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Smart Sanitizing Robot with Medicine Transport System for Covid-19

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ABSTRACT

This task describes the evolving role of robots in fitness care and contexts with special concerns associated with the control and control of the spread of the 2019 coronavirus (COVID-19). The number one use of such robots is to lessen contact with one another and to make sure cleanliness, birth control and guide inside the same hospitals and facilities as isolation. this will lead to a discount in health risks for scientific workforce and physicians who play a large role in controlling the COVID-19 epidemic. The aim of the present day look at is to highlight the significance of medical robots in fashionable and to link their use with the vision of COVID-19 managers so that health facility directors can recognition on increasing using clinical robots in numerous clinical techniques. this is despite the recognition of telemedicine, which works properly in comparable situations. In reality, the latest fulfillment of the Korean and chinese healthcare sectors in gaining effective manipulate of the COVID-19 epidemic could no longer were possible with out using ultra-modern scientific era.

Key words: Covid -19, Sanitizer spray, Arduino Uno, Smartphone Function etc.

INTRODUCTION

Remedy for corona virus 2019 (COVID-19) can be done by way of disinfecting each the human body and the outside surroundings. in addition to disinfecting the item, the disinfection method can also be accomplished by using exposing the virus to ultraviolet (UV) light. since the outbreak, various disinfectants have all started to build, manually and routinely. automatic machines are considered to be very beneficial and useful inside the procedure of decomposition of germs and bacteria. but, with the excessive mobility of medical personnel and epidemic officials, a transportable disinfectant tool is needed and reduces the transmission potential of the virus.

Sanitation, which has come to be a totally essential aspect in those times of epidemic and performs a totally important function in preventing the unfold of this deadly virus and thus supporting to eliminate this worldwide epidemic may be very critical. one of the areas most vulnerable to contracting this deadly virus is in a place wherein people rush to get treatment, specifically hospitals and doctors' wards. Sanitation in these regions is a actual undertaking and requires the highest standards of movement. but no matter most of these excessive-stage measures, there are constantly dangers related to it. The goal of this assignment is to lessen human contact as plenty as possible and consequently to automate sports such as sanitation with the help of robots. In this case, the use of robots can reduce human publicity to germs, that's turning into increasingly important as epidemics spread. The undertaking makes use of Autodesk Fusion 360 software for its layout and development of a hygienic robot. included Arduino integration with HC-05 Bluetooth module used for control and modifying. The design of the robotic has a smiley effect that contributes to right distribution all through those instances.

PROBLEM STATEMENT

COVID-19, a disease due to the radical coronavirus, has caused a worldwide outbreak that has no longer been visible in greater than a century. Responses to tropical regions have various from encouraged advice to obligatory isolation.
we've become acquainted with seeing robots in our lives, acting day by day responsibilities from checking save cabinets to cleaning our houses. however in the event of a catastrophe just like the COVID epidemic, we understand that those gear can help keep humans secure with the aid of decreasing our exposure to the virus and supporting to lessen the spread of the virus.
"Covid-19 will be a catalyst for the development of robotic systems that can be fast dismantled, with out the want for far off expert help and critical service companies.

OBJECTIVE

- The main goal of this undertaking is to layout a smart cleaning robotic in the context of COVID-19 and shop the lives of our leading heroes.
- Clean the inflamed region with wireless operation
- Transporting drug treatments, meals and whatever else needed inside the affected person's region
- Look at cell verbal exchange and its controls
- Have a look at the manage required for the project and its features to improve it.

PROJECT METHODOLOGY

a. Block Diagram

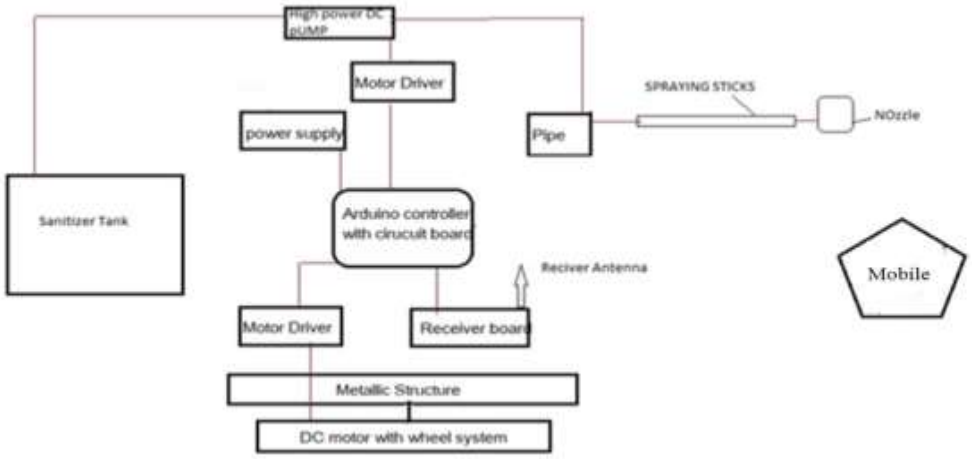

Fig. 1 Block Diagram

b. System Architecture

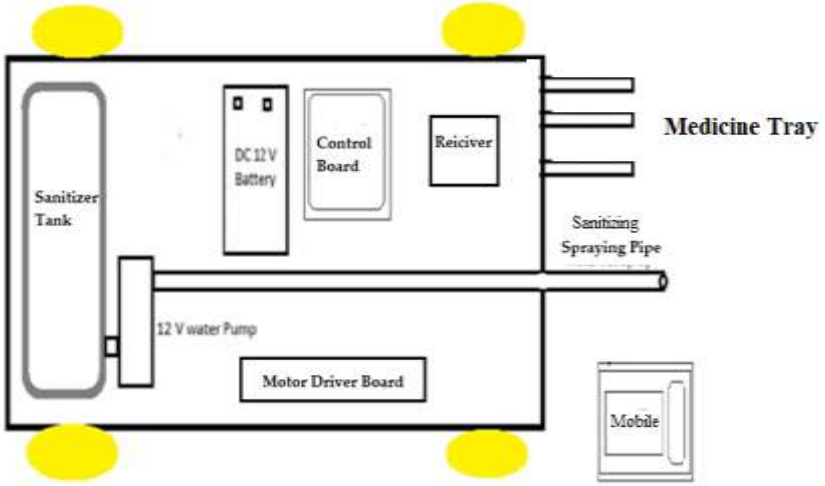

Fig. 2 System Architecture

c. Working

- The ultimate goal of this project is to design a Smart sanitizing robot for the Covid-19 environment, and to save the lives of our former heroes. By using remote control.
- The robot is loaded with a sanitizer tank and a high-speed pump controlled by a wireless connection for spraying. To operate what you want, an Arduino microcontroller is used.
- At the end of the sender, the push buttons are used to send commands to the receiver end to control the movement of the robot, forward, backward, right or left as well as 360 directional movement.
- Remote control with sufficient width of up to 30 meters of incoming note, while the decoder decoder before supplying it to another smaller controller to drive DC motors with motor IC driver to perform the required function. .
- The sanitizer tank and water pump and control board are connected to the robot body and its operation is performed from the outlet of the microcontroller with the appropriate signal from the transmission end.
- There is a wireless camera attached to the front of the robot. We can see a live video of the surrounding area and spray accordingly.
- The robot is powered by a 12v battery, and is charged with 12v adoption without power interruption.
- The robot also transports various medicines and medical equipment within the corona ward and elsewhere. This makes the robot a multi-tasking player.

d. Component

- Arduino Uno Controller (R3-ATmega 328)
- Bluetooth module (HC-05)
- DC pump (DC12V)
- 12V DC Power Supply,
- 5V DC Regulator (7805 IC)
- LCD display (16*2) (DC 5V)
- Relay (12V)
- Adapter (12v 2Amp)
- Battery (12v 1.5Amp)
- Tank (1 Lit)
- LEDs
- Resistors, Capacitors and Diodes
- Other

e. Mechanical design

The robot uses DOIT chassis with the T100 kind. The two chassis are then assembled and expanded with four bars of aluminum alloy to accommodate the chassis dimensions to 48 cm in length and 24 cm in width. The chassis, which can carry loads of up to 5 kg, has a specified torque of 9.5 kgNan, made of aluminum alloy material, weighs 0.65 kg, and a trackwheel made of engineering plastic. This chassis includes two DC motors with 9 V voltage specifications, currently loaded by 1200 mA, and a loading speed of 100 rpm.

The placement of each component in the board system should take into account the relative weight of the robots. Apart from the position of the sprayer, the tank, and the pump are also very important for proper and high pressure. The location of the battery and the main control robot are placed in the back so that they are away from potential exposure to liquid spray. FPV cameras are mounted on the back so that they can monitor the movements of the robots and spray them properly. With this specification of the machine, the robot can transport more than 1-liter disinfectant, DC pumps, batteries, and electrical circuits.

Fig. 3 Project Image

RESULTS AND DISCUSSIONS

This section focuses on the outcome and analysis of a moving robot. The design effects in terms of mechanical, electrical, performance, and sensory learning are well described in this section.

a. Mechanical chassis and track wheels

As explained in the previous chapter, this robot is four wheels drive machine. The chassis is composed of rods and wheels made of aluminium alloy type 5070. As showed in Figure 6, each wheel has three jagged wheels, one of which is driven directly by the motor and two others to position the trackwheel so it will stay still in the frame. The trackwheel material used is engineered plastic with each adjustable lattice. The frame of the robot is connected by aluminium alloy bars 3 mm thick. Above the frame is given an acrylic sheet with a thickness of 5 mm to place the water tank and electrical components such as pumps, batteries, and controllers. At the front of the frame, the acrylic slab is made to tilt to prevent the front motor from being sprayed with liquid droplets.

b. Power consumption

Every electrical component transported by this robot has a power consumption borne by a three-cell LiPo battery. The list of components current consumption is as follows; DC motors are 120 0mA each, and DC pumps are 1200 mA, FPV cameras are 510 mA, Arduino Mega 2560 around 100 mA, a micro servo is 250 mA each, then sensors and drivers can be ignored. The mathematical representation to calculate the total power needed can be described using (1).

$$P_{total} = \sum_{i=0}^{i}(V_i \times I_i) \quad (1)$$

Vi is the voltage of each component, and *Ii* is the current of each component, respectively.

The total power expressed by *Ptotal.* The total power is the sum of the voltage and current multiplications of each component used. Hence, the total power needed by the robot is around 63,442 W.

$$T_{operate} = \frac{V_{battery} \times I_{battery}}{P_{total}} \times 80\% \quad (2)$$

With a LiPo battery V_battery = 8000 mAh and I_battery = 11.1 V, the robot can operate for more than an hour with the pump operate. The calculation above, when compared with actual measurements in the field, does not show significant differences in results. A fully operated robot with running conditions and the pump running causes a decrease in battery voltage from 11.4 V to 8.8 V for approximately 56 minutes. When the cell's voltage touches 3 V, the alarm turns on, and the robot operation is stopped. This is caused by unbalanced battery cell charging, so even when emptying, it is also unbalanced. Cell 1 has been degraded and has the lowest cell voltage. So, it can be overcome by using a battery charger that has a good balancer feature.

c. Design Calculations

i. Sprinkler flow rate

Theoretical

$Q=k \sqrt{p}$

p=20 psi

k=5.6
Q=5.6 √20
Q= 25 GPM
Q=Flow Rate (GPM), P=Operating PSI of head/Outlet
K=K Factor of Head/outlet

ii. Analysis

For 1 litre, the flow rate of the Sprinkler is 476seconds.
For the project the flow rate of the sprinkler is 200 seconds.
The area of the sanitizer covered is 600mm.
The acquired Flow rate is 17GPM

iii. Motor Specifications

Speed = 200 RPM,
Voltage = 12V,
Power = 100W
Torque of the motor
Torque = (P X 60) / (2 x 3.14 x N)
Torque = (100 X 60) / (2 x 3.14 x 100)
Torque = 9.554 Nm,
Torque =9.554 x 103 Nmm

iv. Battery life calculation

Robot working hours for one full charge.
Batter capacity = 12v 7Ah (Ampere Hours)
Total device consumption = 520ma (mill ampere)
Battery Life = Battery Capacity in mAh / Load Current in mA
= 7000mAh/520ma
= 13.46 Hours

d. Remote Operating System

Wheel-primarily based robots regularly experience trouble while visiting through complicated terrain together with steps and limitations in area [10]. To keep away from this trouble, visual structures and far flung wheelchair packages are used on mobile robots. The running precept of the automatic sanitizer sprinkler robot is much like that of a television far off control. when you press a button at the faraway, it obeys the input sign thru the app. to start with, the input statistics reaches the Bluetooth module, then the sign goes to the Arduino module. The Arduino machine transmits commands to the motor pressure. at some stage in blowing the cylinder back and front, air enters and contains the disinfectant outdoor the tank.

i. Forward-F

Forwarding the F button allows the robotic to move ahead whilst the person gives the F command in terminal mode.

ii. Backward-B

The lower back feature button permits the robot to opposite while the consumer gives a B command in terminal mode

iii. Left-L

at the left is a function used within the Loop block that permits the robot to move left whilst the user gives the L command in terminal mode.

iv. Right –R

on the right is a Loop block characteristic that allows the robot to move proper while the user offers the L command in terminal mode.

v. Pump start-O

Pump start utilized in Loop block lets in the pump to begin while the person gives an O command inside the final mode.

vi. Pump stop-G

Pump top used in Loop block allows stop pumping when consumer offers G command in terminal mode.

vii. Stop-S

ST in terminal mode will send a positive frequency to the Bluetooth module and the robotic will forestall mechanically.

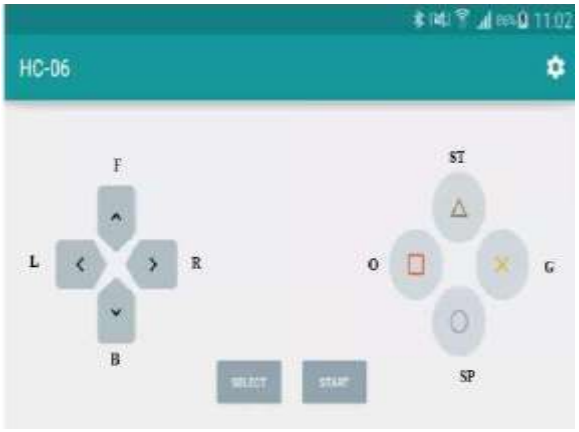

Fig. 4 Mobile Controller mode

e. Coding

```
 #include <LiquidCrystal.h>
#include <stdio.h>

LiquidCrystal lcd(6, 7, 5, 4, 3, 2);

char gchr='x';

int sti=0;
String inputString = ""; // a string to hold incoming data
boolean stringComplete = false; // whether the string is complete


int m1a = 8;
int m1b = 9;
int m2a = 10;
int m2b = 11;

int relay = 13;

void okcheck0()
{
 unsigned char rcr;
 do{
 rcr = Serial.read();
 }while(rcr != 'K');
}

void setup()
{
 Serial.begin(9600);serialEvent();
// mySerial.begin(9600);

 pinMode(m1a, OUTPUT);
 pinMode(m1b, OUTPUT);
 pinMode(m2a, OUTPUT);
 pinMode(m2b, OUTPUT);

 pinMode(relay, OUTPUT);
```

```
 //Smart Sanitizer spraying Robot for covid-19
 lcd.begin(16, 2);lcd.cursor();
 lcd.print("Smart Sanitizer");
 lcd.setCursor(0,1);
 lcd.print("Spraying Robot");
 delay(2000);
 lcd.clear();lcd.print(" Covid-19 ");

 delay(2000);
 lcd.clear();
 // initialize serial:

 digitalWrite(m1a, LOW);
 digitalWrite(m1b, LOW);
 digitalWrite(m2a, LOW);
 digitalWrite(m2b, LOW);

 digitalWrite(relay, LOW);

 //serialEvent();
}

void loop()
{

 delay(1000);
}

void serialEvent()
{
 while (Serial.available())
 {
 char gchr = (char)Serial.read();
 Serial.write(gchr);

 if(gchr == '8')
 {gchr='x';
 digitalWrite(m1a, HIGH);digitalWrite(m1b, LOW);
 digitalWrite(m2a, HIGH);digitalWrite(m2b, LOW);
 lcd.setCursor(0,0);lcd.print("Front ");
 }
 if(gchr == '2')
 {gchr='x';
 digitalWrite(m1a, LOW);digitalWrite(m1b, HIGH);
 digitalWrite(m2a, LOW);digitalWrite(m2b, HIGH);
 lcd.setCursor(0,0);lcd.print("Back ");
 }
 if(gchr == '6')
 {gchr='x';
 digitalWrite(m1a, HIGH);digitalWrite(m1b, LOW);
 digitalWrite(m2a, LOW);digitalWrite(m2b, HIGH);
```

```
lcd.setCursor(0,0);lcd.print("Left ");
}
if(gchr == '4')
{gchr='x';
digitalWrite(m1a, LOW);digitalWrite(m1b, HIGH);
digitalWrite(m2a, HIGH);digitalWrite(m2b, LOW);
lcd.setCursor(0,0);lcd.print("Right ");
}
if(gchr == '0')
{gchr='x';
digitalWrite(m1a, LOW);digitalWrite(m1b, LOW);
digitalWrite(m2a, LOW);digitalWrite(m2b, LOW);
lcd.setCursor(0,0);lcd.print("Stop ");
//digitalWrite(relay, LOW);
}

if(gchr == 'C')
{gchr='x';
digitalWrite(relay, HIGH);
lcd.setCursor(0,1);lcd.print("Pump ON ");
}
if(gchr == 'E')
{gchr='x';
digitalWrite(relay, LOW);
lcd.setCursor(0,1);lcd.print("Pump OFF ");
}

}
}
```

CONCLUSION

The automated cellular-cleaning robot has emerge as very beneficial inside the COVID-19 clinic surroundings. lessen human encroachment on sewage. The designed gadget is notably included, so it may without problems flow this robotic from everywhere. The COVID-19 epidemic presents a further motive for the usage of mobile robots to smooth up confined spaces. The proposed model was evolved and tested in a health center putting. The machine is capable of disinfect the location as much as a hundred m2 consistent with day. with the aid of the use of the self sustaining sprinkler gadget it will increase the disinfection houses and reduces the harm to the sanitizer. The designed device is able to cleaning up to a hundred m2 per day. The utility area may also consist of sanatorium corridors, scientific keep, running theater, transit routes, doctor's workplace, exam center, and patient room, and many others., etc.

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