



# Surveillance Robot for Military Application (Bicopter)

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**Abstract:** Due to growing enemy attacks, monitoring of military regions is vital in today's world. The fundamentals of robotics, including sensors and actuators, provide an overview of robotic building. The drone is controlled via a reliable and long-range remote-control system. The robot will serve as a surveillance robot, both during the day and at night. The robot will also drop explosives in certain locations to give stealth during a war-like situation. In some situations, if the robot is spotted by opposing troops, it will also operate as a suicide bomber. This robot is better suited for military purposes like monitoring a certain region. It will provide a tactical edge in hostage situations or on unfriendly terrain. It is capable of walking on surface and monitoring a large region. This will be useful in applications such as civilian and military robots.

**Keywords:** BLDC motors, Propellers, High-resolution camera, Real-time videos, Actuators.

## I. INTRODUCTION

Surveillance robots, also known as unmanned aerial vehicles (UAVs) or drones, have become an increasingly important tool in military and security operations. These robots are designed to gather intelligence, conduct surveillance, and perform other tasks without putting human lives at risk. One type of surveillance robot that has gained popularity in recent years is the bi-copter. Bi-copters are small, unmanned aircraft that use two rotors to achieve lift and control. They are often equipped with cameras, sensors, and other surveillance equipment that allow them to gather valuable intelligence in a variety of military and security applications. Bi-copters are particularly useful for military surveillance and reconnaissance missions due to their small size, quiet operation, and manoeuvrability. They can fly at low altitudes and in tight spaces, allowing them to gather detailed information on enemy positions, movements, and activities. Bicopters can also be used to monitor borders, coastlines, and other areas of interest, providing valuable information to military and security forces. In addition to military applications, bi-copters are also used in law enforcement, disaster response, and other security operations. They can be used to gather information in dangerous or hard-to-reach areas, or to provide situational awareness in critical situations. Overall, bi-copters are a valuable tool in the arsenal of surveillance robots, providing a versatile and effective means of gathering intelligence and conducting surveillance in a variety of military and security applications

## II. METHODOLOGY

A bi-copter has two propellers at each sides of the frame for each propeller, speed and direction of rotation are independently controlled for balance and movement of the drone to maintain the balance of the system, one pair of rotors rotates in a clockwise direction and the other pair rotates in an anti-clockwise direction to hover, both rotors should run at high speed. By changing the speed of rotors, the drone can be moved forward, backward, and side-to-side. The subject of Fluid Dynamics plays a significant role in the design and development of aircraft and drones. This subject consists of the working principle of the aerodynamics of aircraft. A sufficient amount of upward force is required to lift the vehicle against gravity which is named Lift and force created to move the vehicle or body in motion is called thrust.

When a drone moves in the air, various forces act on it. The resultant force will decide its movement. There are major forces acting on a drone Design and Fabrication of Surveillance Robot for Military Application

*Weight:* Due to the mass of the bi-copter, the body mass force always acts in the direction of gravity. Higher the weight of the drone, more power is required to lift and move the drone. Weight of drone = mass of drone × acceleration due to gravity

*Lift:* The vertical force acting on the drone is called lift. This force is due to pressure differences across the drone (in the vertical direction). Hence, the speed, size, and shape of the propeller blade decide the amount of lift force. Lift is essential to lift the body against the gravity. To create this force, all both propellers run at high speed to lift the bi-copter.



*Thrust:* The force acting on the drone in the direction of motion is called thrust. However, for drone dynamics, it is normal to the rotor plane. During hovering, the thrust is purely vertical. If thrust is inclined then the drone will tilt forward or backward. This force is essential to move the drone in the desired direction at equal speed. To get desired motion, two propellers have been given high speed.

*Drag:* The force acting on the drone in the opposite direction of motion due to air resistance is called drag. This may be because of pressure difference and viscosity of air. To reduce the drag, the aerodynamic shape of the drone is selected.

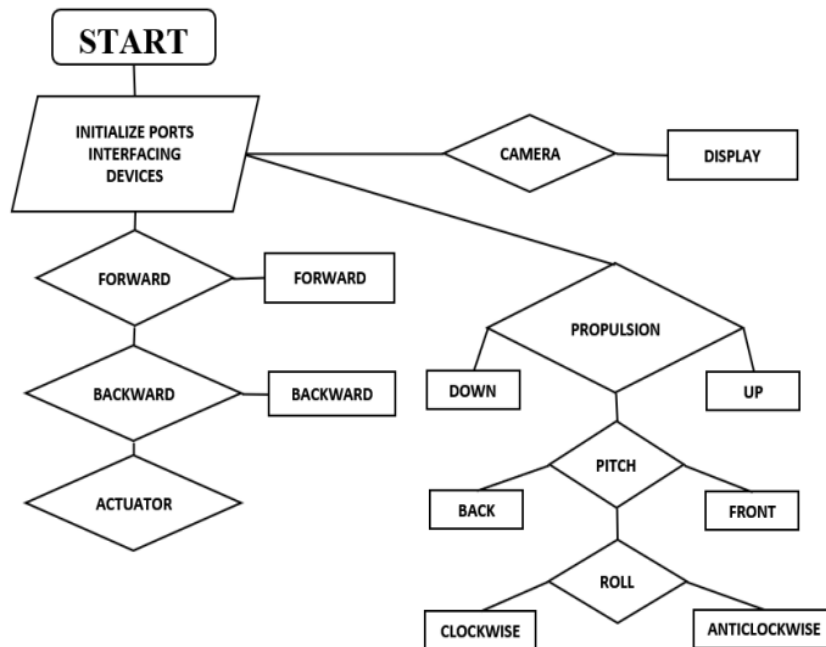


Figure 1: Robot control flow chart

### III. LITERATURE REVIEW

Dr. Wilfred John Vaz, P Sravani, Roshan Banu S, Shilpashree V, Shridevi Prabhogol., [1] proposed Military Surveillance Robot the paper proposed a Raspberry-pi based robotic vehicle system is designed to save the precious human life in some dangerous fields such as military during hostage situations. This robotic vehicle is a new method to trace out the enemies and use that information to make a tactical move. It is having all the necessary accessories to trace enemies like: long range camera which captures and live streams the video to the control station, sensors to detect the presence of human being and GPS/GPRS system to determine and transmit the position of the enemy targets. The system can substitute the soldier in border to provide surveillance as well for reconnaissance circumstances.

Tathagato Biswas, Supran Biswas, Vaibhavi Hanamshetti , Prof. Rageshri Bakare., [2] proposed Spy Robot This paper proposed a design and implementation of a remote. controlled camera car by Wi-Fi technology mobile devices. In this analysis work, radio code and hardware technologies area unit used, like the wireless module of ESP8266 for (transmitter and receiver), Arduino Uno as microcontroller, associate H-bridge L293D IC for motor controller and 2 electrical DC motors are used to move the car, & a Camera attached on the top of the vehicle.

Dr S.M Girirajkumar, A.Yaamini, R.S Sanchhali, G.Nivashni., [3] proposed Military Surveillance Robot Using IOT The paper proposed the surveillance robot is designed in such a way that it would automatically detect the invader in the borders and alert the nearby security personnel as a helping hand by alerting him through video streaming over Internet of Things. The heart of the robot is a powerful Raspberry Pi 3 Model B which is used as the ultimate controller for the entire operation of the robot in this bot we have used PIR sensor which is interfaced with the raspberry pi in order to rotate the camera for video streaming and it would be enabled when an intruder is detected.

Minal Ghute,K. P. Kamble,Mridula Korde., [4] proposed Design of Military Surveillance Robot The paper proposed a single unit, which will monitor the environment in various Design and Fabrication of Surveillance Robot for Military



Application MITE, MTR, 2022- 23 11 hazardous conditions and provide live video feedback, and is also able to capture real-time videos which are useful for surveillance for a specific person or area. This robot is more comfortable for military applications such as surveillance of interested area. It will provide tactical advantage during hostage situations or in hostile grounds. It is capable of walking on any surface and providing monitoring over an area with the help of high quality video transmission.

R. Karthikeyan, Sanka Karthik, Prasanna Vishal, S. R. Vignesh., [5] proposed Design and development of a mobile robot for surveillance and reconnaissance The paper proposed a robot named Snitch capable of climbing walls, scaling horizontal and vertical surfaces while automatically controlling surface transitions, and provides the controlling user with surveillance of its location. Unlike other wall-climbing robots currently available using vacuum suction technique and magnetic prosthesis, Snitch uses Micro-suction Cups to provide adhesive force to traverse across varied surfaces. The proposed model is also capable of capturing real-time images, video and audio to provide surveillance over a person or area.

Rakshana Mohamed Ismail, Senthil Muthukumaraswamy, A. Sasikala., [6] proposed Military Support and Rescue Robot The paper proposed the design and build of a semi-autonomous, unmanned robotic system used for various military and rescue operations. Dangerous tasks such as bomb disposal, enemy territory surveillance, search and rescue can be efficiently carried out by the MSRR, Military Support and Rescue Robot. This reduces the risk of losing the lives of both soldiers and civilians. With the help of live feed from the wireless camera and data analysis of environmental composition by various sensors, of the area under surveillance, the soldiers can better prepare for their missions.

Widodo Budiharto., [7] proposed Design of tracked robot with remote control for surveillance The paper proposed a robot that can be controlled by low cost remote controller Integrated Circuits (IC) and able to avoid obstacles using ultrasonic distance sensor. It can be used for education and research in the university. The performance of the robot in terms of the distance and the capability to deliver video streaming from the output raspberry pi and 2.4 GHz Video transmitter.

Hong, D., Kim, J., Lee, B., & Park, S. J.[8] proposed bicopter design performs well in indoor and outdoor flight tests, demonstrating high maneuverability and stability. Overall, the article contributes to the development of advanced rotorcraft designs with potential applications in surveillance, search and rescue operations, and aerial photography.

#### IV. CONCLUSION

In conclusion, surveillance drones have become an important tool for gathering intelligence and monitoring different activities, particularly in the military and law enforcement domains. They offer several advantages over traditional surveillance methods, such as their ability to cover large areas quickly and safely, gather high-quality imagery and video data, and reduce the need for human intervention in potentially dangerous situations.

However, their use also raises concerns about privacy, civil liberties, and potential misuse, and it is important to ensure that their use is transparent and subject to appropriate oversight and regulation. While the future scope for surveillance drones is exciting and promising, it is important to balance the potential benefits against these risks and ensure that their use is guided by ethical and legal considerations.

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