Retraction

Retraction: Aerial Surveillance using Remotely Operated Drone with 3D Printed Frame (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012062)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Aerial Surveillance using Remotely Operated Drone with 3D Printed Frame

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Abstract. To ensure security among the people, a remotely operated vehicle is employed which provides a live image feed to the operator. The drone’s frame is developed using 3D printing technology. Thus reduces the cost of the drone. Radio control transmitter and receiver play a major role in controlling the drone. The Camera and video transmitter is employed to provide a live image feed to the user for monitoring and other applications.

1. Introduction
With the population of the world growing drastically day by day, security for most of the people is not given properly. The current methodology of providing security is through CCTV’s and then the information is provided to the cops for further investigation. These kinds of providing security does take time and may even affect the individual even more. In the modern age of technology, we live in has become fast. Therefore, a drone can make all the above-mentioned concerns a better solution. The base of the drone which is the frame being designed and 3D printed makes the drone react greater heights and can be used in various different applications. Cameras have evolved in a very massive way which can be even programmed to identify an object or a human [1]. By this method, surveillance can be given to people in different areas like agriculture, animal monitoring and any areas at any time at the highest quality.

2. Proposed System
A drone is employed which can be used for quick surveillance and cover a very vast area. The drone’s frame is 3D printed to reduce the overall weight of the drone and enhance the capacity of the drone to fly high. With the camera employed in the drone, the user operating the drone gets a live view of the drone travelling [2]. And the camera can also be programmed to identify an object or a human. If any kind of problem gets detected, a call gets triggered to the cops via the GSM module. Through the above-mentioned system, security can be given to every person in the world. And the proposed idea can be implemented with less man work done when compared to the current system of security monitoring [3]. The proposed system is also cost-efficient when compared to the drone present in the market today.

3. Requirement Analysis
3.1. Software Used

3.1.1. Betaflight
Betaflight is an open-source software used mostly to control a remotely operated multirotor drone or a winged flight.

3.1.2. BLHeli Configurator
BLHeli Configurator is similar to Betaflight configurators. It is the first cross-platform electronic speed controllers programming/flashing tool for BLHeli.

3.1.3. SolidWorks
SolidWorks is a computer aided program used for modelling solid objects mainly used by engineers and is used to develop mechatronic systems from beginning to end.

3.1.4. Ultimaker Cura Slicer
Cura is an open-source slicing application for 3D printers. This allows importing CAD model provides the G-code for 3D printing in an FDM printer.

3.2. Hardware Used

3.2.1. Electronic Speed Controllers (ESC)
Electronic speed controllers are devices that allow drone flight controllers to control and adjust the speed of the aircraft’s electric motors. A signal from the flight controller causes the ESCs to raise or lower the voltage to the motor as required, thus changing the speed of the propeller [4]. Figure 1 shows the Electronic Speed Controller.

![Figure 1. Electronic Speed Controller](image)

3.2.2. BLDC Motor

Brushless DC motors are mostly used for various industrial applications. This motor eliminates the need for brushes to flip the electromagnetic field [5]. In these DC the rotors contain the permanent magnets, and the stators contain electromagnets. Figure 2 shows the BLDC motor.

![Figure 2. BLDC motor](image)

3.2.3. Propellers
Figure 3. Propeller
They transform the rotary motion into linear thrust. They are connected to the shaft on the stator of the out-runner BLDC motor [6]. These propellers help the drone lift off from the ground by rotating and creates continuous airflow around the drone creating a difference in the pressure of air making the drone reach greater heights [7]. Figure 3 shows the propeller.

3.2.4. Flight Controller

Figure 4. Flight controller
A flight controller is a small circuit board. Its function is to with respect to the response of input it directs the RPM of the motor [8]. This sends the PWM signal to the ESC, thereby controlling the speed of the BLDC motor. Figure 4 shows the flight controller.

3.2.5. 2.4 GHz RC Tx and Rx

Figure 5. Transmitter and Receiver
Transmitter and Receiver of 2.4GHz are used to send control signals to the drone for its proper operation. It uses AFHDS spectrum technology which is reliable and responds quickly [9]. Figure 5 shows the transmitter and receiver.

3.2.6. Lithium-polymer ion battery

Figure 6. Lithium Polymer ion battery
The batteries used for the operation of a drone is a lithium ion battery. As the dischargerate is less when compared to other batteries, lithium ion batteries are preferred [10]. In this battery the polymer electrolyte used provides good conductivity at room temperature. Figure 6 shows the lithium polymer ion battery.

3.2.7. Camera
Figure 7. Camera

A camera in the drone provides the user to have a bird’s view of the surround. It helps the user in many ways such as photographs, videography and monitoring etc. The better the resolution of the camera, the accurate the results are fed to the user [11]. Figure 7 shows the camera.

3.2.8. Video Transmitter

Figure 8. Video Transmitter

A video transmitter is used to transmit the video that is being captured from the camera of the drone. And sends it back to the receiver present in the user’s hands [12]. Figure 8 shows the video transmitter.

4. Working of the Proposed System

Radio control transmitter and receiver play an important role in establishing the communication of signals for effective use. The operator controls the drone using a radio control transmitter on the ground station. The transmitter sends a signal to the receiver in the drone. The flight controller consists of an inertial measurement unit (IMU). This IMU detects changes in rotational parameters using gyroscopes. Thus the movement of the drone is controlled. Figure 9 shows the flowchart.

Figure 9. Flowchart of the proposed idea

Keeping the movement of the drone aside, the camera also plays a major role in this proposed system. The better the resolution of the camera, the better the video gets transmitted to the operator for monitoring. So the combination of both the process of movement of the drone and the camera makes
this idea the best aerial surveillance and is used for various operations too. With the frame of the drone 3D printed, various designs of frames can be developed to make the weight and the efficiency of the drone improved to achieve greater heights. The cost of the drone is reduced using a 3D printed frame.

5. **Comparison with the Existing Work**
The aerial surveillance drone present is very expensive when compared to our proposed system. Drone with pre-installed camera and transmitters, costs around 1160 USD. Whereas our proposed system costs 578 USD. Which makes our proposed system relatively cheaper than the existing system. Table 1 shows the price comparison.

| S.NO | COMPONENTS                              | PRICE  |
|------|----------------------------------------|--------|
| 1    | ABS FILAMENT FOR 3D PRINTING DRONE FRAME | 14 USD |
| 2    | ELECTRONIC SPEED CONTROLLER            | 62 USD |
| 3    | BLDC MOTOR                             | 44 USD |
| 4    | FLIGHT CONTROLLER                      | 39     |
| 5    | PROPELLER                              | 6 USD  |
| 6    | LITHIUM POLYMER ION BATTERY            | 32 USD |
| 7    | RADIO CONTROL TRANSMITTER AND RECEIVER | 72 USD |
| 8    | CAMERA AND VIDEO TRANSMITTER           | 309 USD|
|      | **TOTAL**                              | **578 USD** |

And the major advantage of the proposed method is that the size and weight of the frame is reduced drastically and hence can be used by normal people in the streets. 3D printing lets the operator make their own desired frame design, it is not possible in the present ongoing system. Figure 10 shows the drone for surveillance.

6. **Conclusion**
The aerial surveillance using remotely operated drones has been successfully designed in a low-cost manner using the FDM method of 3D printing. The drones have been finally made in their working, which helps the cops to identify certain issues in the remote place. It is much more convenient because
of its rapid response in action. The working and controlling of the drone are also made easy for anyone to operate and adapt.

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