CASCOV-CONSULTATION AND SANITIZATION FOR COVID-19

Hackfest '21 Idea Presentation

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PROBLEM STATEMENT

Healthcare workers who are physically near (within a 6 feet radius) a person with COVID-19 or directly contact that person are at the most significant risk of infection. When people with COVID-19 cough, sneeze, talk, or breathe, they produce respiratory droplets that can land on surfaces and objects. A person could get COVID-19 by touching a surface or entity with the virus on it and then touching their mouth, nose, or eyes.

To minimize the exposure of healthcare workers to this virus and prevent the spread of the virus through contact with infected surfaces, we propose CASCOV-a Consultation and Sanitization Bot.

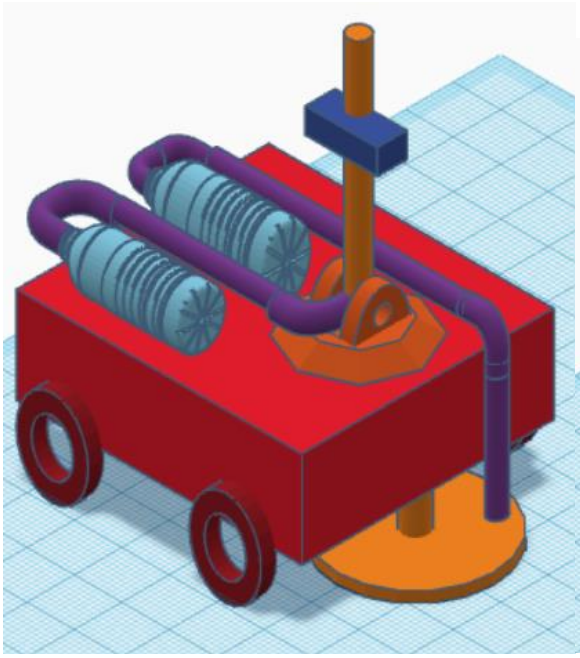
OBJECTIVES

- Safety of healthcare workers who are putting their lives on the line to save the lives of others.
- Low-cost robot to provide essential sanitization and consultation in the remotest of hospitals.
- Time-efficient consultation with the medical staff so that the needs of each patient are met.

OVERVIEW OF TASKS

- Regular sanitization of covid ward includes mopping the floor and spraying sanitizer on the surroundings' walls and objects.
- Arranging a call with the medical staff for the patients in need.

DESIGN OF BOT



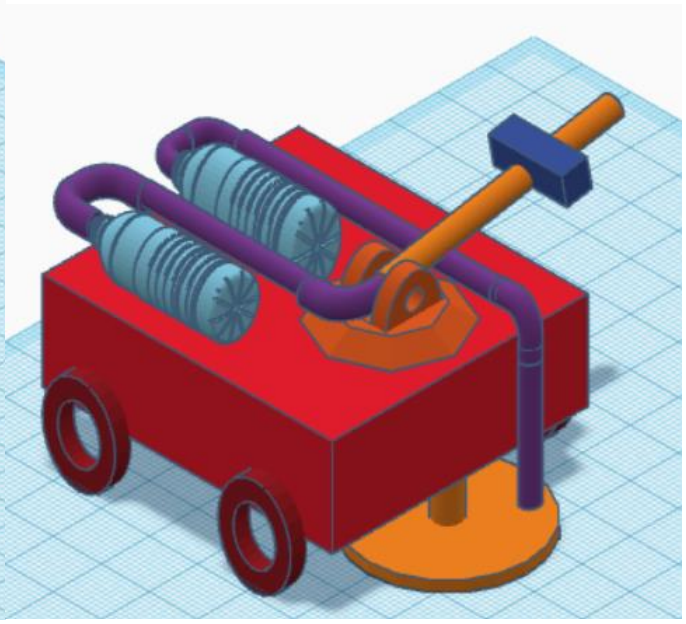


Fig1.When spraying on wall Fig2.When spraying under the bed

CASCOV has a rectangular chassis, which will allow it to reach each and every corner of the ward. The sensors are embedded in the body of the bot, along with the Arduino Uno and Arduino Mega. Four wheels connected to DC motors enable motion of the bot. The circular acrylic sheet at the front, is essential for the mopping functionalities. The vertical arm as shown in Fig.1 is controlled by two stepper motors which enable accurate rotation of the arm in 3-Dimensions. The arm is fit with a box containing an ultra sound sensor and a sprayer. The ultra sound sensor is at the same height as the beds in the hospital.

FUNCTIONS

Motion

Follows the moving mechanism of a line follower robot, an automated guided vehicle, which follows a visual black line painted on the floor. The path is customized with unique markings near the walls and the bed so that the bot can sense and function accordingly. The bot will move around the whole ward, spraying sanitizer on the walls, floor, and objects simultaneously.

An ultrasound sensor will detect any obstacles in its path to prevent a collision. This feature would enable our robot to move without any supervision.

Floor markings are as follows:-

- Type1: This indicates that the bot is in front of the wall, so it has to stop, spray sanitizer on the wall and then start moving again.
- Type 2: This indicates that the bot is at the head of the bed, so it will have to stop, perform arm rotation to make the arm horizontal, put it under the bed, and then start moving further.
- Type 3: This indicates the bot to stop, take the arm back to its initial vertical position, and then start moving.
- Type 4: This indicates that the bot moves along a parallel wall on the right to spray while moving continuously.
- Type 5: This indicates that the bot moves along a parallel wall on the left to spray while moving continuously.

Mopping

To achieve this functionality, we attach a circular acrylic sheet below the bot with a motor. The acrylic sheet scrubs the surface, thus cleaning it far more efficiently. The bottle with disinfectant liquid is attached to the surface of the bot with a few connecting tubes that can be drawn from it to clean the surface properly.

Sanitization

This spraying mechanism has a working similar to that of a piston. An engine type of mechanism will be implemented to push the piston of the sprayer. Depending on the type of signal received at the markings, the vertical arm of the bot is rotated so that it faces the surface on which the spraying is to be done.

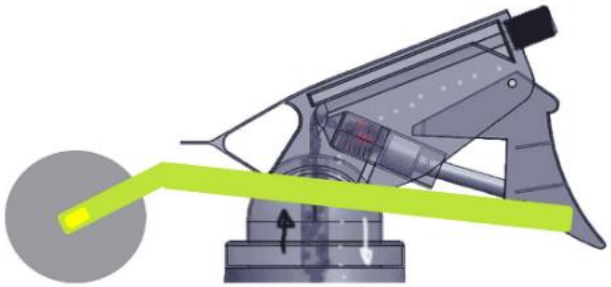


Fig.1 Shows a decompressed piston.

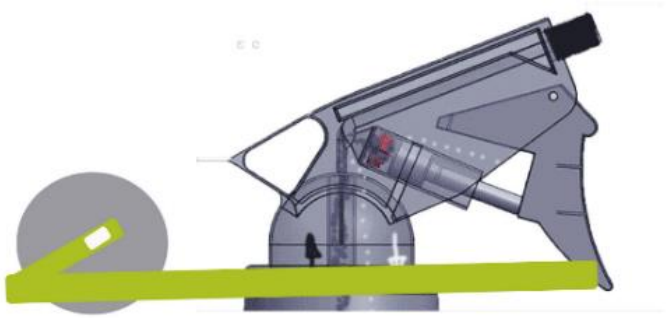
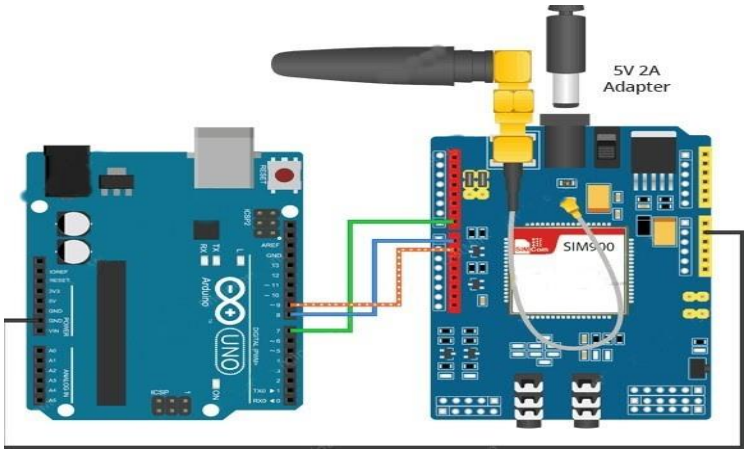


Fig.2 Shows a compressed piston.

The same mechanism will be used to spray sanitizer under the beds and on the walls. But now a second stepper motor will be used to make the vertical arm horizontal.

Communication

For the communication of the bot with the medical staff via voice call, a GSM Shield(SIM 900) is used with an external SIM Card connected with the Arduino UNO board. This is connected to an external speaker and a microphone circuit. The feature will include a pushbutton, which will enable the patient to converse with the medical staff.
The following is the schematic diagram for the sample circuit connection of the Arduino Board with the GSM Shield having an integrated microphone.



SOFTWARE

- GSM module
- Arduino IDE
- AutoCAD
- TinkerCAD
- Glowscript
- MATLAB/Simulink
- Visual Python

HARDWARE

- DC Motor
- Stepper Motor
- Arduino Mega
- Arduino UNO
- GSM Module
- Motor Driver
- Customized Chassis
- Wheels
- Wires
- LiPo Batteries
- Sponge
- Sanitizer Bottle
- Graphite Rod

TOTAL COST

Component Name	Amount	Cost per Piece (in Rs.)	Total
Simple DC Motor	6	173	1038
Stepper Motor	2	1200	2400
Graphite Rod	1	345	345
Arduino Mega	1	1259	1259
Arduino UNO	1	789	789
GSM Module	1	850	850
Sanitiser Bottle (1L each)	2	225	450
Motor Driver	1	500	500
Ultrasonic Sensor	1	200	200
Infrared Sensor	4	200	800
Lithium Ion Battery	1	250	250
Miscellaneous (wheels, chassis, welding etc.)	1	1000	1000
		Total	**9881**