Smart Shoe Sanitizing Device

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Abstract. People of our country are searching for all kind of protection against the virus which has been spread in all countries, according to surveys it is known that coronavirus keep active on the metallic grounds but on the other hand it can remain on shoe for three to five days. As plastic, leather, and rubber are the good transporter of viruses so daily requirements made by these materials are needed to be sanitized. If a person goes to an infected place or sneezes or speaks in front of another person can be infected easily by the globules spread over the shoes. Also, as our shoes come in contact with most of the dirt and germs, it is another reason for growing corona along with another virus. For this which virus and bacteria stay stick with the sole of the shoes can be carried to home. So, to fight against this situation, this paper proposed a smart IoT based Shoe Sanitizing System. Our proposed system will detect and remove the bacteria or virus by liquid spraying sanitizer along with the light of UV and at last, the shoes are dried with the air of DC. We can monitor and control the system over the Wi-Fi or internet by the implementation of the Node MCU and 4G GSM module. We have constructed this system to be carried out on the entry gates and doors. Through this device, a passer-by can avoid destroying the pandemic and also lower cost.

Keywords: Shoe, Covid-19, IOT, Sanitizing

1. Introduction

At the beginning of December of 2019, in Wuhan, China, a virus was spread which is also known as COVID-19. The COVID had spread rapidly and thoroughly the most through China along with many other countries like Italy, Japan, South Korea, Bangladesh from January of 2020. It has appeared to be increased by a human to human connections. WHO took quick steps as soon as it got information about the information of COVID-19 from China. It was informed to every country to stay conscious and every person to stay home to stay safe. Millions of COVID cases caused because of the rapid cases of COVID-19. With many other countries, COVID-19 has spread over the whole of India too. Thousands of people died because of COVID-19 and lakhs of people infected. The scientists, doctors of the whole world had
started with the full potential to make a cure for COVID-19 which has become a big threat to human society. Now, the main cause of Covid-19 is mass gathering and hand to hand spreading of COVID. In that crowd, people can be infected by COVID-19 from COVID infected people. The infectious globules of a diseased person when they speak or sneeze through their nose or mouth is the easiest way for COVID-19 to spread from one person to another. Because through these globules COVID-19 can easily be carried from one to another person. People can be infected by COVID-19 if they take a breath in these globules from a COVID infected person. This is why keeping at least a 1 meter distance from one to other people is important. This virus can attach to the objects people touch the most like knobs, railings, windows, etc. Now people can be influenced by this coronavirus when they touch their nose and mouth after touching here and there. So, that’s why regular washing of hands and feet with soap and water or clean with hand rub which is mostly used to kill germs, is necessary. So, for this reason, each and everyone uses hand sanitizer, soap, hand washes regularly. We also use hand gloves, masks, etc. to save ourselves from mass communication. But the most unavoidable thing we avoid every time that is COVID-19 can also spread by shoes that we wear at the time of going anywhere in this pandemic situation.

2. Methodology

2.1. Hardware’s Components-

For developing the system, we need the following hardware: Arduino UNO, G GSM module, IR sensor, Water pump, speakers, UV light, DC Fan, etc.

2.1.1. IR Sensor (Figure 1) · This is a proximity sensor that is based on Infrared. It is an infrared transmitter and a receiver fit contained Infrared transceiver in a compact form on a tiny board.

2.1.2. ESP8266 Node Mcu Wi-Fi Development Board (Figure 2)- Node MCU is used for IoT implementation, the board just like Arduino which comes with a built-in ESP8266 Wi-Fi module already present in it. A NODE MCU is a Wi-Fi miniature module that also provides us to connect Wi-Fi connections within some limits of its place.
2.1.3. **DC Fan (Figure 3)** - Dc fan is an important and rigid component for our device. This fan is made Arduino compatible by connecting it with a relay. Dc fan operates in much higher voltages than Arduino. The speed of the fan varies proportionally with its cost. The DC fan is the largest component in the module and thus consumes much power.

2.1.4. **4G GSM GPRS Module (Figure 4)** - GSM has mostly used in IoT based devices in order to use SIM facilities in any module. SIMM900A is the best at a low suitable cost and works almost fine. This module consists of two or more antennas according to our requirements. GMS module requires a little bit soldering but it is much rigid to be fit in an entire IoT circuit. Current days GSM devices support 4G speed services to be used.

![Figure 3: DC Fan](image1)

![Figure 4: 4G GSM GPRS Module](image2)

2.1.5. **Relay (Figure 5)** - This component is made to link highly voltage circuit with low voltage circuits. The relay circuit consist of three phases, first one is the source phase, second one is the driver phase and the last one is the isolation part. All of the three phases together perform switching operations.

2.1.6. **Water Pump (Figure 6)** - This miniature water-pump is designed to provide IoT facilities along with high rigidity. As because the water pump works easily with Arduino, this helps to run and compile the entire mechanism of flowing liquid efficiently. This IoT component is water-resistant and also works fine with low diluted liquid.

![Figure 5: Relay](image3)

![Figure 6: Water Pump](image4)

2.1.7. **Arduino Uno (Figure 7)** - The Arduino Uno is the main component of this module. Arduino microcontroller is commonly used in every IoT device. Coming to its low cost and efficiency, it is suitable for many components that have many parameters. Physically, Arduino is very stiff and
its coding method is very easy if it's known how to be used. The capacitors on the board are
arranged in such a way that is passed every data much fluently.

2.1.8. UV led (Figure 8) - UV light helps to kill bacteria which are the main cause of infection from air
and surface. The main advantage of UV light is it doesn’t require chemicals or heat to kill germs cause
its range(222nm) can kill bacteria.

2.1.9. ARDUINO M131Loudspeaker (Figure 9) - It is an Arduino compatible speaker. It requires quite
low power but gives high sound. It will be used as an alarm or buzzer here.

2.2. WORKFLOW DIAGRAM

Figure 7: Arduino Uno

Figure 8: UV led

Figure 9: ARDUINO M131Loudspeaker

Figure 10 : Work Flow Diagram
3. Working Principle

![Figure 11: Circuit Diagram](image)

When anyone will enter at home or any other places at the entry place there will be the device placed. Now, at first the device will detect our feet with the shoes. Within one second of detecting, the sanitize spray in the device will spray sanitizer in the shoes and at the same time the UV light will be activated, and it will kill all the germs. Then there is a DC fan in the device. This fan will work as a warm drier. Now, this warm drier will blow warm wind. This warm wind will dry out the entire shoe so that it cannot be wet any more with the sanitizer. The device will ensure the person with a sound that the shoe is now fully sanitized and germ-free and now the person is ready to enter. In this device, all the components like sanitizer spray, UV light, shoe detector, etc are controlled by Arduino. The whole device is working through Arduino programming.

3.1. STEPS

i. At first the device will detect the shoes by the help of an IR sensor.

ii. After 1sec the UV light will activate and kill all the germs and at the same time the sanitizer spray will activate to sanitize the shoes.

iii. Then the dc fan will start and blow the warm wind to dry the shoe.

iv. After the complete process the Buzzer will ring, which means the shoe is sanitized successfully.
4. Results and Discussion

After connecting all the components to Arduino and adjusting all the set up to a one-on-one doorway, when a person stands at the door his/her shoes get sanitizes and germ-free by UV light. The shoes are then dried so that it does not get wet due to sanitizing spray. The module can also be controlled over Wi-Fi or internet due to NODE MCU.

![Figure 12: Simulation process of the device](image1)

![Figure 13: Output of simulation](image2)

5. Conclusion and Future Scope

In this COVID-19 pandemic situation, we all are concerned that germ protection is very necessary and the most important thing is to sanitize and keep clean the environment around us and sanitizing the source from where the germs spread the most is also equally necessary. Now, this device sanitizes a person’s shoes which are the main carrier of all the germs along with COVID-19. As we wear shoes whenever we go outside and carry the germs most through our shoes. So, this device can sanitize our entire shoes and stop spreading COVID-19 along with other viruses. So, to prevent the spreading of COVID-19 through shoes or legs of pedestrians we are proposing such a device that can sanitize our shoes automatically with the help of UV light, IR sensor, and specially sanitizer spray. Now in this way, everyone can stay safe, stay healthy. As this is a very easy process and a fast mechanism it can match soon with our every lifestyle. Also, to make this device well settled with our daily life we are implementing IoT among with some other components like Arduino, DC fan, etc.

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