E-Waste Bin for Disinfection and Waste Management of Masks

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ABSTRACT

The corona virus pandemic has shook the entire world and the major precautionary measure for this is to wear masks. The demand and supply of these masks has increased drastically, with majority of population using surgical three, two or one ply masks which is generally thrown after its use. The first thing that is in contact with the masks is nose and mouth of the person wearing it. These masks are becoming carrier of the virus due to improper disposal methods used. Until the masks are not disinfected they are not safe to be disposed in dumping yards. There are many rag pickers who enter the dumping yards to collect recyclable wastes or the person who collects the garbage from individual homes become people of high risk to the exposure of this virus. The proposed work presents a novel approach to eliminate this problem by employing a smart electronic bin which has a disinfection section which will disinfect the masks using UV-C lights and then it will be dumped into the bin installed just below the unit. This bin has a level sensor which will monitor the level of waste in the bin and whenever it gets full, it will notify the concerned authority on his mobile using Blynk app. The Blynk app interface is designed to present the status of level of waste in the bin.

Keywords : E-bin, masks disposals, covid-19 waste management

I. INTRODUCTION

Waste collection has always been a major problem in city areas as the dustbins are full or the public dustbins overflow but the workers don't collect and drop this garbage in the main dumping yard. There should be a provision to automate the process and notify the department and concerned authority to the sensor network which will help to identify the work of garbage collection each day. In this paper the author has presented a way to monitor the level using sensor and notify through GSM technology[1]. In this paper the author has proposed a wireless sensor network to monitor the status and notify the user through both GSM and internet based technology[2]. Using GSM technology at each node will be a tedious

process and costly process, rather it would be better to connect the bins in a wireless networks as nodes and location of each node should be annotated while installation of that bin in that area[3]. This would reduce the cost of the hardware drastically and make the work more economically and technologically feasible. In cases where the bin has to be relocated, the annotations can be updated easily thereby making it easy to use and update as well. The corona virus pandemic has brought about a very high rise in use of masks by individuals and majority of them use disposable masks like the one two or three ply masks. Corona virus has been proved to spread through surface contact and these masks can become potential carrier of the virus as they are the most exposed to nose and mouth of a person. Earlier it was suggested to dispose these masks separately in plastic bags to contain the risk of spread of virus. But the use of plastic bags is not the solution to this problem rather it would increase the problems of waste management. There are many ways suggested to deal with this waste but economical feasibility and technological feasibility is essential. An important parameter to be monitored at this point of time is to disinfect the masks at the same place so that there is no carrier of surface contact of these viruses. The existing system requires a garbage collector to collect garbage from individual homes. This increases the risk of these personnel to the virus, the up-gradation of this system is needed. Lack of disposal management of biomedical waste.

- Health threat to cleaners
- Health threat to general public
- Chances of virus spread to graveyard cleaners due to PPE kits being discarded in huge quantities at these places.

II. METHODS AND MATERIAL

Disinfection

The UV-C light has been proved to kill the covid-19 virus hence is a very suitable choice for disinfection of surfaces and objects. The disinfection of the masks is very important because it can be a potential carrier of the virus. The range of UV light should be in UV-C for disinfection.
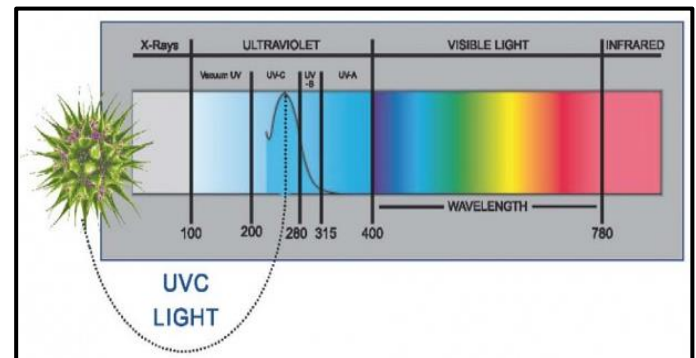

Fig 1 : UV-C light range

The UV-C range is from 100-280nm which is available for disinfection, it not only kills virus but also is used for disinfection of water and air. The researches have proved that corona virus on mask is killed with UV-C light. Masks will be disinfected hence it can be reused or disposed. It will ensure that there is no risk of virus to the persons collecting it or even if it is not disposed properly in the dumping yards.

Technological communication

Mainly the technologies used for communicating the level of waste in the bin are:

- Internet
- Bluetooth
- Zigbee
- Gsm

Internet has got its advantage over other technologies as it has no limitation of range and it can be accessed from any corner of the world. WIFI modules are required for accessing the internet and connecting it to the controller. GSM technology, Zigbee increases the cost and has a major problem of range. Bluetooth cannot be used in this application owing to its limited functional capacities.

III. PROPOSED WORK

The proposed work presents a novel approach to properly disinfect the masks and inform the status of bin to the concerned authority. Initially the user first opens the chamber and keeps the mask into it, then the user control is to turn ON the mechanism and UV-C lights are turned on. It will continue till the specified duration and then automatically turn off. The LCD installed will show the status of operation of the unit. This disinfected mask can be reused or disposed in to the bin. The bin is attached just below the chamber. The bin is installed with ultrasonic sensor and level of waste will be monitored through the dustbin. This data is then sent over the internet through WIFI module. Blynk app is installed and then an id will be created which will be dedicatedly allotted to the user only. The interface is designed according to the requirements of user, one major advantage of using this is that it will create notifications on the mobile once the bin is full and user can allot some person to collect it in a particular duration.
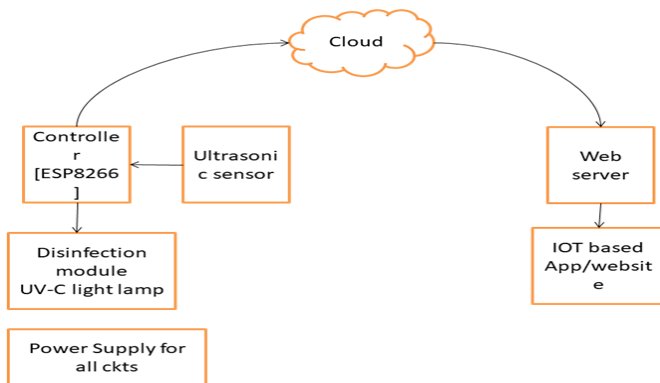
BLOCK DIAGRAM

Fig 2 : Block diagram

NodeMcu is a controller that has built-in WIFI module which helps to keep the status of bin monitored continuously. The cloud will be helpful in storing and accessing the data.
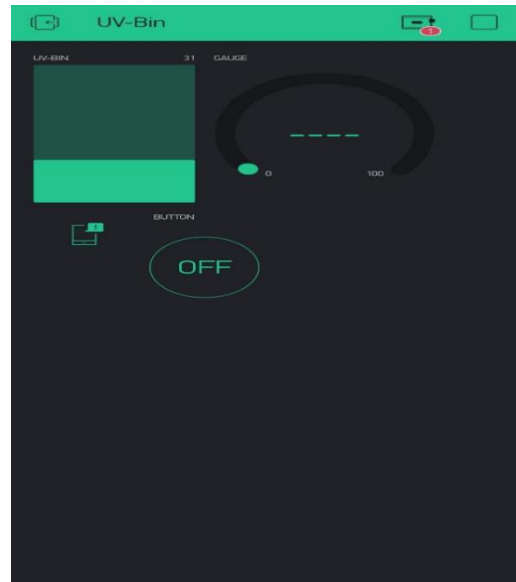

Fig 3 : Blynk app Interface

The general interface of the app is easy to use and access. Its graphical view helps to interpret the data easily. The UV-C light commercially available comes in various shapes the best suited out of these would be of a tube-light to cover maximum area of the chamber. The inside surface of the chamber has to be lined with reflective surface such as that of aluminium foil. This reflective coating ensures that the light is focused on the object to be disinfected and would help to efficiently disinfect the surface of the object. Human exposure to the UV-C light is very dangerous and has many side effects. To avoid this problem of exposure to this light a reed switch is installed which will send a signal to the controller and the light will be turned off directly when chamber is accidentally opened during the working of disinfection. Programming of the controller is done on arduino IDE which uses a structured programming language. SSID and password has to be set through programming. The system has to be kept connected to internet continuously, the internet device name and password has to be same as that of the programming.

IV. CONCLUSION

The work is designed to be an efficient smart electronic bin which will be capable of disinfecting

the masks with UV-C lights and also provide the status of waste in the bin. The level of waste will be updated on Blynk app and interface can be seen on the mobile app. This work will be beneficial for hospitals, clinics, quarantine facilities, shops etc.

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