

Chapter 36

Touchless Doorbell with Sanitizer Dispenser: A Precautionary Measure of COVID-19



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Abstract We all aware of COVID-19 impact around the world which made us to be more cautious in our social life. In this situation, we need to adopt few precautionary measures such as washing hands regularly, sanitization and social distancing. In this regard, we need to upgrade our gadget which comes under physical contacts regularly with people as it can be high risk of transmission of virus. Here doorbell is one such an example which comes under gadget with multiple person contacts, so there should be an upgradation to avoid physical contact while using doorbell. This made us to develop a product called as touchless doorbell with sanitizer dispenser, which avoids physical contacts as well as provides sanitizing the hand. It consists of two IR transceivers, and microcontroller along with surrounding circuitry helps to control sanitizer and doorbell.

36.1 Introduction

Generally, nowadays most of the house owners are using doorbell, and there are many types in the designing of doorbells such as wired doorbells, wireless doorbells and smart doorbells. Mostly the wired doorbells are connected to the electrical system of the room, and those are controlled with a switch which is placed outside of the door. Wireless doorbells are operated wirelessly with the help of transmitter as a switch which is connected outside of door and receiver is placed anywhere in the room with range specifications needs to be met. It uses radio frequency (RF) technology or infrared technology such as Bluetooth, Zigbee for data transfer between transmitter and receiver [1]. The major advantages of wireless doorbells are cost-effective, easy to install, power saving, and majorly no drilling is required to walls. The smart

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doorbells are also one type of wireless doorbells but operated with Internet, and these are controlled with smart devices such as mobile phone or a remote. The major limitation in smart bell is connectivity issues when no Internet, and also, it has to support your smart phone application.

There are many ways to control the touchless doorbell device such as [2].

- It can be controlled with the help of serial joysticks, which contains potentiometer and push buttons which controls the motion of motor with the help of pulse width modulation (PWM).
- It can be controlled by interfacing device with personal computer (PC) using serial port.
- It can control with the help of 433.92 MHz RF transmitter wirelessly.
- Lastly, it can also control with the help of Zigbee Communication.

As we know that COVID pandemic brings lot of changes in the human life, and also, it brings changes in the technology to be used such as increasing digital transactions which reduces the exchange of liquid cash and usage of smart technologies which provides safety precautions to decrease the effect of human life with COVID pandemic [3]. There are many precautionary measures and are there to avoid COVID such as maintaining social distance, washing hands regularly with sanitizer and keeping the face mask while going outside. Out of all we have taken sanitizing hands as a concept and linked with smart doorbell mechanism [4]. Generally, in regular life there are many persons may visit our home or our office, so every time they need to press switch to ring doorbell and also there is a possibility to exchange some goods from them and both has to be avoided in this pandemic. So, this paper will discuss the design of such system called as automatic doorbell with sanitizer dispenser.

36.2 Implementation Diagram

Figure 36.1 shows the implementation diagram of the project, and it mainly consists of transmitter and receiver. The transmitter block is placed at outside of the door, and it consists of two IR transmitters, Arduino Uno, one relay circuit, sanitizer bottle and an antenna for wireless data transfer [5]. The outer part of design consists of two LEDs, red colour and green colour, red colour LED used for enabling doorbell and green colour LED used for dispensing sanitizer. Each of the LEDs is connected to Arduino Uno microcontroller through IR transmitter and to dispense the sanitizer a relay is connected to Arduino and the output of this is connected to a motor which is inside of the sanitizer bottle [6]. Whenever person wants to knock on the door, he/she is having to keep his hand nearby IR transmitter of red LED then through antenna along with Arduino, information will be transmitted and received at antenna of IR receiver which is placed at doorbell, so that it activated [7].

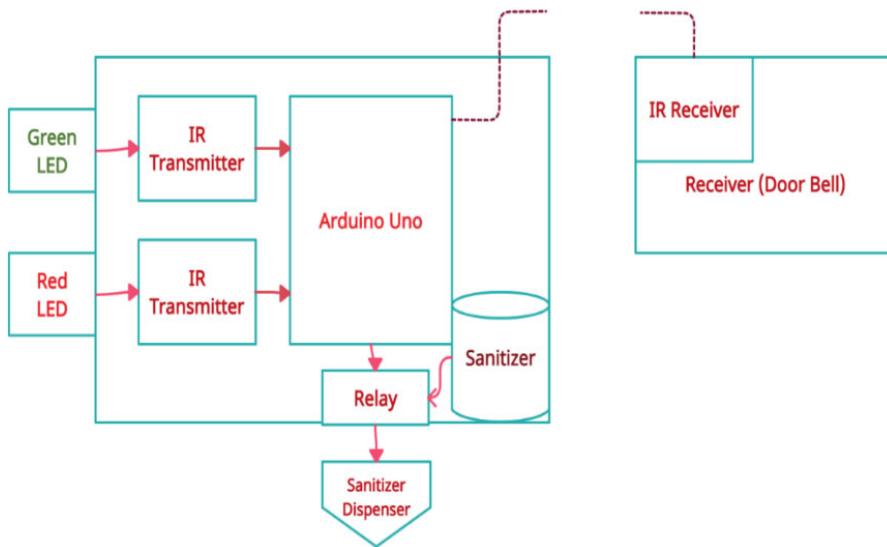


Fig. 36.1 Implementation diagram

36.3 Design Approach of Project

In this section, we will study flowchart and how to access the IR sensors to get required outputs.

Flowchart of project: Fig. 36.2 shows the flow diagram of the project, in which initially the person has to decide whether he/she wants to knock the doorbell or clean hands with sanitizer dispenser, based on that hand has to be used near the corresponding LED. When it detects properly, then corresponding action takes place.

Accessing Mechanism: Table 36.1 shows the accessing mechanism of the project, in which if any one of the LED glows, then only corresponding action executed, if none of the LED is on then no operation takes place and both LEDs never activated simultaneously [8].

36.4 Results and Discussions

Figure 36.3 shows the overall project implementation consists of bell setup and sanitizing setup as well as receiver doorbell speaker.

As this product needs to be operated without physical contact, we seek the help of IR sensors and RF modules in place of conventional switching in doorbells. A sanitizing setup is installed in addition to the doorbell setup.

Working of Doorbell

When a person wants to ring the doorbell, he/she has to place the hand near the IR sensor which is placed in bell setup. Whenever the hand reaches near the IR

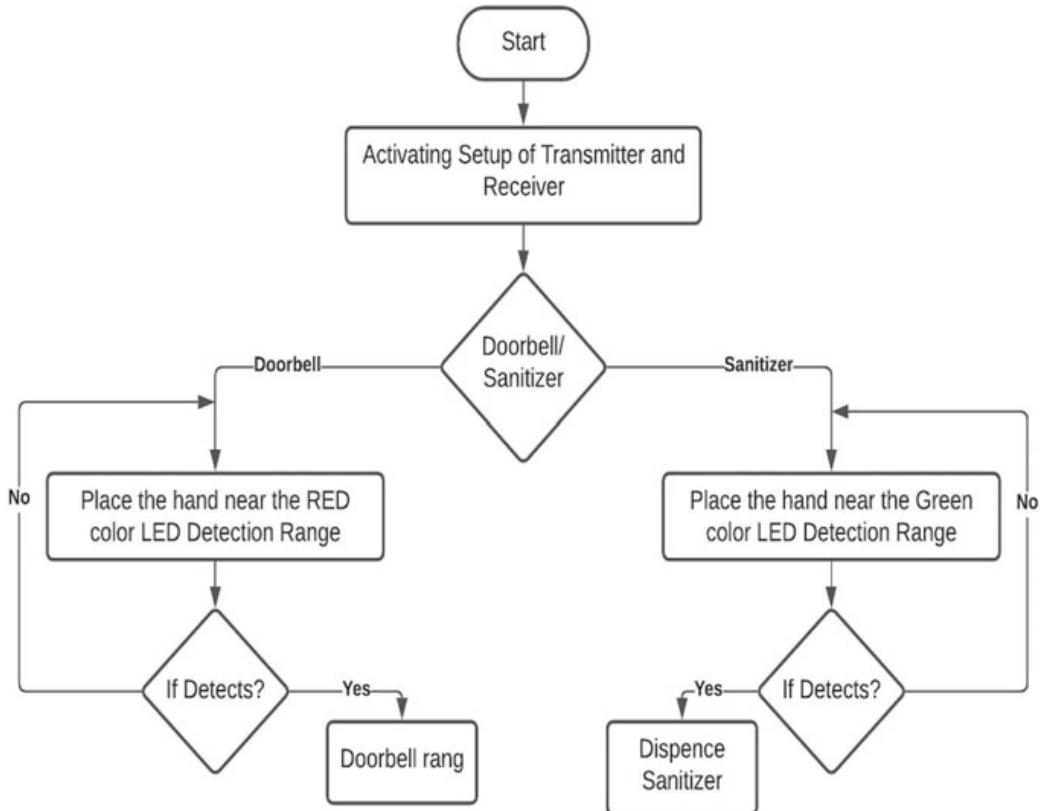


Fig. 36.2 Flow diagram of the project

Table 36.1 Accessing mechanism of the project

Red LED	Green LED	Type of operation
0	0	No operation takes place
0	1	Sanitizer dispensed
1	0	Doorbell Activated
1	1	Invalid input/no operation

sensor at a distance less than 5 cm, then Arduino gives the PWM pulse with width of 200 ms from its digital output pin and a signal will be sent to bell speaker using RF transceiver. The activation of IR sensor is indicated by red colour LED. Figure 36.4 shows the corresponding output to activate the doorbell.

Working with Sanitization

If he/she wants to sanitize hands, they need to place their hand near the sanitizer slot. Whenever the hand is placed near the IR sensor at a distance less than 7 cm, then the IR sensors are activated (activation is indicated by green colour LED) and sanitizing liquid is dispensed for duration of 2 s. Figure 36.5 shows the setup for sanitizer dispenser.

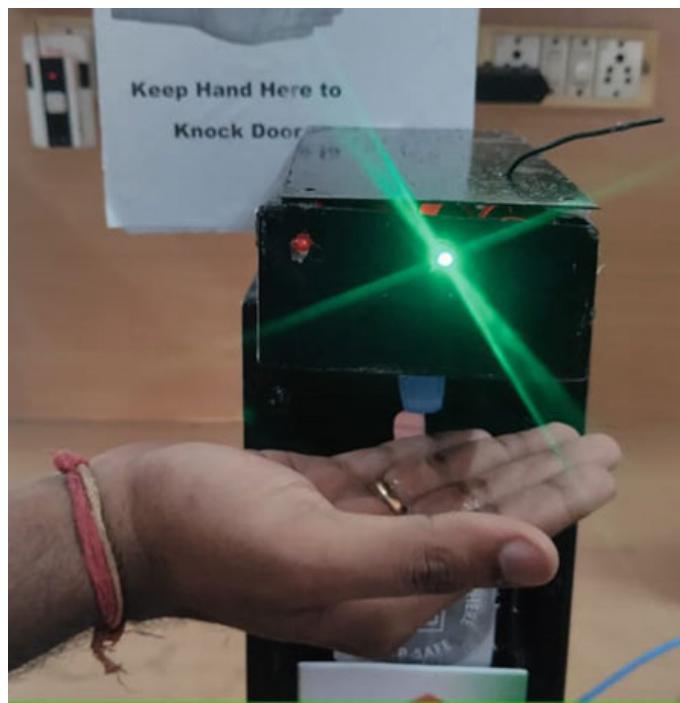


Fig. 36.3 Overall project implementation



Fig. 36.4 Doorbell indication

Fig. 36.5 Sanitizer dispenser



36.5 Conclusion

Finally, we have designed a product which is very useful during this COVID pandemic for providing two-dimensional safety, i.e. dispensing the sanitizer without touching any device before using calling bell, and hence, safety is provided at both the ends like persons who are living inside home and persons who came to knock the door. We have used already existing devices only to implement this product with less cost and can be used by anyone. In future, same project we are modifying by including image processing to detect and intimate the person who is outside of the door and also by providing image fusion sensors to scan the person when he is some distance away from the home whether, he/she carries any malicious devices.

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