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Touchless Faucet with Door Control System for Covid19

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ABSTRACT
COVID-19 is a serious pandemic at this moment. The coronavirus is spreading quickly and easily between humans. There are ways to curb the spread of this virus and one way is to wash hands using soap for at least 20 seconds. Sometimes, if the person carelessly touches the faucet - which could be contaminated - after washing his/ her hands, he/she has a higher chance of contracting this coronavirus disease. If you go out, it is safe to wash your hands before entering your premises. You do not have to touch the door handle because the door lock system is automated. In my project, a person will only be granted access once he/ she washes his/ her hands.

The person could be wearing face masks when they go to public places but their hands may not be clean. Even if he/ she cleans their hands, they could touch the surface which was touched by a virus carrier. The virus carrier's hands would be contaminated. Coronavirus could last on a contaminated surface from several hours to days depending on the environmental conditions such as humidity and temperature. By washing your hands before entering the premises, this way of spreading coronavirus could be prevented.

In this project, I have made a prototype to wash hands safely with automatic door control system. I have made an touchless faucet so that you do not have to touch the surface of the faucet and is automatic. This faucet is automatic and could also prevent wasting water when not in use.

I made this prototype using the resources at my home as I could not go out due to the lockdown in my country. You are allowed to remake this project or even improve it, but you could also try to convert any container of water into a faucet. I would suggest you to use a solenoid water valve instead of the submersible water pump. The tube is modelled as the faucet in this prototype. This model could be used in malls, offices and your home. This model could be used in places with automatic sliding doors or automatic door system, by replacing the single channel relay module with solid state relay module.

This prototype could also be used as an automatic alcohol-based hand sanitizer dispenser, but when using the hand sanitizer, the container should be closed as the alcohol could evaporate.

Design requirements

IR sensor ,Arduino uno, ultrasonic sensor,HC-SC04,solderless breadboard half size, adafruit RGB backlight LCD -16*2 , relay module,submersible water pump ,male/female jumper wires ,sg90 micro servo motor

Keywords: Safety requirements, touchless faucet, automatic door control system, sensor based .

I. INTRODUCTION

If you want to wash your hands, place your hands within 15 cm from the ultrasonic sensor. According to my Arduino program, this will switch on the relay module. The submersible water pump is connected to the relay module and an external power supply. The external power supply can be adjusted to provide the appropriate voltage. The water pump is switched on and the water is pumped from the container to your hands through a tube, which is modelled as the faucet in this prototype.

After washing your hands, place your hand in front of the IR tracking sensor. The IR sensor sends a LOW signal when an object is detected within 2cm. The LOW signal makes the servo motor to rotate 90° and open the door (in this model). The door will automatically close after 10 seconds.

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If you place your hand in front of the IR tracking sensor without washing your hands, the door will not open and the LCD display module will show a message asking you to wash your hands.

❖ **Inductive principle**

The Design Principles consist of Learnability, Flexibility and Robustness. Learnability, which consists of Predictability, Synthesizability, Familiarity, Generality, Consistency, is about designing an easy . the interaction of developed automatic faucet.

- Predictability: The developed faucet did not equipped with lever similar to other automatic faucet; hence users intuitively put their hands under the faucet's tip. An upturned hands icon was also placed on the tip for guiding users to put their hands beneath it to activate the automatic faucet. Once the hand had been detected, the faucet exited water and soap simultaneously. Seeing soap in their hands, users could easily predict the next action, which was scrubbing their hands with it.
- Synthesizability: The water and soap was designed to come out once the hands were detected; hence users able to correlate the faucet would commence the hand washing process by placing their hands beneath the faucet's tip.
- Familiarity: The developed faucet had icon of upturned hands on its tip as guidance for users to intuitively put their hands beneath it. This simple hands symbol in upturned position is easily understandable by users.

II. LITERATURE REVIEW

] M. Burton, E. Cobb, P. Donachie, G. Judah, V. Curtis and W. P. Schmidt:

The Effect of Handwashing with Water or Soap on Bacterial Contamination of hands, In International Journal of Environmental Research and Public Health.

Handwashing is thought to be effective for the prevention of transmission of diarrhoea pathogens. However it is not conclusive that handwashing with soap is more effective at reducing contamination with bacteria associated with diarrhoea than using water only.

In this study 20 volunteers contaminated their hands deliberately by touching door handles and railings in public spaces. They were then allocated at random to (1) handwashing with water, (2) handwashing with non-antibacterial soap and (3) no handwashing.

[2]C. P. Borchgrave, J. Cha and S. Kim :

Hand Washing Practices in a Collage Town Environment, Journal of Environ Health, 75, 18- 24 (2013)4.

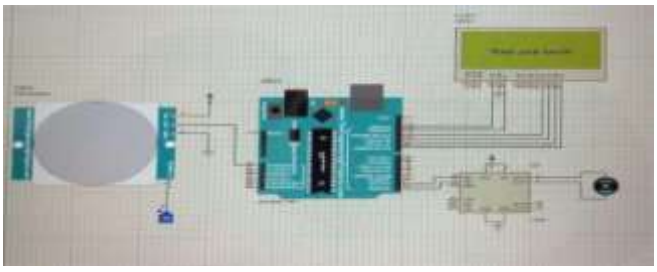
Many people do not wash their hands when the behavior in which they engage would warrant it.

Most research of hand washing practices to date has taken place in high-traffic environments such as airports and public attraction venues.

These studies have established a persistent shortcoming and a gender difference in hand washing compliance.

III. METHODOLOGY

- Buildings , banks, and other places



- If you want to wash your hands, place your hands within 15 cm from the ultrasonic sensor. According to my Arduino program, this will switch on the relay module. The submersible water pump is connected to the relay module and an external power supply. The external power supply can be adjusted to provide the appropriate voltage.
- The water pump is switched on and the water is pumped from the container to your hands through a tube, which is modelled as the faucet in this prototype.
- After washing your hands, place your hand in front of the IR tracking sensor. The IR sensor

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- If you place your hand in front of the IR tracking sensor without washing your hands, the door will not open and the LCD display module will show a message asking you to wash your hands.

IV. APLLICATIONS

- School
- Colleges
- Office

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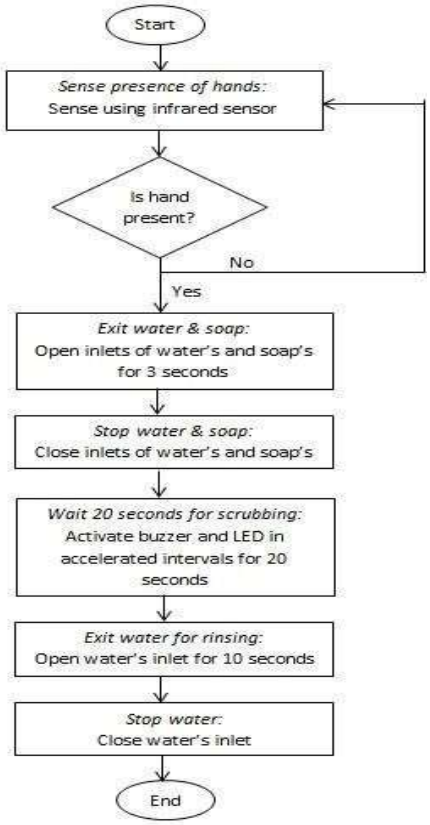

V. CONCLUSION

In this paper, a fully automatic faucet for hand-washing has been developed using Interaction Design process to maximize its usability.

The analysis on Verification, Validation and User-Participation test has shown that it functions well to force users to use soap in their hand washing routine and to scrub in 20 seconds as well as excel the usability in terms of Usefulness, Satisfaction and Easiness.

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