Introduction

The main idea of this project is to make a tunnel that can properly and safely sanitize people and objects passing through it hence ensuring a safe and sterile environment leading to a significantly less spread of COVID-19. This disinfection and sanitation tunnel sanitize people fully from head to toe in a time span of just 15 seconds from any possible bacteria or virus including COVID-19. The sanitizing agent used is effective and completely harmless.

How it Works

A Water Pump machine is placed on the side of each tunnel that takes the solution of 0.4% of Sodium hypochlorite solution in 100 Liter of water from the tank. The machine is automatic it senses whether anyone is entering into the tunnel. As anyone enters the tunnel the Water Pump gets started for 15 seconds. The user can pass through that tunnel and if there is no one in the tunnel the pump will be off to save the water and electricity. The misty disinfectant spray protects citizens from catching bacteria for a period of at least 60 minutes. As it disinfects the air, exposed skin and human clothing.

Materials used to construct the project

- Arduino UNO
- Micro tubing pipe
- Jumping wires (generic)
- Pyroelectric Infrared sensor PIR (generic)
- 1 H.P Water Pump
- Water tank
- Sodium Hypochlorite Solution
- Tent (generic)
- Fogger
- Relay
- PVC pipe
- Switch
- Other

Benefits of using disinfection tunnels

- Can be used to disinfect people and objects.
- Fast effective and reliable due to its automated nature.
- Decreases the risk of physical transmission of the covid-9 virus.

Approach towards health issues

The Health Care Without Harm organization have a few issues concerning the usage of disinfection tunnels and this is how we addressed the issues:

1. *"There is a lack of evidence that a 20-30 second misting in a tunnel will disinfect the target surface."*

   The disinfectant solution used consists of a combination of sodium hypochlorite (NaOCl) and water (H2O). The disinfectant is non-volatile, thus enabling prolonged veridical and bactericidal activity and sanitizing the surfaces. proper misting ensures that the solution reaches all the sides of the target.

2. *"Newer technologies involving fogging for room decontamination (e.g., ozone mists, vaporized hydrogen peroxide) that have become available since 2003 and 2008 were assessed by the CDC and the Healthcare protection or lung protection for those entering the tunnels. Lung protection might need to include air supplied respirators depending on the nature of the mist."*

   The nature of the mist would be adjusted so that it doesn't cause any breathing issues and wearing a mask should be forced upon entering the room as an extra protection level decreasing the probability of it entering lung tract.

3. *"The hazards associated with the practice will vary depending on the virucidal agent, the concentration of the disinfectant, the time of exposure, and the vulnerability of the person entering the tunnel. There is a possibility of respiratory irritation, depending on these factors."*

   The preparation of the solution will abide to the rules and regulations mentioned in the following two guidelines: *"Ipswich, MA and its representatives. (2020). Guidelines on the Use of Disinfectants. "* and *"World Health Organization. (2020). Collecting, preserving and shipping specimens for the diagnosis of avian influenza A(H5N1) virus infection Guide for field operations October 2006.".* Proper concentration levels of the disinfectant substance will be used so that it doesn't cause any type of skin, lung, or eye irritation but still be effective enough to disinfect the surface and kill the virus. The time of exposure to the mist would be safe and won't cause any health issues either.

4. *"There is no evidence that disinfection tunnels will address the source of the virus. Once a person goes through the tunnel, the viral load that a person is carrying in their mouth, nose, and respiratory tract - the major sources of exposure to others – still has not been addressed. Exhaled aerosolized virus (very small particles in gaseous phase or tiny droplets) can persist in the air longer than previously realized. Infected people will still be carrying the virus indoors after going through the tunnel."*

   The disinfection tunnel is only meant to be used as an extra layer of protection against physical transmission of the virus not as a face mask replacement, hence the face mask should be forced upon any entry.

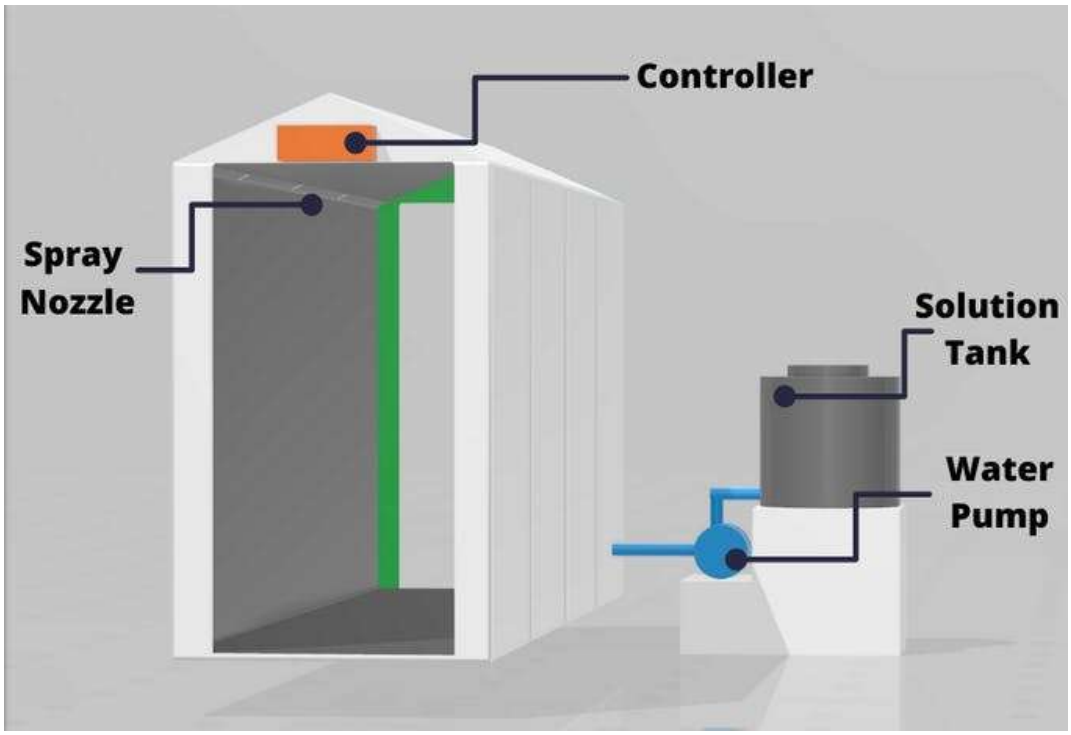
Possible upgrades and improvements

- Adding an entrance blocker that only opens after the machines finish releasing the mist this ensures that the target gets the necessary exposure to be properly sanitized.
- Automating the process of checking the temperature such that the entrance blocker mentioned in the previous proposition doesn't open if you don't have the acceptable temperature level.
- Automating it on a higher level such that a warning notification can be sent over the internet so that the necessary actions can be taken to accompany the possibly contaminated person.
- Using AI face recognition to detect if a person is wearing a face mask or not and take the proper decisions accordingly.

Pricing and assembly

- The total cost of the tunnel is approximately between 200$ / $300 (Revised cost)
- The time needed to assemble the tunnel can be done in a day
- The project has a long-term usage. The only expenses would be the electric and water bill in addition to the Sodium Hypochlorite Solution.
- The time needed to make a prototype, if the materials are available, is approximately three days.

Visual illustration



References

- Health Care Without Harm. (2020). Health Care Without Harm - Disinfection tunnels - April 17 2020. https://noharmeurope.org/sites/default/files/documentsfiles/6374/Health%20Care%20Without%20Harm%20-%20Disinfection%20tunnels%20-%20April%2017%202020.pdf
- Ipswich, MA and its representatives. (2020). Guidelines on the Use of Disinfectants. https://www.ipswichma.gov/DocumentCenter/View/10072/50ppm-Guidelines-on-the-Use-of-Disinfectants
- World Health Organization. (2020). Collecting, preserving and shipping specimens for the diagnosis of avian influenza A(H5N1) virus infection Guide for field operations October 2006. https://www.who.int/ihr/publications/Annex7.pdf?ua=1#:~:text=The%20best%20compound%20for%20the,50%20000%20ppm)%20available%20chlorine.&text=manufactured%20bleach%20if%20possible