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Arduino Based Smart Dustbin for Waste Management System

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Abstract: Smart intelligent alarm system is important in the waste management system. This helps by looking into the public environment cleanliness, maintaining good health and also avoiding bad odour, thus reducing the spread of the disease by the waste garbage. Waste alert system is important for every waste management system. Alert system makes clear indication a dustbin being full/complete, whether one will used it in the home or in the public place. This paper emphasizes on an alarm system which is based on Arduino, which conveys the information through LED blinking for disposal of the waste material of the dustbin. Without proper maintain of dustbin it creates a lot of diseases in the surrounding and also pollutes the ambience.

Keywords: Smart Dustbin; Arduino; Waste Alert System; Ultrasonic sensor; Motor.

I. INTRODUCTION

Improper monitoring of the waste material in a dustbin can produce bacteria, virus and also different threatening diseases, which can be spread by insects like flies, mosquitoes, driver ants and bees. Normally unhygienic conditions occur if there is an overload of the waste material in the dustbin. To reduce unhygienic conditions either in the city, society, home, college or in a public area, waste management system is necessary. Basically, societies use different color dustbins for waste management system [1]. Healthy workplace, either it's home or in the office or in public transport or surroundings which is neat and clean has received much attention by public in recent days. Proper daylight to any area can reduce some percentage of germs which is not visible to eye. So now a days people are using innovative technology of light shelf for multipurpose system [2],[3]. Floor cleaning can be useful for simple small dust [4]. For daily uses waste material without proper management may a risk to a public health.

Associated with waste generation different cities faces a lot of challenges. Arduino based smart alarm system will help to overcome the bed smell, unhealthy condition and also the pollution. The major aim is to reduce the human resources along with the time i.e. the way for improvement of the smart vision of the smart world by proper management of the solid waste material.

If proper cleaning of waste material from the dustbin is done, it can be prevent serious diseases. At the same time there is a reduction of bad smell and also from unhygienic situation of the surroundings. Smart environment also gives smart valuation of the area. Organized and smart mechanism is highly recommended to all cities for proper waste management. The awareness to provide through local organization and NGO to rural areas are important to make surrounding clean.

Fig 1. Green, Red and Blue Bins

The main aim is to clean up the streets, road and the infrastructure of every cities, rural areas and towns. The blue dustbin is meant for dry waste, whereas the green dustbin is meant for wet waste. Some cases yellow dustbin is used for recyclable waste. Green dustbin material can be recyclable, such as hard plastic. Similarly, almost every hospital has different bins for different biomedical waste, because in hospitals there are huge waste materials like sanitary napkins, blood stained cotton, disposal syringes and many more.

In many places different color dustbins are used as shown in Fig 1. Municipal workers use trolley to carry waste products as shown in Fig 2. Fig 3 represents mismanaged waste collection, or one can say it is set at open place . Due to poor management system sometimes, waste produces very bad odor.

This is very important and necessary challenge throughout the world, as there is rapid increase of population. So, an efficient and smart garbage system is required to the urban societies [5],[6].

Fig 2. Easy wheel system for waste collection

Fig 3. Large waste carrying system.

II. PROPOSED CONCEPT

The laborers of municipality are not taking that much responsibility to check each time whether the dustbin is full or going to be full. It is also a hectic work to check each moment, as it may be required on an hourly basis. So proper monitoring can possible through the alarm and LED indication system, so that municipal people can collect massive amount and make the surrounding good.

Basically waste disposal are placed in the dustbin, but one can not estimate the level of garbage, so ultrasonic and with the help of Arduino controller one can get the information easily about the garbage level is full in the dustbin and from this LED indication help municipal people so that they can take the waste from the dustbin.

Ultrasonic sensor is placed at the top of the dustbin which will measure the distance, when the waste product/ garbage reaches the exact threshold level which is set by the control program then controller sends the signal for alarm [7]. As per the need one should use a motor into the dustbin, so that it will work as per the controller action [8]. This will help the cleaning people/ cleaning authorities easily. Smart dustbin with alarm system will help from foul smell from the waste and due to this alarm dustbin will be squashed on regular intervals. This will be a long-term solution to make the environment healthy and good .

The sensor which will be placed at the top level of the dustbin and the garbage level indication is through the ultrasonic sensor shows that in figure 4. From the sensor there is connection to the alarm which gives the dustbin level full that information to the municipal cleaning people.

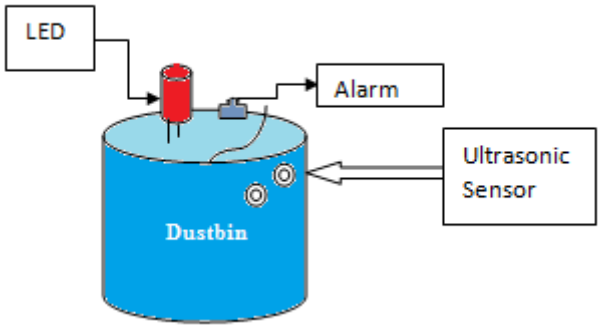

Fig 4. Proposed Smart Dustbin

Solar panels have the potentials to generate sustainable green energy.

Most of the time road side municipal dustbins are not maintained properly as well as it is not regularly cleaned. Ultrasonic based alarm and LED indication systems helps a lot to the workers of municipal and the outdoor environment is well maintained by the city corporation. This helps garbage collection authorities to make complete waste disposal in efficient and the smart way.

As now a day's a lot of work can easily carried out through IOT. Collection and transportation and monitoring of recycling process can easily done through IOT platform [9],[10]. But there must be important on securities while the overall process will be done through server system [11].

In general, public municipal garbage corporation did not get the time and right information about the full of the dustbin , which makes the system with different harm full diseases . alarm system makes the timesaving and the workers can easily check their work .

When someone put the waste object within the sensing area the dustbin automatically open, the flow chart is shown in figure 5.

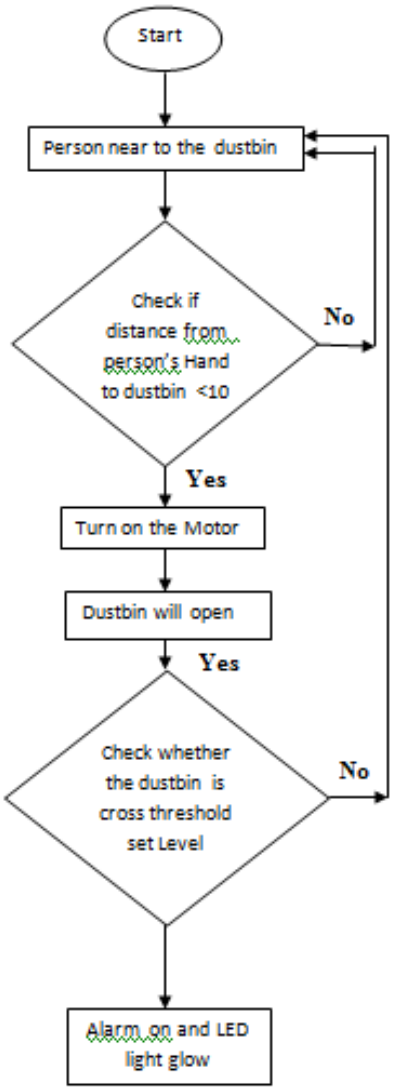

Fig 5. Working Flowchart for Smart dustbin

III. RESULTS AND DISSCUSSION

Arduino and ultrasonic based touch free dustbin will help to the user of every individual. As per the controller setting on the level of reaching to that then the buzzer sound will be there and the LED placed on the dustbin will glow, which gives a clear indication of that the dustbin is full.

Irresponsible on the waste management make increase of germs which is the root cause of many bad smell and variety of diseases. Actually, in the design of smart dustbin, we have interface Arduino with ultrasonic sensor to make the system better then the general conventional method.

Prime parameter is to reduce the waste by using different municipal dustbin. Basically, waste on the road that needs to a number of problems which will also spread throughout the city. This also degrading the beauty of the city.

A. Designs

There are so many manufactures made this type of dustbin system but if some one place the solar cell then the cost for battery will be reduced and easily functioning on the daytime [12].

B. Prototype connection

By proper placing of the required circuit connection which consists of ultrasonic sensor , LED, Arduino, Power supply, Stepper motor will make the system and it give much effect and make easy way the proper garbage collection by the local prevailing parties. This can also help to collect maximum amount with minimum amount of time. So that in regular basis proper disposal can be possible with proper time.

Servomotor and ultrasonic sensor are connected to respective pins of Arduino. When someone's hand will come closer that time trigger pin HC-SR04 receive the high pulse , so that it can measure the distance then it sends the signal to the Arduino , if it crosses the threshold value it triggers the servomotor so that the dustbin can easily open. Prototype model is shown in figure 6.

Fig 6. Prototype model for smart dustbin.

C. Specification

The specification for the smart dustbin are as Arduino uno, jumping wire, LED, ultrasonic sensor 5v global

current consumption and dc motor operating 4,5 v to 9 volt and battery.

D. Potential applications

Normally it does easy way of waste level indication and using this Arduino based system waste collection should be efficient. The main advantage is that no overflowing of garbage whenever it is filled to certain level. Maintenance cost is low and can be applicable any condition in the city. Smart dustbin fundamentally solves maximum issues arise in the society.

Proper recycling regulation is necessary for time to time. There should be mandatory for adoption of waste directives for respective place. In addition, it's mandatory for regulation of waste deposit system. As large no of population has to properly disposing their garbage in appropriate way then there will be reduced of environmental problems. This type of study also encouraging different engaged people for their valuable recommendation and suggestion for better improvement.

IV. CONCLUSION

The collection of waste material under the well control by the municipal body can easily done through by using smart dustbin. Smart dustbin constantly check the waste material level, when it is reached to its maximum level , it notify the controller and then there will be a RED LED blinking and an alarm sound will be there when the bin will be full. In India 0.14 million times garbage generated daily and this will be expected more in upcoming years. This kind of smart dustbin can help the society in terms of reduction of germs produced by the waste materials. It also makes the surroundings clean so it can make green environment . it also can stop the overflowing of dustbins either it is in the home or in the roadsides.

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