identification module and Global System for Communications. The model provides a real-time web-based waste monitoring and collection system [9]. V. Aswin, et al.,2019 proposes a solar-powered smart garbage system. It is built using a sensor, cloud-based technologies, and ZigBee. The model provides efficient waste supervision and collection method [10].

M. A. Hussain, et al., 2019 suggested a real-time IOT Based cloud platform for monitoring waste level. The model also alerts the surrounding if the dustbin catches fire [11]. A. Khan, et al.,2018 states that the carbon footprint can be reduced by efficient use of IOT in the field of waste management. The authors have proposed Smart Waste Bin and public complaint management model [12].

II. PROPOSED METHODOLOGY

The proposed system uses a BIOBIN to collect and alert the individuals involved in the waste management process. It involves the following components: Smart BIOBIN, ultrasonic sensors, servo motor and Node MCU.

A. NodeMCU

It is an IoT platform which primarily has a ESP-12 module. It has a Microcontroller which accommodates 16 Digital I/O Pins and 1 Analog Input Pin. It has a compatible USB for a plug-in with Flash Memory capacity of 4 MB. The advantage of being a small-sized module fits smartly inside any IoT integrated projects.

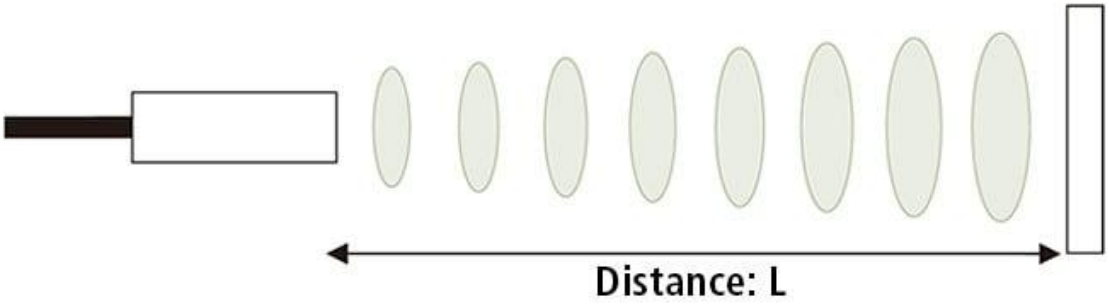


Figure: 1 Working of Ultrasonic Sensor

B. Servo Motor

A Servo motor is attached with this sensor which facilitates the movement of the lid. Servo motor is a DC motor which uses the concept of Pulse Modulation. The servo motor rotation angle is decided by the duration of the pulses applied to its signal pin.

C. Ultrasonic Sensor

An ultrasonic sensor is primarily a distance measuring device that works on the principle of ultrasonic waves. This device discharges the ultrasonic wave and obtains the wave that was echoed from the intended device. It measures the distance between the sensor and the intended device by computing the time difference between the emitted and echoed signal.

Formula to estimate the distance is given by

$$L = \frac{1}{2} \times T \times C \qquad (1)$$

where L represents the distance between the sensor and the intended device, T represents the difference in time, and C represents the speed of light. Fig1 represents the steps involved in constructing the BIOBIN

III. Results and Discussion

In the proposed BIOBIN, as in Fig 1, three Ultrasonic sensors are used in its construction. The first sensor is placed on the front part of the bin, which helps in the opening of the bin on the detection of the waste. Then the next sensor is placed inside the bin precisely in the middle, which detects whether the bin is half-filled or not. If the bin is half-filled, then NodeMCU sends a message to the sanitary work involved using IFTTT (If This Then That) web-based platform. The third sensor is placed on the backside of the lid to detect whether the dustbin is filled. If the bin is completely filled, then NodeMCU triggers an SMS.

To dispose the waste inside the bin, the waste is first placed in front of the BIOBIN. The first sensor which is placed in front of the bin detects the waste and if the bin is not full and the lid is opened with the help of servo motor as shown in Fig 2 and 3.

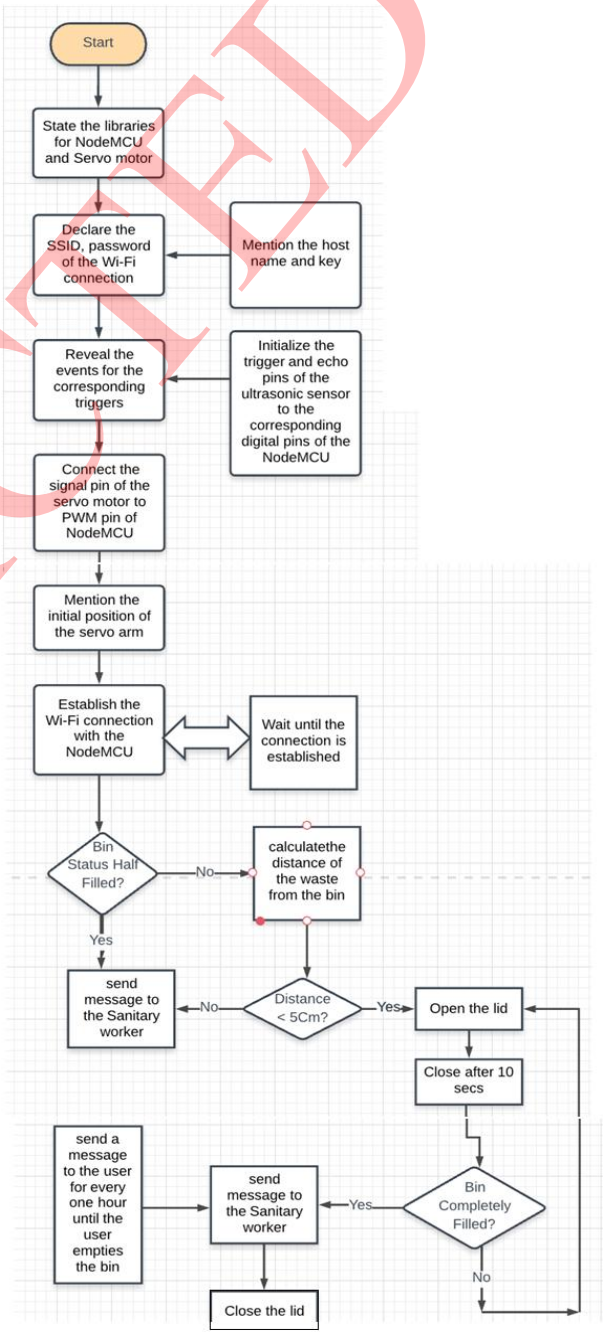


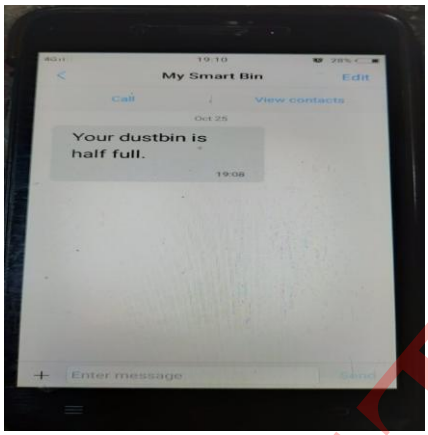
Figure:1 Flowchart representation of the proposed system

Figure:1 Proposed BIOBIN

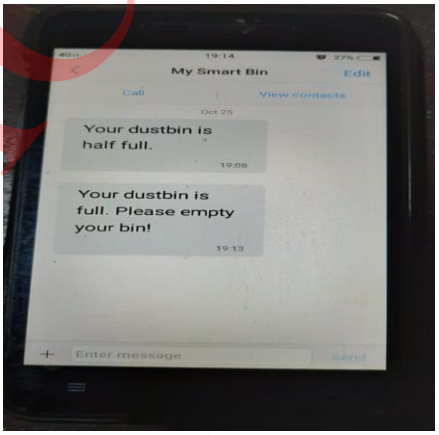
Figure:2 Detection of waste using the first sensor

Figure:3 Waste is dropped in the BIOBIN

Figure:4 Half filled status of the bin



(a)



(b)

Figure:5 Alert Message to the sanitary worker involved when the bin is a)Half filled b)Completely filled

Figure 6: Completely filled status

Figure:7 BIOBIN is Locked

After a few seconds, the bin is closed automatically. Once the bin is half full, the second ultrasonic sensor detects it, and the Nodemcu sends a message to the user. To perform this, the NodeMCU is equipped with a good WiFi connection (Fig 3, 4 and 5).

Once the dustbin is completely filled, the third ultrasonic sensor detects it, and the Nodemcu sends a message for every one hour to the user reminding him to empty the bin.

The first ultrasonic sensor would not detect any waste, and the lid would not be opened until the bin is emptied.

IV. CONCLUSION

A Smart BIOBIN was designed to collect and to alert the peers involved in this waste collection which dramatically reduces the risk and harmful effects caused to the sanitary workers in this pandemic situation which in-turn breaks the chain-link of the COVID'19 cases. The designed BIOBIN is an IoT enabled device which can also help in tracking and maintaining the database in a cloud-assisted environment or in any central server to carry out regression analysis in finding the dependent variables in analyzing the future waste deposition which significantly helps in deciding the method of disposing of the collected waste.

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