VIRODRONE – A FLYING VIRUS FIGHTER

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I. ABSTRACT

In This paper presents an application for drone named VIRODRONE- A drone designed for Fighting Viral Diseases. Time and safety are two main factors in such viral diseases to address this both this drone is designed. It has the facility of crowd screening, crowd control and sanitization. If no of people at any place at that instant is more than 5 it will give warning to maintain social distancing and if no of people is 0 it will go and sanitize that place. A drone useful for fighting in such pandemic situation.

KEYWORDS: Drone,Aerial Vehicles, Temperature Sensors, Propellers, Transmitters, Sanitization

II. INTRODUCTION

Unmanned air vehicle systems have a lengthy and arduous history of development and deployment. Unfortunately, administrators, regulators, and financiers rarely share engineers' and scientists' visions. The evolution of the required technology has also influenced the availability of UAV systems. Unmanned Aerial Systems (UAV - Unmanned Aerial Vehicle or UAS - Unmanned Aerial Systems) are aircrafts that can fly without a pilot or passengers on board. Quad copter control is done remotely or autonomously using radio waves A quad copter's drive does not have to be a specific size or type. They are frequently equipped with optoelectronic heads, which are utilised for keeping an eye on and monitoring. The drones' most crucial feature is that they don't require any additional infrastructure to instantly register and monitor a particular area or object.

One of the most significant vital markers in the human body is body temperature. It is most immediately known if the patient has a fever or not by monitoring the subject's body temperature, and it is even possible to speculate on the effect of the treatment on the patient by monitoring the subject's body temperature. A thermal imaging camera is a new instrument for determining the amount of energy lost by an item. This procedure is quick, and the thermal images produced by the camera provide exact and convincing evidence. The purpose of this project is to identify persons who are infected with viruses or dangerous diseases in crowded and public settings during epidemics, particularly in markets, malls, and train stations. Because time is a critical issue in this case, this research aims to aid in the detection of infected patients quickly and automatically. Because there are so many people in these settings and they can move quickly, the procedure must be quick to get a result and precise.

As we already know after lockdown there is so much crowd in the markets use to come every day, there should be something to monitor more crowd at once and give them warning if they do such mistake. Using a drone (UAV) can be best way to monitor them and control crowd by using camera. Now everybody has understood the use of sanitizers and its importance in hygienic and disease free life.

III. BLOCK DIAGRAM

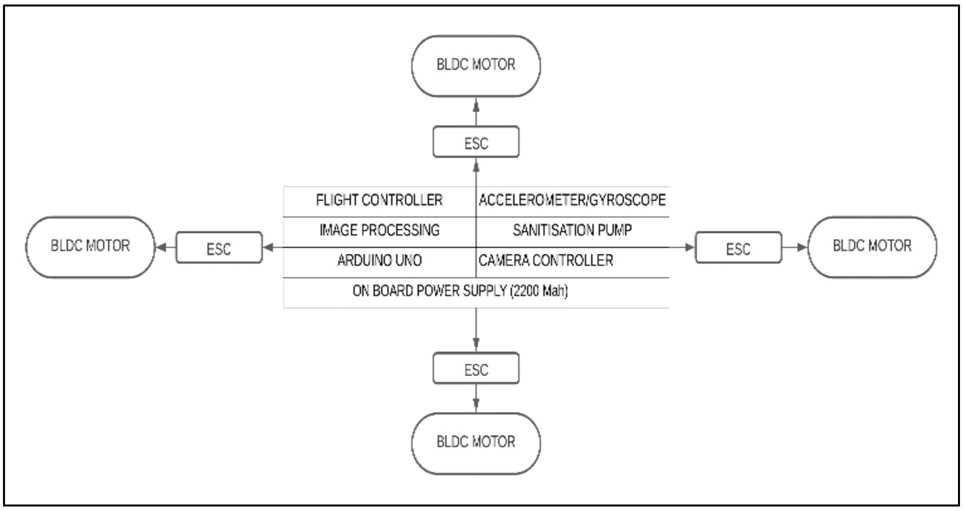


Figure 1 Block Diagram of VIRO-DRONE

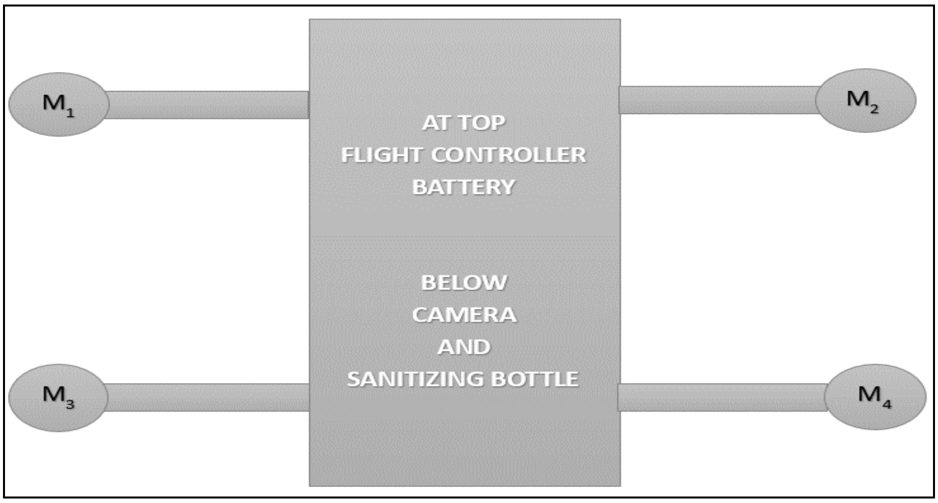


Figure 2 Construction View

From the Figure 2, it can be seen that it consists of following main parts:

- M1 motor 1 (BLDC)
- M2 motor 2 (BLDC)
- M3 motor 3 (BLDC)
- M1 motor 4 (BLDC)
- Flight controller
- Battery
- Camera
- Sanitizing bottle

Four BLDC motors for giving thrust to drone, flight controller for controlling all motor and manage overall flight of drone. Speaker for giving warning and sanitizing bottle for storing sanitizer.

IV. CIRCUIT DIAGRAM AND OPERATION

A. Circuit Diagram

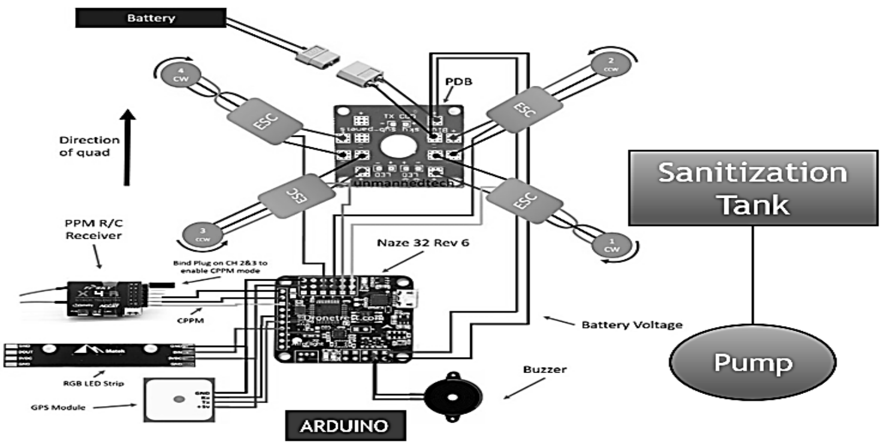
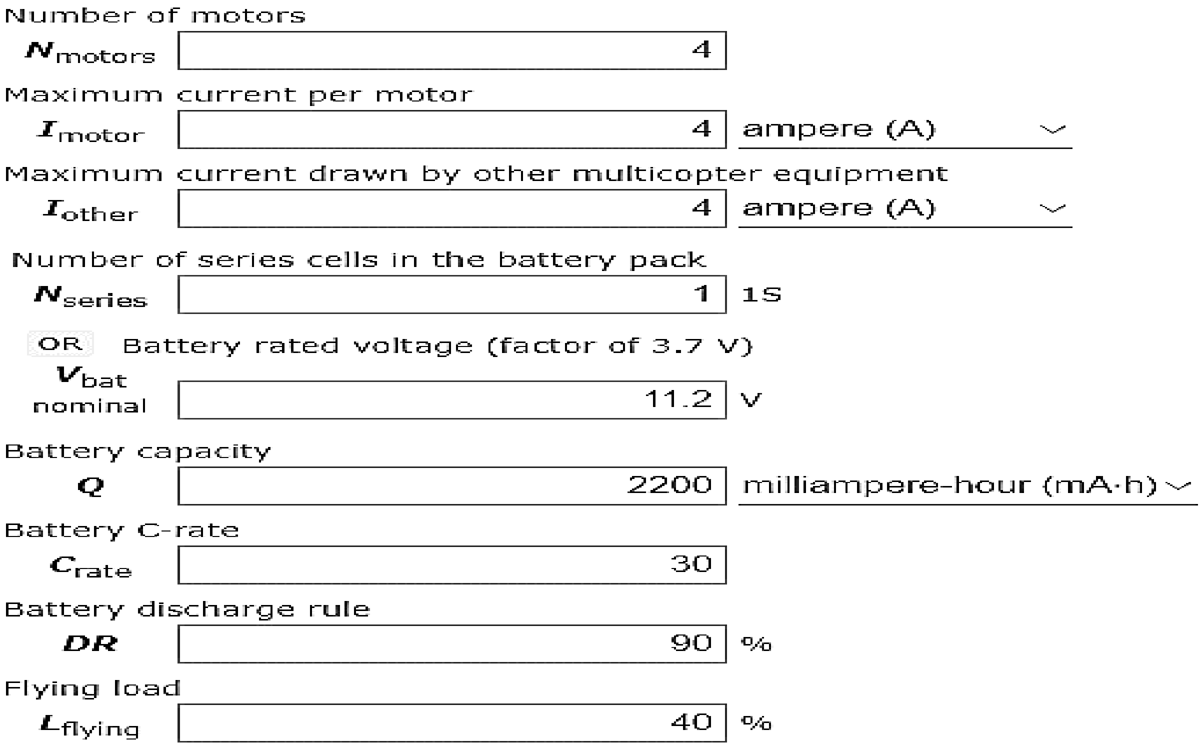


Figure 3 Circuit Diagram of VIRO-DRONE

The circuit diagram of "VIRODRONE" consists of an Arduino UNO,4 BLDC motors of 1000 KW each, ESC, 2200 mAh battery, camera, sanitisation tank, pump.

B. Ratings of Virodrone



Number of motors	N_{motors}	4	
Maximum current per motor	I_{motor}	4	ampere (A)
Maximum current drawn by other multicopter equipment	I_{other}	4	ampere (A)
Number of series cells in the battery pack	N_{series}	1	1S
OR Battery rated voltage (factor of 3.7 V)	$V_{bat\ nominal}$	11.2	V
Battery capacity	Q	2200	milliampere-hour (mA·h)
Battery C-rate	C_{rate}	30	
Battery discharge rule	DR	90	%
Flying load	L_{flying}	40	%

The above shown diagram shows the rating of instruments that are used to fly drone. As this is a quad copter, we are going to use 4 Brushless DC motors having rating of 11.2V and 30C

The maximum power consumed by drone can be given as

$$W_{max} = I_{max\ full\ load} \times V_{bat\ nominal}$$

The maximum current drawn from the battery at full flying load $I_{max\ full\ load}$ is determined as

$$I_{max\ full\ load} = I_{other} + I_{motor} \times N_{motors}$$

The current drawn from the battery at selected flying load $I_{\text{flying load}}$ is determined as

$$I_{\text{flying load}} = I_{\text{max full load}} \times L_{\text{flying}}$$

The maximum current drawn from the battery at full flying load $I_{\text{max full load}}$ is determined as

$$I_{\text{max full load}} = I_{\text{other}} + I_{\text{motor}} \times N_{\text{motors}}$$

The expected flight time is determined by a simple formula:

$$t_{flight} = \frac{\frac{Q}{1000}}{I_{flying\ load}} \cdot 60$$

Output

Maximum current drawn from the battery at full flying load

$I_{\text{max full load}}$ 20 A

Current drawn from the battery at selected flying load

$I_{\text{flying load}}$ 8 A

Required number of batteries; it depends on the C-rate, total current, and

$N_{\text{bat req}}$ 1

Expected flight time (HH:MM:SS)

t_{flight} 00:16:30

Expected flight time, 80% rule (HH:MM:SS)

The 80% rule can be changed in the **Battery Discharge Rule** field.

$t_{\text{flight 80\%}}$ 00:14:51

Maximum power consumption

W_{max} 224 W

Charger specifications:

Battery charge rate

I_{charger} 2.2 A

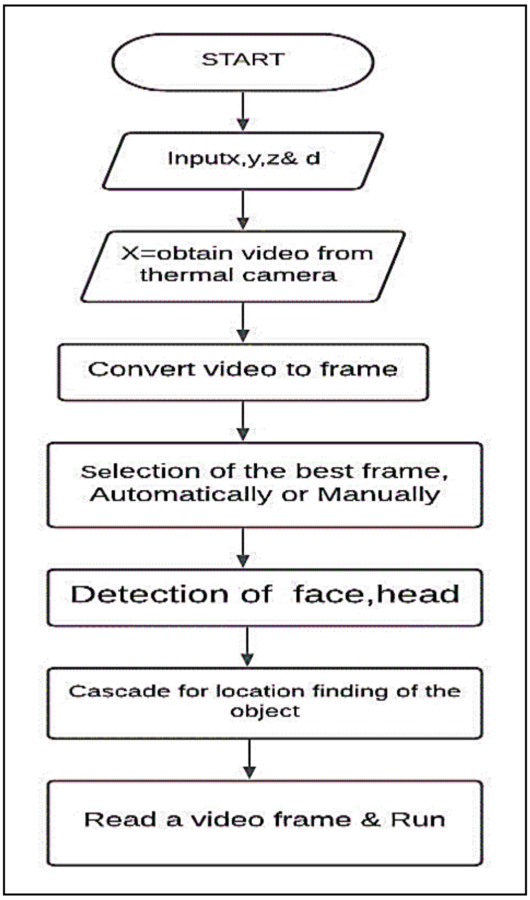
Charger power required

P_{charger} 11.09 W

Charger voltage

V_{charger} 4.2 V

V. FLOW CHART FOR FACE/HEAD AND ALGORITHM



Here we collect videos from the camera. The video that is taken from thermal camera is named as an Input X here. We then process that video as frame by frame. By taking Frame by Frame, it increases the quality as well as efficiency of Image or Video Processing. After processing the videos, we get the head count using python libraries.

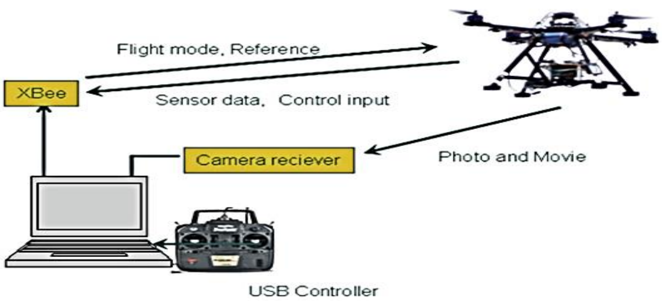


Figure 4 Drone with flight controller

It detects number of persons in the particular area and calculates the distance between two persons. If it is less than 1 meter than it shows as Social Distance not maintained or else it shows as Social Distance managed with total head count.

For Sanitizing any particular area, we first analyze the area which is in need for sanitization through video captured by Drone camera. If that particular area has less rush than we trigger the sanitization button.

VI. ALGORITHM USED FOR OPERATION

- Step 1: Start the motors and let drone fly to some height.
- Step 2: Camera will start counting heads and to measure body temperature.
- Step 3: If count >= 5 go to step 5
- Step 4: If count = 0 sanitize that area otherwise go to step 3 (it can be done manually also)
- Step 5: Give warning of maintaining social distancing by blinking light

VII. OPERATION OF DRONE

To achieve autonomous control of a small unmanned helicopter's flight, the control system is segregated into attitude, velocity, and position control loops. We created the control system to emulate the autonomous control techniques of tiny unmanned helicopters because the manual control of Quad-Rotor type MAVs is comparable to that of a helicopter. The motion of the Quad-Rotor MAV appears to be coupled because each degree of freedom is controlled by modifying the rotating speed of each rotor.

Because modelling such a multiple-input, multiple-output (MIMO) system is difficult, we ignored the coupled motion in this study and treated each degree of freedom as a separate single-input, single-output (SISO) system, designing the control system accordingly. We divided the control loop for the X and Y directions into three control loops: attitude (Roll, Pitch), velocity, and position. There is only one control loop for yaw angle. By employing GPS, the vertical direction controller design technique commonly separates into two loops: velocity control loop and position control loop. However, this study makes use of a low-cost GPS system (u-box). While vertical direction control is achievable when the GPS signal is strong, it is difficult to control when the signal is weak.

Figure 5 Project Model

Figure 6 Drone Controller

As a result, instead of employing the GPS sensor, the air pressure sensor is used to determine the vehicle's vertical direction location. However, it varies from the advanced control system that employs standard GPS since the velocity cannot be recognised by the air pressure sensor. As a result, the velocity control loop is disabled and just the positioning control loop is employed in this scenario. Each loop is first modelled, and then the model-based controller is designed. The inner loop controller is created initially, and then the outer loop controller is changed in a multi-loop control system.

Simulation

We used the OpenCV Python library in simulation for image detection. With the help of image processing, motion recognition, and motion tracking in PyCharm, we were able to maintain social distance between people in a busy environment as well as count the number of heads in a frame.

For a continuous flight at one time charging, a drone's flying time is approximately 15 minutes. With the assistance of a 2200 m battery

The drone's accuracy is around 90-95 percent. For the drone's image processing and flight stability.

Figure 7 Simulation

Figure 7 illustrates the total headcount in a region as well as the number of people who are breaking Social Distancing standards in that area.

VIII. POSSIBILITIES OF USING THIS DRONE

Unmanned vehicles are great for patrolling broad regions and can be used to safeguard property as well as state borders. They can also take aerial images for geodesy, archaeology, advertising, and other applications. They can fly between barriers, buildings, and even to rooms, via open gates, windows, and doors, because to their small dimensions and high mobility. Models with thermal and night vision cameras (using infrared active or reinforcing starlight) can be employed as prospecting machines in rescue operations, with daily surveillance of the designated region and the ability to operate 24 hours a day over wooded areas. They broadcast an image in real time, allowing appropriate services to respond quickly in the event of an emergency, an accident, or a crisis situation that necessitates assistance. The following services, industries, and businesses can benefit from them:

a) Monitoring and Sanitation:

• Provides statistics to the authorities on whether or not everyone is respecting social distance properly.

• Remote Sanitation of Public Places when there is less traffic.

b) Fire brigade:

• Thermal imaging of fire conductor directions

• Thermal detection of fire sources

• Tracking and monitoring pollution sources

• General assistance of mobile operational position/command

c) Police:

• Service for communication disasters

• Patrolling a defined area,

• Documenting traffic congestion and traffic jams,

• Organizing and monitoring a large event,

• Assisting with pursuits, searches, and other police activities, and

• Obtaining evidence

d) Border guards:

• Air support of border control traffic border,

• Rapid visualisation and mapping of the region,

• Detection and monitoring of pollution sources objects, land and water border,

• Tracking moving targets

e) Army:

• Reconnaissance and surveillance region,

• Direct assistance for combat and training activities,

• Conducting intelligence shares,

• Tracking a moving target,

• Terrorism fight

f) Energetic and chemical industry:

• Level gas emission, fumes, and other toxic or unpleasant chemicals monitoring, diagnostics, and analytics,

• Thermal detection of fire sources

• Production, technology, and logistic operations are all being monitored, as well as the infrastructure in the designated area.

All of this may be accomplished with this drone by just changing the supporting accessories, which are inexpensive.

IX. CONCLUSION

This project showed that VIRODRONE can be useful to help health workers, government officials in various ways for sanitizing, screening, crowd control, patrolling etc. This Drone can be used for screening at large scale at crowded places like stations, markets and other places. By crowd management it will be helpful to break corona virus chain or any other viral disease in future. Also, this drone is not just limited to sanitization only, it can be used for many more purposes by just little modification which can be the future scope.

X. REFERENCES

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