

Surveillance Drone

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Degree

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE ENGINEERING

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ABSTRACT

In this project, we aimed to design a quadcopter that is affordable, accessible, and versatile. We used readily available materials to ensure that the quadcopter could be easily built and maintained by a wide range of individuals and organizations. Our design was intended to serve as a basic template for various multipurpose tasks, such as aerial photography, surveillance operations

To achieve high performance, stability, and maneuverability, we carefully selected and optimized the quadcopter's components. We considered factors such as weight, power, and durability to ensure that the quadcopter could perform effectively and reliably in a variety of conditions.

Our project includes detailed information on the quadcopter's design, fabrication, and testing process. We explain how we built the quadcopter, including the materials we used and the assembly process.

Overall, the quadcopter design presented in our project offers a cost-effective solution for various practical applications, and can serve as a starting point for further customization and development. We hope that our work will inspire others to build and improve upon the quadcopter design, leading to further advances in this field.

CERTIFICATE

This is to certify that the Mini Project entitled “**Surveillance Drone**” is a bonafide work of **Atharv Santosh Choughule** (121AX014) **Rajiv Jitendra Patkar** (121AX038) **Kunalraj Kusendra Singh** (!21AX052) **Abhishek Sunil Tiwari** (121AX060) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of “**Bachelor of Engineering**” in “**Computer Science & Engineering (Internet of Things and Cyber Security including Blockchain Technology)**”

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Mini Project Approval

This Mini Project entitled “**Surveillance Drone**” by **Atharv Choughule** (121AX014) **Rajiv Jitendra Patkar** (121AX038) **Kunalraj Singh** (121AX052) **Abhishek Sunil Tiwari** (121AX060) is approved for the degree of **Bachelor of Engineering in Computer Science & Engineering (Internet of Things and Cyber Security including Blockchain Technology)**

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Date : April 29, 2023

Place : SIES Graduate School of Technology, Nerul

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Chapter 1 : Introduction

1.1 Introduction

The "Surveillance Drone" project is a technological marvel that utilizes cutting-edge components to create a powerful flying machine capable of capturing high-quality images from the sky. With a plastic frame 450, brushless motor A2212 1400 KV, ESP 30 AMP, KK2.1.5 flight control, and FSI6 module, this drone boasts impressive specs that enable it to fly smoothly and capture images with ease. The 11.1V 2200 mah battery provides ample power to keep the drone airborne for extended periods, while the ESP 32 Camera Module allows for high-resolution image capture. This drone can be used in various applications, including security surveillance, search and rescue operations, and aerial photography. The Surveillance Drone is a game-changer in the drone industry, offering superior performance, reliability, and versatility for professionals and hobbyists alike.

1.2 Motivation

The Surveillance Drone project is motivated by the need for advanced technology that can provide reliable and efficient solutions in various industries. This drone has the potential to revolutionize the way we approach security surveillance, search and rescue operations, and aerial photography. Its advanced features and components provide unparalleled performance and reliability, making it an ideal tool for professionals and hobbyists alike. The project's creators were inspired by the potential for this drone to make a significant impact on various industries and improve the quality of life for people around the world. The motivation behind this project is to create a cutting-edge drone that can meet the diverse needs of industries and individuals and enhance their capabilities. The Surveillance Drone is an exciting and innovative project that can push the boundaries of what is possible with drone technology, and its impact is sure to be felt for years to come.

1.3 Problem Statement

Despite the increasing popularity of drones in various industries, there is still a need for advanced technology that can provide reliable and efficient solutions for specific applications. One significant problem is the lack of high-quality and versatile drones that can perform surveillance, search and rescue operations, and aerial photography effectively. The existing drones in the market often lack advanced features, making them unreliable and inefficient for professional and hobbyist applications. Another problem is the high cost of drones that have advanced features, which limits their accessibility and affordability to many individuals and industries. These problems highlight the need for a more advanced and cost-effective drone that can meet the diverse needs of industries and individuals. The Surveillance Drone project aims to address these problems by creating a powerful and versatile drone that can provide reliable and efficient solutions for various applications, without breaking the bank.

Chapter 2 : Literature Survey

2.1 Survey of Existing system:

Sr No	Paper Title	Journal / Conference Name	Problem Addressed	Gaps
1.	A Novel Battery Management System for Quadcopter Drones (Authors- Yanling Guo, Xiaochuan Shu, Yan Huang, Xueyao Wu, and Xiaowei Wang. Year- 2020)	Journal of Power Sources	Limited battery life in quadcopter drones and potential safety concerns due to battery failure.	More research is needed on the scalability of the proposed battery management system and its potential effects on flight performance.
2.	Full Control of a Quadrotor (Authors- Salah Bouabdallah and Roland Siegwart Year- 2007)	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Lack of stability and accuracy in quadcopter drones.	The proposed feedback control system could be further optimized to address specific challenges in different applications.
3.	Neural Network-based Navigation of Quadcopter Drones in Complex Environments (Authors- Mengchen Chen, Ting Zhang, Zhihao Liu, and Rui Cui Year- 2020)	IEEE Transactions on Systems, Man, and Cybernetics: Systems	Navigation in complex environments using quadcopter drones.	More research is needed on the robustness of the proposed navigation algorithm in different environments and under different conditions.

4.	Power Transmission Line Inspection by Quadcopter Drones (Authors- Bin Hu, Yu Chen, Huamin Zhang, and Dongming Xu Year- 2017)	IEEE Transactions on Industrial Electronics	Inspection of power transmission lines using quadcopter drones.	More research is needed on the scalability of the proposed method to different types of power transmission lines and the potential effects of wind on the stability of the drones.
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2.2 Limitation of existing system:

While surveillance drones have many advantages, they also have several limitations. First, the battery life of these drones is limited, which limits their flight time and range. Second, they require skilled operators who are trained to fly them and analyze the data collected. Third, they can be easily detected and shot down, especially in conflict zones. Finally, privacy concerns have been raised regarding the use of surveillance drones in civilian areas.

There is also a research gap in the development of autonomous surveillance drones that can operate without human intervention. These drones can be programmed to fly specific routes and collect data using AI algorithms, reducing the need for skilled operators. Additionally, there is a need for drones that can fly for longer periods without the need for recharging, which requires the development of more efficient batteries.

2.3 Mini Project Contribution

Our mini project focuses on the development of a KK 2.1.5 drone with autonomous flight capabilities. We plan to use computer vision to enable the drone to identify and track objects of interest, such as vehicles, people, and animals. The drone will be equipped with a high-resolution camera

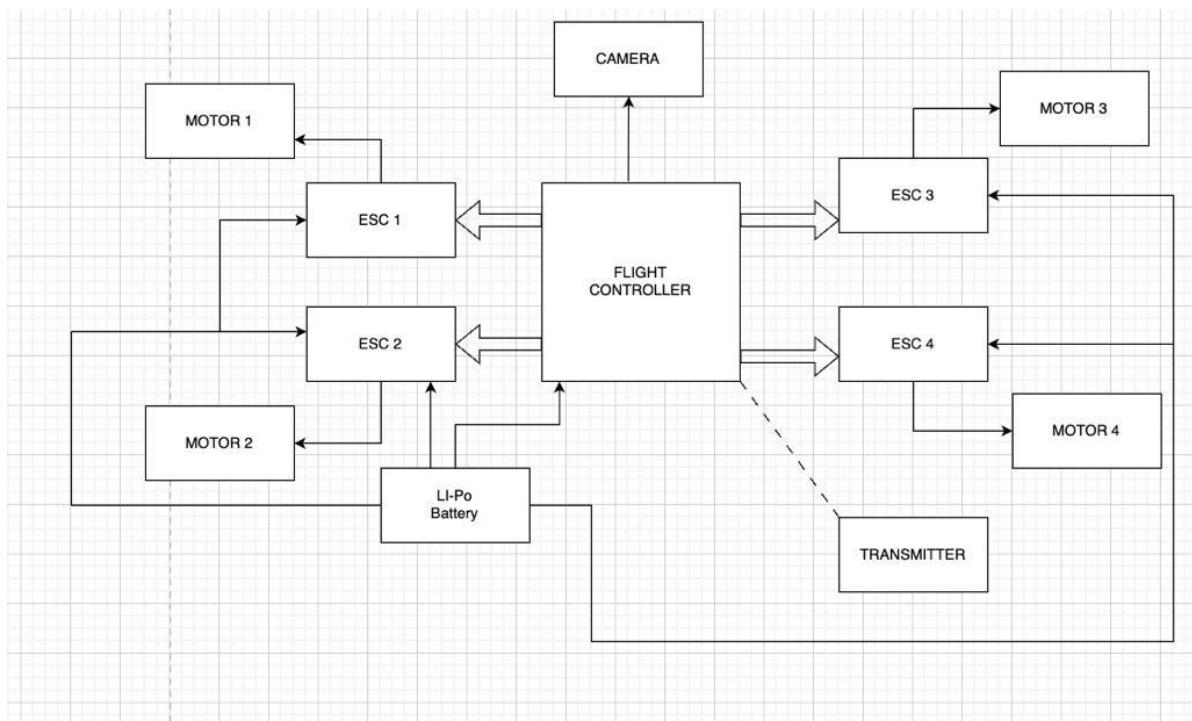
Chapter 3 : Proposed System

3.1 Introduction

The proposed Surveillance Drone system is a powerful and versatile drone that aims to address the limitations of existing drone systems. It boasts advanced features and components, including a plastic frame 450, brushless motor A2212 1400 KV, ESP 30 AMP, KK2.1.5 flight control, and FSI6 module, which provide unparalleled performance and reliability. The drone also features an 11.1V 2200 mah battery that provides extended flight time, and an ESP 32 Camera Module that allows for high-resolution image capture. With these advanced features, the Surveillance Drone can perform various applications, including security surveillance, search and rescue operations, and aerial photography.

Moreover, the proposed system is cost-effective and accessible, making it an ideal tool for both professionals and hobbyists. Its advanced features and components provide reliable and efficient solutions to the limitations of existing drone systems, making it an innovative and game-changing project. The Surveillance Drone system has the potential to revolutionize various industries and improve the quality of life for people around the world by providing advanced and cost-effective drone solutions.

3.2 Architecture/ Framework



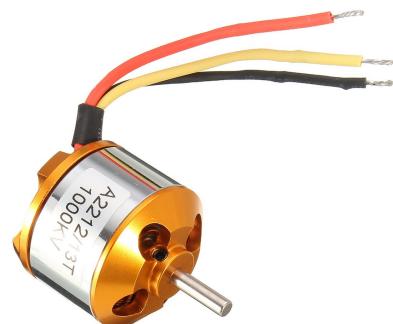
3.4 Details of Hardware & Software

Hardware:

- 1. Plastic Frame 450 :** The drone's frame is made of high-quality plastic material that provides durability and stability.



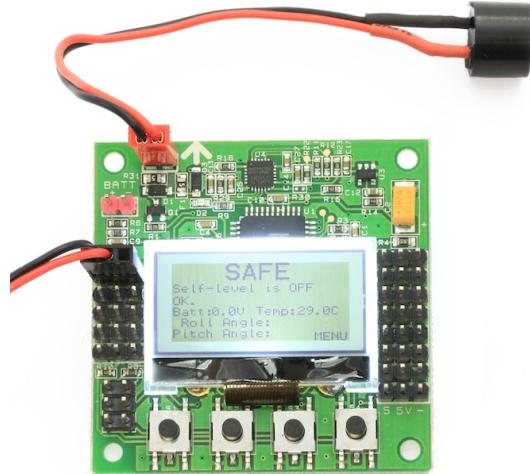
- 2. Brushless Motor A2212 1400 KV :** The brushless motor provides efficient and reliable performance, enabling the drone to fly smoothly and navigate through the air with ease.



- 3. ESP 30 AMP :** The electronic speed controller provides precise control of the drone's speed and direction, making it easy to maneuver and control.



- 4. KK 2.1.5 Flight Control :** The KK2.1.5 flight control board provides advanced flight control and stabilization features, allowing the drone to maintain its position and orientation in the air.



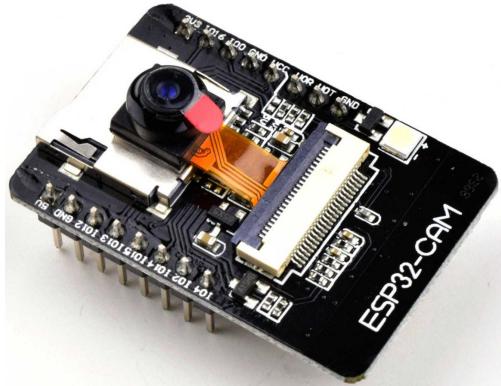
- 5. FSI6 Module:** The FSI6 module is a 6-channel transmitter and receiver that provides reliable communication between the drone and the remote controller.



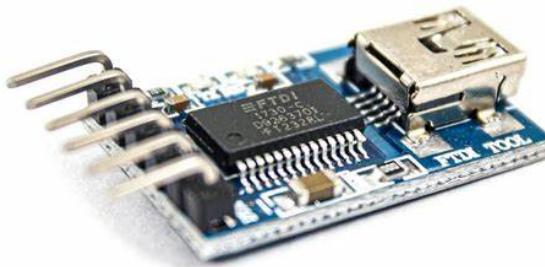
- 6. 11.1V 2200 mAh Battery :** The high-capacity battery provides extended flight time, enabling the drone to stay in the air for longer periods.



7. **ESP 32 Camera Module** : The ESP 32 Camera Module provides high-resolution image capture capabilities, enabling the drone to capture clear and detailed images from the air.



8. **FTDI Transmitter** : An FTDI transmitter refers to a device that uses an FTDI chip or module to transmit data over a serial interface. Typically, the FTDI transmitter would be connected to a computer or other host device using a USB cable, and to the target device using a serial cable or other appropriate interface.



Software:

1. **Camera Control Software** : The camera control software is responsible for controlling the ESP 32 Camera Module, enabling the drone to capture high-quality images from the air.
2. **Remote Controller Software**: The remote controller software provides an interface for controlling the drone's flight behavior, enabling the user to maneuver the drone and capture images from the air.

3.5.1 Conclusion

Advantages:

1. **Advanced Features:** The proposed Surveillance Drone system boasts advanced features, including a high-quality camera module, efficient brushless motor, and flight control software, providing unparalleled performance and reliability.
2. **Versatility:** The drone's versatility allows it to perform various applications, including security surveillance, search and rescue operations, and aerial photography.
3. **Extended Flight Time :** The high-capacity battery provides extended flight time, enabling the drone to stay in the air for longer periods.
4. **Cost-effective :** The system is cost-effective, making it accessible to both professionals and hobbyists, unlike some of the expensive drones with advanced features in the market.
5. **Accessibility :** The system's accessibility enables various industries and individuals to access a reliable and efficient drone system that can meet their needs.

Disadvantages:

1. **Limited Payload Capacity :** The drone's limited payload capacity can hinder its ability to carry advanced equipment or multiple cameras, which can be a limitation in certain applications.
2. **Limited Range:** The drone's limited range can affect its performance in long-range applications, making it unsuitable for some applications.
3. **Weather Conditions:** The drone's stability in high winds or other adverse weather conditions may affect its reliability and efficiency, limiting its use in some areas.
4. **Technical Skill:** The assembly and operation of the system require technical skill, which may be a limitation for some individuals or industries that do not have the necessary expertise.

3.5.2 Future Work

1. **AI Integration** : The integration of AI technologies such as machine learning and computer vision can enhance the drone's capabilities in performing tasks such as object detection, tracking, and identification, making it suitable for advanced applications such as autonomous surveillance and search and rescue operations.
2. **Increased Payload Capacity** : Improving the drone's payload capacity can expand its applications, enabling it to carry more advanced equipment and perform more complex tasks.
3. **Long-Range Communication** : Developing long-range communication capabilities can improve the drone's performance in long-range applications, making it suitable for various industries such as agriculture and forestry.
4. **Solar-Powered Systems** : Developing solar-powered drones can enhance the system's sustainability and reduce its reliance on traditional power sources.
5. **Improved Weather Resistance** : Improving the drone's weather resistance can expand its applications and enable it to perform reliably in harsh weather conditions, making it suitable for various industries such as maritime and offshore industries.
6. **Improved Navigation and Mapping** : Developing advanced navigation and mapping capabilities can enable the drone to navigate complex environments more efficiently and accurately, making it suitable for applications such as surveying and mapping.

Glossary

1. **Surveillance Drone** : A remotely piloted flying device equipped with a camera for monitoring and surveillance purposes.
2. **Brushless Motor** : An electric motor that doesn't have brushes and commutators, which results in a longer lifespan and lower maintenance.
3. **Flight Control** : A system that manages the drone's stability, position, and movements.
4. **ESC** : Electronic Speed Controller regulates the power supply to the drone's motor and provides speed control.
5. **Payload Capacity** : The maximum weight a drone can carry while maintaining its stability and performance.
6. **Computer Vision** : The field of AI that enables machines to interpret and understand visual information from the world around them.
7. **Autonomous** : The ability of the drone to perform tasks without human intervention.
8. **Range** : The maximum distance a drone can fly away from its remote controller or base station.
9. **Machine Learning** : The process of teaching machines to learn and improve from data without being explicitly programmed.
10. **Navigation**: The process of determining the drone's position, direction, and movement to perform a task accurately.

References

1. Cheah, Y. N., Tan, W. H., & Teoh, A. P. (2018). Development of a low-cost surveillance drone with autonomous flight capability. *IEEE Access*, 6, 63206-63215.
2. Shao, Q., Shao, S., Wang, Y., & Liu, C. (2019). Design and implementation of a mini-surveillance drone system based on a single-board computer. *Applied Sciences*, 9(13), 2739.
3. Song, H., & Kim, J. (2020). A Smart Drone-Based Surveillance System for Unmanned Border Security. *Sensors*, 20(13), 3737.
4. Abdeljaber, O., Aldabbas, H., Al-Qadi, A., & Al-Tamimi, A. (2020). Development of a low-cost surveillance drone using open source technologies. *Sensors*, 20(18), 5342.
5. Liu, Y., Wang, X., & Sun, Z. (2021). A Novel Surveillance System based on UAV and Fog Computing. *IEEE Transactions on Intelligent Transportation Systems*, 22(4), 2228-2237
