

Smart Dustbin: An Initiative Towards Cleaner City

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Abstract

Today there is need to tackle the increasing problem for the disposal of the waste material generated from the different industries and the home usage waste. The waste generated from the different households or the industries or the persons travelling on the roads is either biodegradable or non-biodegradable which need to segregate for the disposal of the waste material. But he people are not generally able to determine the kind of the waste due to which there arises a need for the automatic segregation of the waste material and its disposal in the same way as it should for that particular kind of material. In this research paper the concept of smart dustbin has been proposed which not only help to segregate the particular kind of waste with the help of infrared sensor but also help to weigh the waste material stored and the remaining capacity or tell the status of the capacity of the dustbin. Upon filling the dustbin send the message to the municipal authorities to clear the dustbin and install the new one or the same dustbin. This dustbin also provides the free internet facility for the garbage thrower. These smart dustbins can be used in the public places, industrial areas, and where ever they are required.

Keywords: *Biodegradable, Capacity, Disposal, Industrial areas, Infrared sensor, Non-biodegradable, Smart dustbin, Waste.*

I. INTRODUCTION

As the human being gained knowledge about his living manners he started cleaning the surroundings so that he can live peacefully and disease free environment but with the further advancement in the usage needs and technologies he started making new products to meet his more needs. With the introduction of more products the waste generated started increasing day by day. The number of fruits, vegetables and much more products whether natural or unnatural increases which led to the generation of more and more waste material which started to become a problem

with the time because disposal of the waste material became a problem as the residential areas increases and the commercial areas also increases. Secondly the collection of the waste material also became a problem [1]. There are different kind of waste and mainly can be categorized as the biodegradable and non-biodegradable.

Biodegradable are those waste which can be degraded or break down with the help of the bacteria and non-biodegradable are those which cannot be degraded with the help of micro-organism and such waste are either reused or recycled. So there is always a problem to separate out such different wastes because people use the dustbin to throw the garbage and does not bother about the material type to be thrown into a particular type of dustbin that can either due to unawareness about the kind of the material or maybe they just ignore to remain in their comfortable zone. So there is need of such smart dustbins which can automatically differentiate between the different kind of materials and separate them out so that the municipal committee persons can easily dispose them off at the right place and in a right manner [2]. There is also need for such dustbins because such dustbins help to prevent the pollution and unhygienic environment and thus prevents the spread of the diseases in the environment. There is also need of the dustbins which can generate an alarm automatically when the dustbins get filled so that the timely disposal of the dustbins is possible which big problem of the today is. Such smart dustbins are only possible when different technologies can be combined with to generate such results. Different sensors can be used in combination with each other which can be further controlled with the use of a microcontroller [3]. Sensors like ultrasonic, infrared sensor, weight sensor can be used for performing the desired functions in the dustbin. Ultrasonic sensor can be used for the roundabout movement of the object to actuate the opening and closing of the dustbin. Infrared sensor can be used for the estimation of the capacity of the dustbin and it can also be used for the detection particular kind of material detection. Ultrasonic sensor can also be used for the capacity purpose [4]. Weight sensor can be used to determine the weight of the container. Servo motor can be used to open or close the lid of the bin. Further to control the functioning of all the sensor and actuators there is need of a microcontroller so that all the components can work in synchronization with each other.

The Arduino UNO is the best board to start with the electronics and coding/programming. The UNO is the very much in demand and documented board of the whole Arduino family [5]. Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 are analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), one USB connection, one power jack, one ICSP header and one reset button. It also contains everything required to support the microcontroller; by simply connecting it with a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in the Italian and was chosen to mark the release of Arduino Software –IDE b 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino [6]. The Uno

board is the first one in the series of USB Arduino boards and the reference model for the Arduino platform, for an extensive list of the current, past and the outdated boards.

II. LITERATURE REVIEW

S.S. Navghane, M.S. Killedar, Dr.V.M. Rohokale in their research paper proposed an IoT based collection bins for the garbage and the waste material. These dustbins are equipped with the IR sensors for showing the status of the garbage in the bin with continuous updating on the web page. The main aim of the project is to reduce the human efforts and the resources in fulfilling the clean city mission [7]. The present research paper has proposed a smart dustbin which is an enhancement of the discussed research paper. In the current research dustbin provides free Wi-Fi for the disposal of the waste material. It also alerts the municipal authorities for the clearing of the container of the respective bin as it automatically segregates the waste material into the biodegradable and the non-biodegradable material. Sonali Joshi, Uttkarsh Kumar Singh, Sahil Yadav in their research paper proposed a smart dustbin which can be tracked using the GPS technology. The dustbin is provided with the PIR sensor for the detection of any motion around the dustbin and a buzzer with ultrasonic sensor to check the filling capacity or capacity status of the dustbin. buzzer buzzes if the dustbin gets full. Dustbin is also accompanied by the IR sensor to detect the scattering of the material around the dustbin. Dustbin contains a photoelectric sensor for the detection of the metal in the waste material. The present research paper is an enhancement of this research study. The dustbin proposed in the present research paper also provides free Wi-Fi for the disposal of the waste material in the dustbin to encourage the people to use the dustbin. Mahesh Chandra Bhatt, Dharmendra Sharma, Ashish Chauhan in their research paper proposed a smart dustbin with the automatic closing and opening of the lid of the dustbin and the lid remains closed in case the dustbin gets full. It also provides message to the municipal authorities in case the dustbin gets full and tells them to clear the bin for the more waste material disposal by the people.

II. METHODOLOGY

As the person approaches the dustbin the lid of the dustbin gets open due to the detection of an object near the dustbin by the ultrasonic sensor. The lid of the dustbin is being operated by the servo motor. As the person throws the waste material onto the common plate of the dustbin, the infrared sensor installed in the dustbin detects the type of the waste material that whether the waste is of biodegradable or non-biodegradable. Here two mechanisms can be used for the movement of the waste into their respective container. On the right side of the dustbin the container is for the biodegradable material and on the left side the container is for non-biodegradable material. One of the throwing mechanism can be the tilting of the common plate to the respective container and second mechanism can be the moving of the slider to throw the waste into the respective container. As the waste is put into the container the weight of the container is measured with the help of the weight sensor provided in each of the container and compared with the weight of the waste already

present inside the container and the difference of the two is displayed is shown on the display and also the type of the waste is shown on the display [8]. After that free internet password is provided on the display installed on the top of the dustbin. This free internet will work for 15 min because after that the password will got expired. The lid closes as the person moves away from the sensor or the dustbin. In case the dustbin gets filled or is just near to the filling capacity an automatic message will be sent to the municipal authority or the concerned person to change the container of the dustbin. All the sensors of the dustbin are controlled by a microcontroller which can be Arduino Uno or any microcontroller which can be suitable for the design purpose because it will depend upon the requirement only. The smart dustbin with its sensors is shown in Figure 1. The working procedure of the smart dustbin is shown in Figure 2.

IV. DESIGN

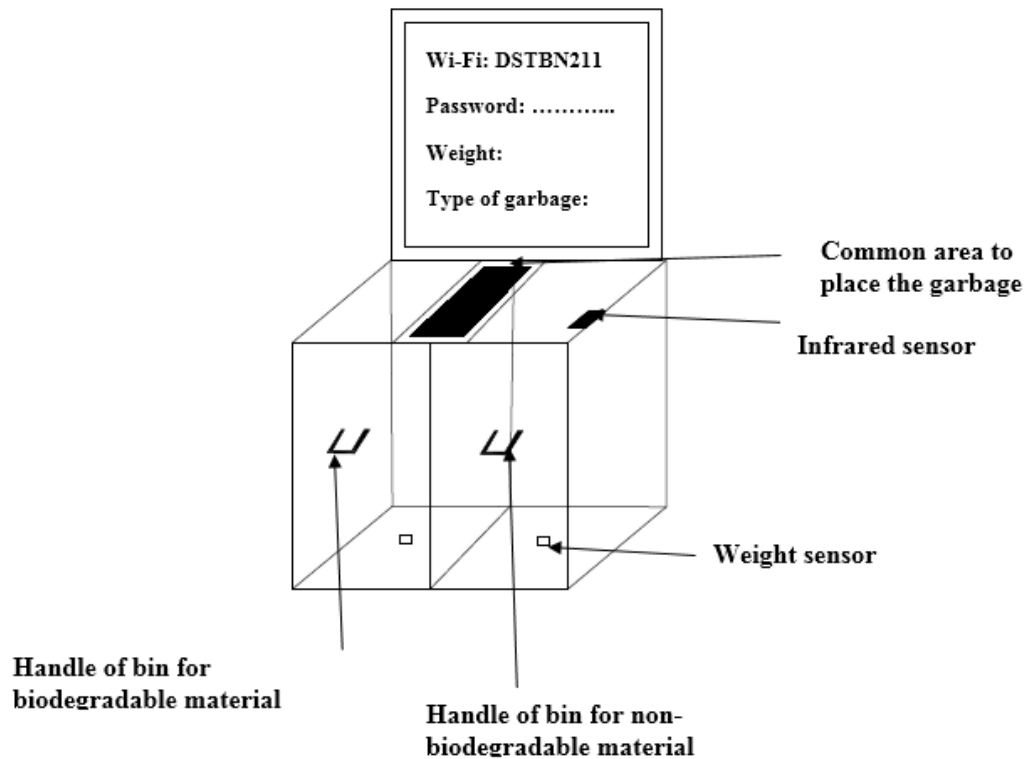
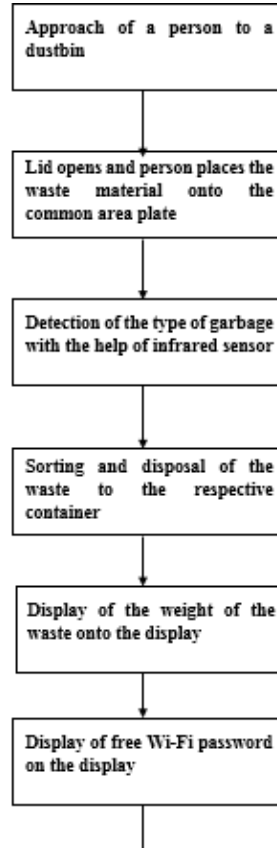


Fig. 1 Smart dustbin with the sensors



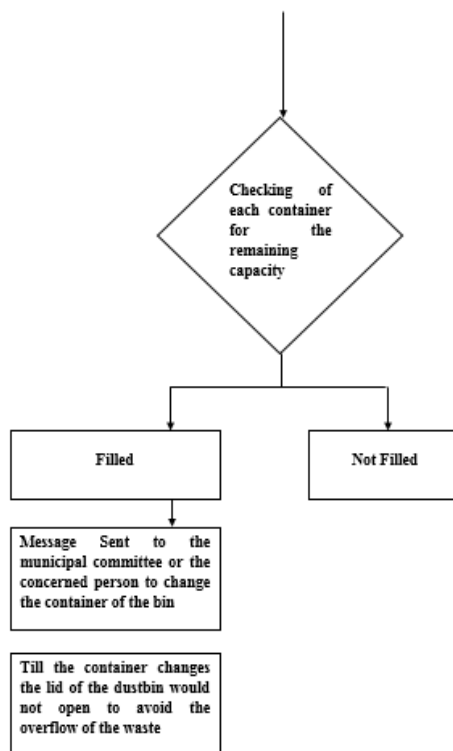


Fig. 2 Flow diagram showing the operation of the dustbin

V. RESULTS & DISCUSSION

The use of the smart dustbin will help to segregate the waste material automatically into the bio and non-bio material easily which will in turn help the municipal committee to deal with the waste material accordingly without wasting extra time for the sorting of the waste material. The smart dustbin also provides awareness to the people about the kind of material they use in their daily life. Providing the free internet services for the usage of the dustbin will also encourage the people to use the dustbin because a number of person just throw away the waste material onto the roads or in the open spaces. The message sent to the municipal authorities will also be kept as record which will keep a check on the working of the municipal committee workers for the timely cleaning of the dustbins.

VI. CONCLUSION

Smart dustbins will help to keep the surroundings clean and odor free and will inculcate good habits in the people of the country to use the dustbins. These dustbins will also promote awareness among the people about the nature of the material they use. Smart dustbins are also the need of the hour due to the continuous increase in the population of the urban population as can be seen from the census of the previous years because in urban areas waste disposal is the biggest problem. As

per the census of 1901 the urban population was 11.4%, in 2001 it was 28.53%, in 2011 it got increased to 31.16% and it is estimated that in 2030 it will get increase to the 40%. So to tackle such a huge population waste disposal problem there is the need of such automatic dustbins.

VII. REFERENCES

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