Fire Extinguisher Drone Using Node-MCU

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***Abstract*— Drones are generally termed as unmanned aerial vehicles (UAVs) since they are operated remotely or they can fly unassisted without any need of pilot. Drones are used for abundant kind of applications such as Weather forecasting, Aerialpurpose, Monitoring, Agriculture, Wildlife, Rescue operations. The main purpose of this paper is to describe the design and development of quadcopter drone for extinguishing the fire. This drone can carry some amount of liquid such that it can wipe out the fire without the requirement of firefighters to enter into the affected area manually. This drone is controlled by a flight controller and the action of extinguishing the fire is done by placing a dc motor to it and that motor is connected to Node-MCU.**

***Index Terms:* Drones, Quadcopter, Flight controller, Node MCU.**

I.INTRODUCTION

Throughout history, fires have dealt with some huge loss of belongings and life. Some of the most usual affected places are residential, forest areas, hospitals, movie theatre, industries. Firefighters risk their life by manually entering into areas to put off those fires. In some of the places by the time they reach the place, the damage will be done. In such kind of situations, the drones are used for the fast access to fire to control them. This quadcopter drone has four motors which are arranged in x mode in clockwise direction. These motors are used to lift the drone to a certain extent of height. The roll, pitch and yawn of the drone can be controlled by flight controller which gives instructions to the motor. Electronic speed control is used to make all the motors rotate at identical speed.

II.BLOCK DIAGRAM AND METHODOLOGY OF FIRE EXTINGUISHER DRONE

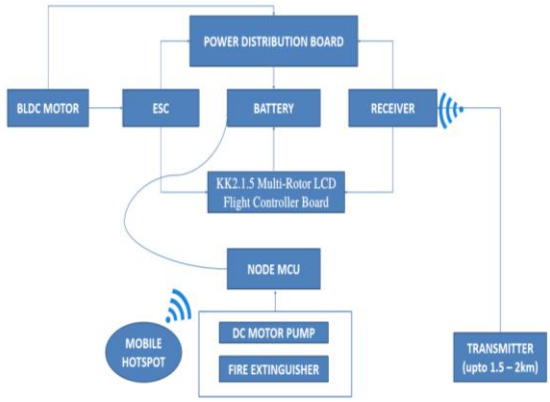

Fig.1: Block Diagram of Fire Extinguisher Drone

This drone is designed in a quadcopter mode. It has four arms and two plates. First, we will arrange all the hardware components on the chassis of the drone. Every BLDC motor is connected to ESC. In this process the two brush-less dc motors will rotate in a clockwise direction and the remaining two brush-less dc motors will rotate in anti-clockwise direction. Electronic speed control is used to control the speed of all the motors. A power distribution board is used to supply the power to this drone with the help of a 2200mAH battery with 11.1volts. A flight controller is used to control this drone. The transmitter sends the desired signal to the receiver and the flight controller sends the required signals to the ESC for the rotation of motors. The left-right, forward-backward, up-down movements of the drone will be controlled by the transmitter. A water tank like extinguisher is fixed to this drone. A dc motor is connected to Node-MCU. Place this dc motor in a water tank containing liquid co2. This pump is controlled using Blynk app. For a continuous internet connection, place Wi-Fi hotspot inside the drone. When the drone reaches near the fire, switch on the pump.

III.HARDWARE USED

1) Brushless DC Motor:

These motors are used such that they are light weight, more reliable and more efficient compared to brushed motors. Most of the drones in present days are equipped with these motors for smooth and better performance.

2) Electronic Speed Controller:
These are shortly abbreviated as ESC. An ESC is an electronic circuit or wire like material which is used to vary the speed of motors and also its direction. These are widely used for brushless dc motors.

3) Battery:
A battery is a device which converts chemical energy into electrical energy consisting of electrochemical cells. Every cell has two terminals which are anode and cathode. In this drone we use 2200mAH battery with 11.1v. It is less in weight.

4) Distribution Board:
A distribution board or power distribution board also known as panel board is a component which supplies power to the other components with the help of a battery. ESC is also connected to this board.

5) Node-MCU:
Node Micro controller unit generally termed as Node-MCU is an open-source platform which contains an inbuilt Wi-Fi module named ESP8266. It is a system on chip. This Node-MCU plays a major role to extinguish the fire. A dc motor is connected to it and that motor is placed in a water tank like extinguisher. When drone is near the fire, we switch on this dc motor with the help of Blynk app. They both are connected to Wi-Fi.

6) Propeller:
Propeller is a fan like component which transmits power by converting rotational motion into thrust. They provide lift to drones by spinning which results in some difference in top and bottom surfaces.

7) Flight Controller:
This is considered as most important component for a quadcopter drone. This flight controller board consists of an inbuilt MPU which is a 3-axis accelerometer and gyroscope. The yawn, roll and pitch are controlled by this flight controller which helps the drone to be stable.

8) 6 Channel Transmitter and Receiver:
In this the communication between an operator and a drone completely depends on transceiver. Receiver is connected to the flight controller with the help of connecting wires. The communication between transceiver and receiver is done by transmitter part. It is a 2.4 GHz transmitter and receiver which is a 6-channel device so called because each channel performs some operations of drone roll, yawn, pitch to left-right, forward-backward and up-down movements.

9) DC Motor:
A dc motor coverts electrical energy into mechanical energy. Stator and rotor are the two key components of dc motor. Stator is a stationary part and the rotor is a rotatory part of the motor. In this drone, dc motor is used to spray our liquid co2 into the fire which is connected to the extinguisher.

Table 1: Components andtheir Weights

S. No	Hardware Used	Quantity	Weight (in grams)
1	BLDC Motors	4	256
2	ESC	4	92
3	Battery	1	175
4	Power Distribution Board	1	10
5	Node-MCU	1	110
6	Propeller	4	56
7	Flight Controller	1	50
8	6 Channel Transmitter & Receiver	1	696
9	DC Motor	1	80
10	Drone Chassis	1	270
Total			1795

IV.ADVANTAGE

1 They can save our lives.
2 They can contribute to safe infrastructure maintenance.
3 It doesn't any pilot.
4 They are stable.

V.DISADVANTAGE

1 Limited to few areas only in some countries.
2 For private persons drones can be very costly.

3 To operate drones, it need practice for many.
4 Limited flying time.
5 It can access the fire within minutes.

VI.APPLICATIONS OF DRONES

1 Used to detect fires.
2 Airforce.
3 Wildlife monitoring.
4 Delivery of goods.
5 Aerial Photography.

VII.RESULTS

Fig.2:Drone setup

Fig.3: Output of Drone (Propellers rotating)

VIII.CONCLUSION

This paper mainly describes the importance of drone in firefighting operations. In our present generation drones as observers in the sky will remain important for future years as they will grow easier to operate. This quadcopter drone helps us to put-off the fire in very quick time and saves life and property. It is designed with some light weight components such that it can be more efficient. Implementation of drones can boost up some new business models and can create new opportunities in the industry. By 2030 as our country is looking to became a global drone hub, it will be easier to fly the drones in many parts of our country where it is restricted now.

IX.FUTURE SCOPE

This drone technology is being adopted by many fire industries to prevent fire accidents. This drone can also be equipped with a thermal camera to monitor the situation of fire during the firefighting operations. In near future with growing technology, this fire extinguisher drone can be developed using artificial intelligence to fly autonomously. Although it is being used in some countries, over next 3 years it will be brought up in many parts of the world. If there's any fire alert, this drone will automatically reach the fire effected area without any human requirement and helps to prevent the loss of life and property.

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