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Ground Control Unmanned Ariel Vehicle for Disinfectant Sanitizing

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ABSTRACT-the COVID-19 pandemic has gradually increased the need for keeping the environment and has led to the need of sanitising public areas so as to decrease the amount of virus transmission. Ground control unmanned ariel vehicle for disinfectant sanitising is used for disinfecting COVID-19 positive areas such as containment zones. Unmanned Ariel Vehicle UAV has many other applications out of which spraying sanitiser is the growing technology due to COVID-19 infection. Manual spraying of sanitiser can be risky for the people as one can get infected with the virus.

To design this ariel vehicle, we will be using spraying mechanism having 9V pump, 0.5 litre of liquid sanitiser as a maximum capacity, quadcopter frame with landing gear as the body structure of UAV and an Electronic Speed Controller for varying the speed of a rotor with a range of 30A.

KEYWORDS: Disinfectant, Covid-19, UAV Works, Spray, Cargo lifting, pump, Sensor.

I. INTRODUCTION

Unmanned Ariel Vehicle UAV also termed as DRONE are a technology that has reached out its use in the latest years to many applications including infrastructure inspection, security surveillance, traffic control and so on. This innovation has been proven so much advantageous for the people. Though drones are favourable for the society also has some negative impacts. This project focus on the development of an Unmanned Ariel Vehicle to get control on the COVID-19 transmissions with the spraying of sanitiser to the containment zones shielding the manual workers.

Drones can be used for various other reasons such as in agriculture field, military field and so on. Drone has been proven to be useful in many fields but also has some negative impact on the people as it can led to injury, also to the wild animals and many more.

1.1 LITERATURE SURVEY

Vimalkumar. R, Karan Kumar Shaw. [1]. Title of the paper. "Design and Development of Heavy Drone for Fire Fighting Operation", 06, June-2020. This paper focus on lifting of load and control and save an environment.

Shubham S. Nagre, Pritesh S. Mahajan, Mohit V. Joshi, Harshal B. Lohar, Dinesh R. Salunke. [2]. Title of the paper "Agro-based Pesticide Spraying Quad Copter using Flight Controller" 06, June-2020. This paper focuses on discuss different architecture based on drone or UAV technology. The use of pesticides in agriculture is essential to agriculture and it would be easy if intelligent machines such as robots used.

Karan Kumar Shaw, Vimalkumar R. [3]. Title of the paper "Design and Development of a Drone for Spraying Pesticides, Fertilizers and Disinfectants"- May-2020. In this paper spraying pesticides using drones is one of the emerging technologies. Manual pesticide spraying causes many harmful side effects to the personnel involved in the spraying process. The Exposure effects can range from mild skin irritation to birth defects, tumours, genetic changes, blood and nerve disorders, endocrine disruption, coma or death. The WHO (World Health Organization) estimated as one million cases of ill affected, when spraying the pesticides in the crop field manually.

II. METHODOLOGY

2.0. Working and Design of UAVs:

Usually, drones are implemented using rotors along with the propellers attached, which provide them upward thrust to hover. The upwards thrust should be greater than the gravitational pull which can make the drones to hover. For this to happen we are using four rotors, two will rotate clockwise and other two will rotate anticlockwise keeping in mind that the drone stays balanced from its sideways momentum. To avoid disturbance from throwing its vertical motion during flight, the required two rotors on the drone will remotely increase their spin. The same principle is applied for moving forward and backwards. For more stability of the drone, an accelerometer and altimeter are used to feed the drone about its speed, direction it is facing and its altitude while hovering. These help the drone for its more stability while landing.

To design a quadcopter, we need have an estimation of the payload including the weight of our motors, propellers, electronic speed controllers and camera. Battery should be selected accordingly knowing the voltage and current consumption by our components used. Then the calculation of the thrust should be done accordingly to the data collected, finally the frame of the drone should be designed as per our needs, arm length and application of the payload.

2.1. Cargo Estimation:

The payload for our quadcopter will define the amount of our range and flight time of the UAV where the weight of the components and all the materials used is included to verify the payload and work accordingly.

The weight of the cargo can be calculated by taking volume of the sanitizer, storage tank, pump and nozzle.

Table-1: Cargo Data

s/no	items	Weight (Grams)
1	sanitizer	500
2	Tank	50
3	Pump	33
4	Nozzle	200
Total:		783

2.2. Construction:

As for our requirements for building drone that can hold the payload up to half a litre of depollute chemicals for sanitizing purposes. We are using four arms-based frames where four 2200 KV brush less motors will be used to provide the total thrust of about 4.8 Kg which will be enough to lift our total payloads of about 4.046 Kg, to perform this outcome each motor will be placed at the four free arms of the frame, then it will be connected to the 30A ESC which will be further connected to the power distribution board where the power supply through Li-Po battery will be provided.

The power distribution board will be connected to the flight controller board and the board will have more devices connected as per the requirements like, camera, radio receiver, battery charger and DC pump. At the bottom of the frame the spraying mechanism is used with dc pump to spray the depollute chemicals which will be stored in a 0.5 litre plastic bottle and is completely monitorable.

2.3 Working:

In this design, we have used KK 2.1.5 flight controller board along with transmitter and a receiver attached with it, followed by battery, pump, pipe line, tanks, camera with a video receiver a video transmitter. We have used ESC which stands for Electronics Speed Control which controls the speed or the thrust of the rotors of the drone and a motor and the propeller.

The signal transmitted from the transmitter will be received by the receiver. The received signal then will be sent to the flight controller board where the signal approaches with the accelerator and gyroscope sensors. From the accelerator and flight controller will be sent signal to the Electronics Speed Controller which enables specified amount of current to the motor based on the signal it receives from ESC. The propellers are integrated in the octocopter so that it can rotate the rotors and produce thrust. The camera takes current from the flight controller board and records the video which will be processed with the transmitter and then sent to the receiver in the ground. Battery is used for providing current supply to the pump which forces the liquid from the tank to flow through the pipeline and get sprayed with the help of the nozzle. Transmitter can control the flow of rate of pump by varying the input current.

UAVs or Drones uses rotors for propelling force and control similar to the rotor of the blower. The rotor of the drone pushes the air downward similarly air forces the rotor upward, this is the phenomenon in the drones moves upward and downward in the air. In a vertical plane, drones can do hovering and descending. For hovering the thrust of the four rotors and the

gravitational force must be equal against the two. For climbing, the pilot must speed up the thrust of the rotors. Now for descending the pilot only need to lessen the thrust or the speed of the four rotors.

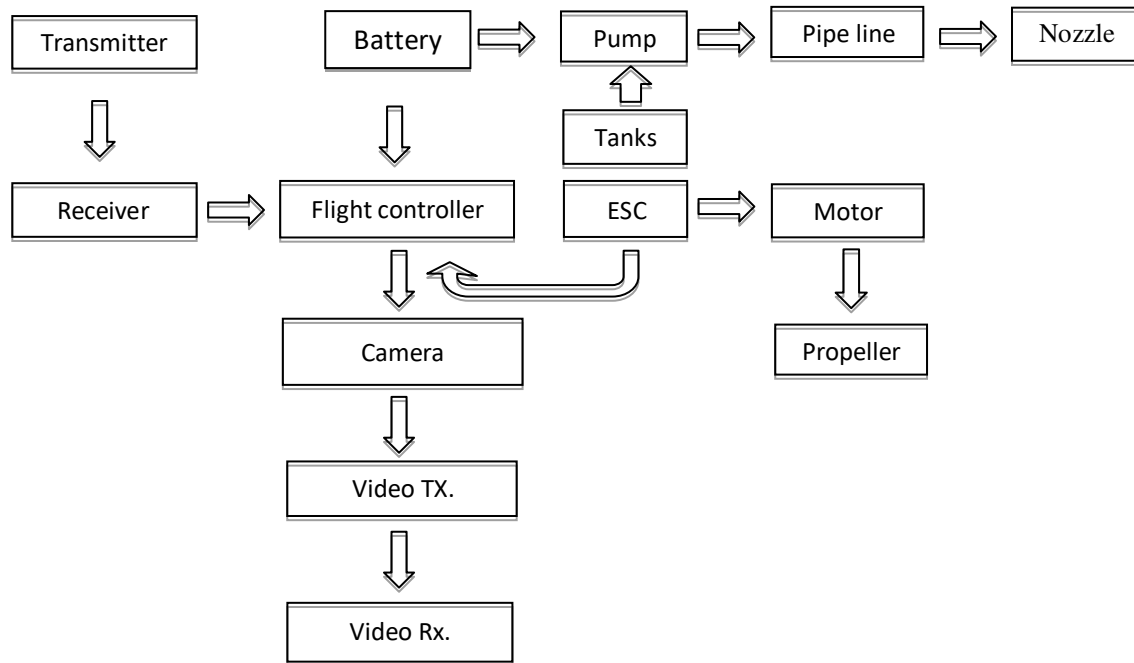


Fig-1: Block diagram of working process

2.4. Component used:

Show all the component we can use to make drone.

S/NO	NAME OF COMPONENT	RANGE	QUANTITY
1	PROPELLER	1045,10x45 inch	2 pairs
2	MOTOR SPEED CONTROLLER 3A REGULATOR	PWM DC 6-12V 3A	1
3	QUADCOPTER MULTICOPTER FRAME WITH LANDING GEAR	F450	1
4	ESC	30A	2 PAIRS
5	12V DC WATER PUMP, BATTERY SPRAYER MOTOR	12V DC	1
6	FLYSKY CT6B REMOTE 6 CHANNELS TRANSMITTER AND RECEIVER FOR QUADCOPTER	FLYSKY CT6B REMOTE 6 CHANNELS	1
7	LIPO BATTERY	2200 mAh 4S lipo	1
8	FLIGHT CONTROLLER BOARD	KK2.1.5	1
9	BLDC MOTOR	2200 KV	2 PAIRS
10	WIFI CAMERA	ESP32-CAM OR OV7670	1

Table-2:Component Chart.

2.5. Weight of all components:

This list of the components we can use in our design.

Table-3: component weight data.

s/no	Items	Weight (Grams)
1	Frame (F450)	200
2	Flight controller	70
3	BLDC motor (4)	(100x4) = 400
4	Propeller (4)	(50x4) = 200
5	ESC (4)	(40x4) = 160
6	Camera	10
7	Battery	190
8	others	10
Total:		1240

The weight of the Quadcopter calculated by summing the total components weight and cargo weight.

$$\begin{aligned}
 \text{Total Mass} &= (\text{total weight of cargo} + \text{total weight of components}) \\
 &= (783 \text{ g} + 1240 \text{ g}) \\
 &= 2030 \text{ g} = 2.03 \text{ kg (Approx.)}
 \end{aligned}$$

Total thrust required: To generate lift at the quadcopter the thrust is supposed to be much double than the total weight of the quadcopter. So, we must require the total thrust to be double the weight of the quadcopter for enough thrust to lift up the vehicle.

$$\begin{aligned}
 \text{Required thrust} &= 2 \text{ times weight of the quadcopter} \\
 &= 2 * 2030 \text{ g} \\
 &= 4046 \text{ g} = 4.046 \text{ kg (Approx.)}
 \end{aligned}$$

2.6. Thrust Calculation:

The total Thrust produced by Quadcopter in 100% RPM to be generate double the thrust and to stable the drone.

The single motor (2200kV) with 1045 propeller calculated is given by;

Maximum thrust given by a motor = 1200 g (approx.)

$$\begin{aligned}
 \text{Total thrust produced by 4 motor} &= (1200 \times 4) \\
 &\text{i.e., } 4800 \text{ g} = 4.8 \text{ kg (approx.)}
 \end{aligned}$$

2.7. Battery Life Calculation:

The life of Battery calculated by provides us the approximate useful data about the maximum fly time of the drone.

Table-4:Current requirement chart

s/no	Components	Current required (Amp)
1	Motor (4)	$12 * 4 = 48$
2	Receiver	0.1
3	ESC (4)	0.4
4	camera	0.1
5	pump	0.5
Total		49.2

Current output from the battery = 2200 mAh



Total current consumption of all components = 49.2 A

Battery life = (current o/p from battery) / (total current consumption)

= 2200 mA / 49.2 A

= (22*60)/49.2

= 26.9 minutes (Approx.) At 100% thrust.

III. CONCLUSION

This journal we have mentioned a design of Ground Control Unmanned Ariel Vehicle for Disinfectant Sanitiser with the tank set up in it for spraying disinfectant sanitiser to get control over Covid-19 virus. This technique of spraying disinfectant sanitiser on containment zone, hotspot area (Covid-19) or the area where it's difficult for human to reach. This technique will reduce the human effort moreover this will save the manual workers from getting infected with the virus. This Ariel Vehicle can also be used in firefighting operation, for security surveillance and also in agriculture field for spraying pesticides in the crop.

IV. FUTURE SCOPE

- Unmanned aerial vehicle have become more advance and improved. It's applications are serving humanity in many ways.
- Our drone for disinfection of covid-19 virus can be upgraded with larger payload facility to disinfectant more areas in single flight.
- It can also be implemented using the technology of IoT and can be controlled from very faraway places, and can be monitored its location using GPS facilities.
- It can be made in a way for aerial delivery of packages and humanitarian relief supplies to victims of a variety of natural disasters far quicker than any other

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