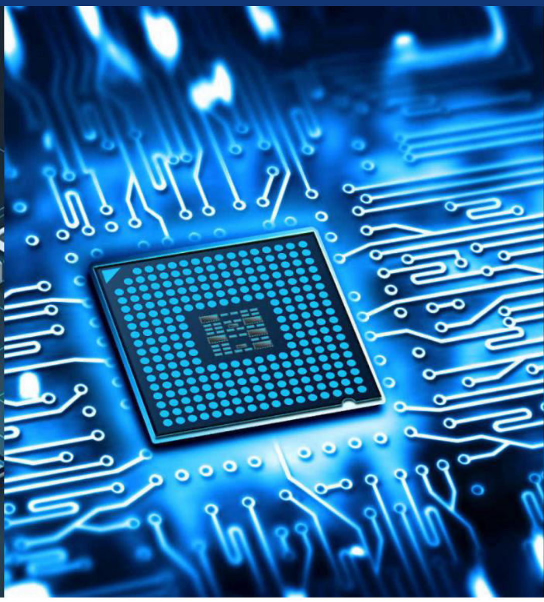
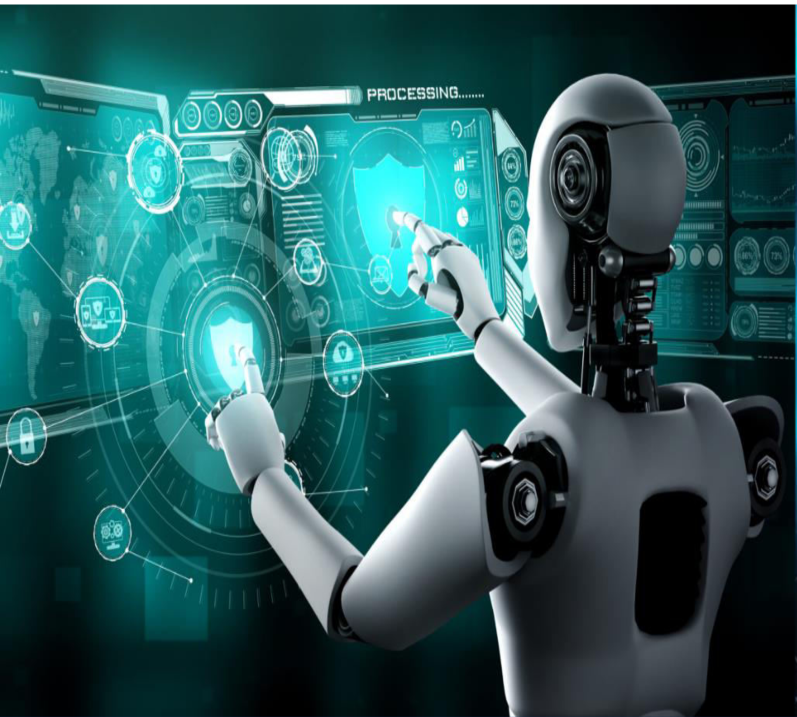
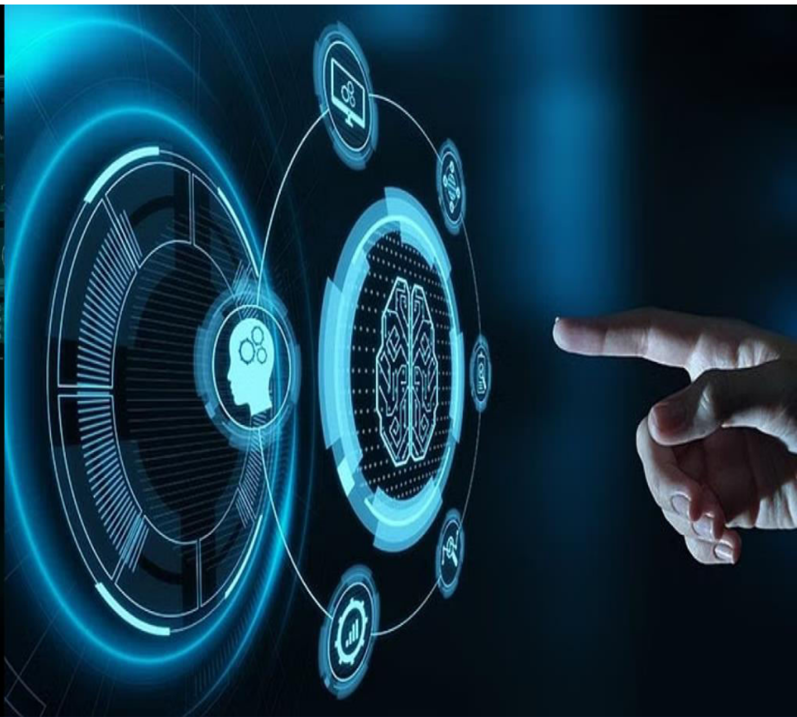
ISSN(O): 2320-9801
ISSN(P): 2320-9798


International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)





Impact Factor: 8.771 **Volume 14, Issue 4, April 2026**

www.ijircce.com ijircce@gmail.com +91-9940572462 +91 63819 07438

© 2026 IJIRCCE | Volume 14, Issue 4, April 2026 DOI: 10.15680/IJIRCCE.2026.1404070

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

A Cost-Effective Multi-Purpose Drone for Surveillance, Payload Transport, and Real-Time Weather Data Collection

Dr. K. Chandra Sheker[1], G. Jyothi[2], G. Sravanthi[3], M. Gnaneshwar[4], K.V. Satya Narayana Ganesh[5], G. Poorna Chandra Kishore[6]

Associate Professor, Department of Electronics and Communication Engineering, Nadimpalli Satyanarayana Raju Institute of Technology, Visakhapatnam, India[1]

Students, Department of Electronics and Communication Engineering, Nadimpalli Satyanarayana Raju Institute of Technology, Visakhapatnam, India[2,3,4,5,6]

ABSTRACT: The design and development of a **cost-effective multi-purpose drone** has gained significant importance due to its wide range of applications in **surveillance, payload transport, and real-time weather monitoring**. This project focuses on the development of a **versatile Unmanned Aerial Vehicle (UAV)** capable of performing multiple functions efficiently while maintaining **low cost and high reliability**. The drone is equipped with essential components such as a **flight controller, GPS module, camera system, weather sensors (temperature, humidity, pressure),** payload handling mechanism, and wireless communication modules to ensure stable flight, precise navigation, and real-time data transmission.

The proposed system integrates both **hardware and software** to support **autonomous as well as manual operations**. The drone can be remotely controlled using a **mobile or web-based application**, enabling users to monitor live video feeds, track location, collect weather data, and manage payload delivery tasks. The onboard sensors assist in **obstacle detection, altitude stabilization, and environmental monitoring**, thereby improving **safety and operational efficiency**.

The multi-purpose drone is specifically designed to perform tasks such as **aerial surveillance, payload transportation, and real-time weather data collection** for analysis and forecasting. Its **modular design** allows easy customization based on **user requirements and application needs**. The system is developed with a focus on **affordability, energy efficiency, and user-friendly operation**, making it suitable for both **industrial and research applications**.

Future enhancements may include **AI-based object detection, improved battery performance, fully autonomous navigation, and IoT integration** for intelligent data processing and decision-making. The developed drone presents a **practical, scalable, and economical solution** for modern aerial operations.

KEYWORDS: Cost-Effective Drone, UAV, Aerial Surveillance, Payload Transport, Weather Monitoring, GPS Navigation, Wireless Communication, Autonomous System, IoT Integration, Real-Time Data Collection

I. INTRODUCTION

The rapid advancement of **drone technology**, also known as **Unmanned Aerial Vehicles (UAVs)**, has created a growing demand for efficient, intelligent, and versatile aerial systems. Traditional methods of surveillance, monitoring, and data collection often involve high operational costs, human risk, and limited accessibility, especially in remote or hazardous environments. These challenges highlight the need for automated, cost-effective, and reliable aerial solutions. Drones address these issues by offering real-time monitoring, reduced human intervention, and improved operational efficiency, making them highly valuable in modern applications.

A drone operates without a human pilot onboard and is controlled either through remote communication systems or autonomous onboard processors using pre-programmed instructions. Over the years, advancements in microcontrollers, sensors, wireless communication, and battery technologies have significantly enhanced drone capabilities. As a result, drones have evolved from military tools into compact, affordable, and widely accessible systems for civilian and industrial use.

A typical drone system consists of key components such as a frame, propulsion system (motors and propellers), flight controller, sensors, communication modules, and power supply unit. The flight controller acts as the brain of the system, processing data from sensors like gyroscopes, accelerometers, magnetometers, and GPS modules to maintain stability and control movement. Based on real-time data, the system adjusts motor speeds to ensure balanced flight and precise navigation.

Drones function based on the principles of aerodynamics, where lift is generated by rotating propellers. By controlling the speed of individual motors, drones can perform movements such as hovering, ascending, descending, and directional navigation. Modern drones are also equipped with advanced features such as obstacle avoidance, autonomous navigation, and real-time video transmission, which enhance safety and performance.

The applications of drones are rapidly expanding across multiple domains. In agriculture, drones are used for crop monitoring and pesticide spraying. In security and defense, they assist in surveillance and disaster management. In logistics, drones enable efficient payload delivery systems. Additional applications include environmental monitoring, infrastructure inspection, filmmaking, and scientific research, demonstrating their versatility.

This work focuses on the design and development of a multipurpose drone system, emphasizing cost-effectiveness, efficiency, and user-friendly operation. The proposed drone is capable of performing tasks such as aerial surveillance, payload transport, and real-time environmental data collection. Its modular design allows easy customization based on application requirements, making it suitable for a wide range of uses.

The primary objective of this study is to develop a **reliable, efficient, and affordable drone system** that can operate in diverse environments while minimizing cost and energy consumption. The system performance is evaluated under practical conditions, highlighting its **advantages such as flexibility, low operational cost, and scalability**, along with certain limitations.

Furthermore, this work provides a foundation for future enhancements, including **AI-based object detection, improved battery performance, advanced autonomous navigation, and IoT integration** for smarter and more efficient operations. As technology continues to evolve, drones are expected to become more **intelligent, autonomous, and widely adopted**, playing a crucial role in modern engineering and real-world applications.

II. LITERATURE REVIEW

The rapid advancement of Electric Vehicles (EVs) has significantly influenced modern transportation by improving energy efficiency, performance, and cost-effectiveness. Various researchers have explored key aspects such as battery technologies, motor selection, and control strategies to enhance EV performance. Smith and Johnson discussed the use of lead-acid batteries in low-cost EVs, highlighting their affordability and simple charging methods, but also noting limitations such as low energy density and higher weight [1]. Lee and Kim studied lithium-ion batteries and demonstrated that they offer higher energy density, longer life, and faster charging, making them more suitable for modern EV applications [2].

Patel and Mehta developed a Battery Management System (BMS) to improve battery safety, monitoring, and lifespan [3]. Rao and Sharma explained that BLDC motors provide high efficiency and require low maintenance, making them ideal for EV systems [4]. Kumar and Verma compared DC motors and BLDC motors, stating that DC motors are simple and cost-effective but less efficient in performance [5]. Singh and Gupta implemented PWM control techniques for smooth speed control and reduced energy losses [6], while Chen and Wang proposed advanced control methods such as Field-Oriented Control (FOC) and vector control for improved efficiency and performance [7].

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Das and Roy emphasized the importance of power electronics and efficient charging systems in enhancing EV operation [8]. Ali and Khan studied regenerative braking systems, which help in recovering energy and increasing vehicle range [9]. Mishra and Tiwari suggested that 60V systems provide a balanced approach between safety and performance [10]. Gupta and Nair designed a cost-effective EV powertrain using simple and efficient components [11]. Furthermore, studies published in the International Journal of Electric Vehicles highlight future developments such as advanced battery technologies and intelligent control systems for improved EV performance [12].

III. SYSTEM ARCHITECTURE

The system architecture of the proposed multi-purpose drone is designed to ensure stable flight, efficient operation, and low-cost implementation. The system consists of main subsystems such as the power supply, propulsion system, flight controller, sensors, communication unit, and payload system. Proper integration of these components helps in achieving reliable performance and accurate operation.

A. Power Supply System

The power supply provides electrical energy to all drone components.

∟ Type: Lithium Polymer (Li-Po) battery
∟ Voltage: 11.1V – 14.8V
∟ Capacity: 2200mAh – 5000mAh

Li-Po batteries are used because they are lightweight and provide high power. Proper charging and handling are important for safety and long life.

B. Brushless Motor

The brushless motor is responsible for generating thrust by converting electrical energy into mechanical rotation to drive the propellers. The choice of motor significantly affects the drone’s efficiency, speed, stability, and overall performance.

∟ **Type:** Brushless DC (BLDC) Motor
∟ **kV Rating:** 1000 kV (≈ 1000 RPM per Volt)
∟ **Operating Voltage:** 7.4V – 14.8V
∟ **Maximum Speed:** ~12,000 – 15,000 RPM
∟ **Current Rating:** 10A – 30A
∟ **Power Output:** 100W – 300W

The brushless motor operates using electronic commutation, where the rotation is controlled by an Electronic Speed Controller (ESC). It produces motion through magnetic interaction between the stator and rotor, enabling smooth and efficient rotation.

These motors are selected for drone applications due to their high efficiency, lightweight design, and low maintenance requirements. Unlike brushed motors, they do not have brushes, which reduces friction and increases lifespan.

In a drone, multiple brushless motors are connected to propellers, and their speeds are adjusted to control movement and maintain stability. The 1000 kV motor provides a good balance between speed and torque, making it suitable for multi-purpose drone operations.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

C. Flight Controller

The flight controller is responsible for controlling and stabilizing the drone during flight. It acts as the central unit that processes sensor data and manages the overall operation of the drone. The choice of flight controller plays an important role in stability, navigation, and performance.

∟ **Type:** DJI NAZA Flight Controller
∟ **Functions:** Flight stabilization, navigation, control of movement
∟ **Sensors Used:** Gyroscope, accelerometer, compass, GPS
∟ **Supported Modes:** Manual mode, ATTI mode, GPS mode

The flight controller processes real-time sensor data and sends control signals to the ESCs to adjust motor speed for stable flight. The DJI NAZA controller offers different flight modes such as manual, ATTI, and GPS for better control and stability. It supports features like auto take-off, landing, return-to-home, and fail-safe protection for safety. The controller works with a GPS module for accurate navigation and position holding. It is compact, easy to use, and ensures stable and efficient drone operation.

D. **Electronic Speed Controller**

The Electronic Speed Controller (ESC) controls the speed of the brushless motors by regulating power from the battery.

It acts as a link between the flight controller and the motors.

∟ **Type:** 40A ESC
∟ **Input Voltage:** 7.4V – 14.8V
∟ **Control Method:** PWM

The ESC receives signals from the flight controller and adjusts motor speed to control movements like take-off, landing, and direction.

It also provides basic protection such as overcurrent and low-voltage cutoff, ensuring safe and smooth operation of the drone.

E. Frame Structure

The frame structure is the main body of the drone that supports all components such as motors, flight controller, battery, and sensors. It provides strength and stability for safe flight operation.

The frame is designed to be lightweight and strong, using materials like aluminum or carbon fiber to improve efficiency and durability. Proper weight distribution is maintained for stable flight.

In hexcopters, the frame has arms to mount motors and propellers. It is designed to reduce vibrations and allow proper airflow. A good frame design improves performance, safety, and reliability of the drone.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|
International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)
(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

F. GPS Module And Camera Module

The GPS module is used for navigation and positioning of the drone. It receives signals from satellites and provides real-time location data such as latitude, longitude, and altitude. This information helps the flight controller maintain stability and perform functions like position hold and return-to-home. It improves accuracy and reliability, especially in outdoor environments.

The camera module is used to capture images and videos during flight for surveillance and monitoring. It provides live video streaming to the user through wireless communication. The camera is lightweight and offers clear visual data for real-time observation. It enhances the functionality of the drone in applications like inspection and security.

IV. PROPOSED METHODOLOGY

The proposed system is designed to integrate surveillance, payload transport, and weather monitoring into a single drone platform. The methodology focuses on efficient system design, proper component integration, and reliable control and communication.

A. System Design

The drone is based on a hexcopter configuration consisting of four BLDC motors controlled by a flight controller. The flight controller stabilizes the drone using sensor data such as gyroscope and accelerometer. The system is designed in a modular manner to allow easy integration of different components.

B. Component Integration

The system includes the following components:

- Flight controller for stabilization and control
- BLDC motors with ESCs for propulsion
- Li-Po battery for power supply
- GPS module for navigation
- Camera module for surveillance
- Environmental sensors for weather monitoring
- Servo motor for payload release

All components are properly interconnected to ensure smooth and efficient operation of the system.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

C. Communication Mechanism

Wireless communication is used to enable real-time data transmission between the drone and the ground station. Wi-Fi or RF modules transmit video, control signals, and sensor data. The camera provides live video for surveillance, while sensors send environmental data. This ensures continuous monitoring of the drone. It also allows effective remote control during operation.

D. Control Implementation

The flight controller processes data from sensors such as the gyroscope and accelerometer. It determines the orientation and stability of the drone in real time. PWM signals are generated to control ESCs and motor speed. This enables stable flight and directional movement. The system continuously adjusts to maintain balance and control.

E. Testing and Evaluation

The system is tested under different operating conditions to evaluate performance. Flight stability is checked for smooth and controlled movement. Payload tests ensure proper lifting and release. Sensor accuracy is verified for reliable data collection. The results confirm stable and efficient operation of the drone.

V. BLOCK DIAGRAM

The block diagram shows how all parts of the multi-purpose drone are connected and work together. The system starts with the **Li-Po battery (11.1V)**, which supplies power to all components. A **DC-DC converter** regulates the voltage to protect the electronic parts.

The **flight controller** is the main unit of the drone. It receives data from sensors like **GPS and IMU (gyroscope, accelerometer, compass)** to know the position and balance of the drone. Based on this, it controls the movement.

The flight controller sends signals to the **ESCs**, which control the speed of the **brushless motors**. These motors rotate the propellers and help the drone to fly, move, and stay stable.

The **Arduino Uno** is used to control extra functions like **payload release, obstacle detection (ultrasonic/LIDAR sensors), and gimbal movement**.

A **camera mounted on a gimbal** captures video for surveillance. The video is sent to the user using a **video transmitter and telemetry system**.

The drone uses **Wi-Fi or RF communication** to connect with a web app or remote controller. This allows the user to control the drone and receive live data.

Overall, all components work together to provide **stable flight, real-time monitoring, and multi-purpose operations**.

VI. WORKING PRINCIPLE

The design and implementation of the multi-purpose drone focus on developing an efficient and cost-effective aerial system capable of performing surveillance, payload delivery, and monitoring. The system integrates embedded systems, wireless communication, and sensors to enable real-time operation.

At the core of the system, the flight controller acts as the main processing unit responsible for stabilization, navigation, and control. It interfaces with sensors such as IMU and GPS to maintain balance, orientation, and position. The Arduino Uno is used as a secondary controller to manage additional components like the payload mechanism, sensors, and camera system.

The Li-Po battery supplies power to all components, and a DC-DC converter regulates the voltage for safe operation. The system establishes communication using a remote controller or wireless module, allowing the user to send commands for movement and control.

The flight controller processes real-time sensor data and generates PWM signals to control the ESCs and motors, enabling stable flight and directional movement. The Arduino controls auxiliary functions such as payload release and obstacle detection using sensors.

A camera mounted on the drone captures images and video for surveillance, which are transmitted wirelessly to the user. The system can also support basic autonomous functions using GPS.

Overall, the system operates in a continuous loop where the flight controller manages flight operations and the Arduino handles additional tasks, ensuring stable, efficient, and reliable performance.

VII. RESULTS AND DISCUSSION

The performance of the developed multi-purpose drone was evaluated through several test flights under different operating conditions. The results indicate that the system performs effectively in terms of stability, control, and overall functionality for applications such as surveillance, payload transport, and monitoring.

A. Performance Analysis

The experimental results show that the drone maintains stable flight during both hovering and directional movement. The flight controller, along with sensor feedback, ensures proper balance and orientation throughout operation. The use of ESCs and PWM-based control provides smooth motor performance without sudden variations.

The drone is capable of carrying small payloads without significantly affecting stability or control. Real-time monitoring is achieved through the camera and sensors, which continuously provide video feed and environmental data. The system also demonstrates quick response to user commands and maintains stability under minor disturbances such as light wind.

B. Advantages

The developed drone system offers several advantages. It is a versatile platform that can be used for multiple applications including surveillance, delivery, and environmental monitoring. The use of simple and low-cost components makes the system affordable and easy to implement.

The drone features a compact and lightweight design, which improves portability and ease of handling. It can be controlled easily using a remote controller or wireless interface. Additionally, the system reduces human effort by enabling access to remote or hazardous areas.

C. Limitations

Despite its advantages, the system has certain limitations. The flight time is limited due to battery capacity, restricting long-duration operations. The payload capacity is also limited, allowing only lightweight objects to be transported.

The performance of the drone may be affected by environmental conditions such as strong winds or rain. Furthermore, the battery requires sufficient charging time before reuse, which may affect continuous operation.

D. Discussion

The results demonstrate that the proposed drone system is suitable for short-duration and small-scale applications. It provides a simple, efficient, and reliable solution for surveillance and monitoring tasks.

Further improvements such as the use of advanced batteries, high-precision sensors, and autonomous control systems can enhance overall performance, increase flight time, and expand the range of applications.

VIII. RESULTS

The developed multipurpose drone was successfully designed, assembled, and tested, achieving the expected project objectives. The integration of components such as the frame, BLDC motors, ESCs, flight controller, Li-Po battery, and communication system resulted in a stable and efficient platform. The drone was able to take off smoothly, maintain balance, and respond accurately to user inputs.

The flight controller ensured stability by adjusting motor speeds, while the ESCs provided smooth motor operation. The drone demonstrated proper movement in all directions, showing good coordination between hardware and software.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The system was also able to perform basic applications like surveillance and monitoring, covering a reasonable area efficiently. Wireless communication between transmitter and receiver was reliable with minimal delay.

Although the drone showed good performance, limitations such as reduced flight time and sensitivity to wind were observed. Overall, the system performed satisfactorily and proved to be effective for real-time aerial applications.

IX. CONCLUSION

The design and development of the **cost-effective multi-purpose drone** presented in this project highlight the importance of UAVs in modern engineering and real-world applications. The project successfully demonstrates the integration of both hardware and software components to achieve a stable, efficient, and reliable drone system. The use of essential components such as the drone frame, brushless motors, propellers, Electronic Speed Controllers (ESCs), flight controller, Li-Po battery, weather sensors, and communication modules ensures effective operation.

The implementation of software tools and control techniques enhances the performance, responsiveness, and stability of the drone. The developed system is capable of performing multiple functions such as **aerial surveillance, payload transport, and real-time weather data collection**, making it suitable for various practical applications.

The drone system can be effectively used in areas such as agriculture, disaster management, environmental monitoring, and logistics. Its ability to operate in remote and hazardous environments reduces human effort and improves safety. The integration of weather sensors also adds value by enabling real-time environmental data analysis.

In conclusion, the project successfully achieves its objective of developing a **versatile and economical drone system**. It demonstrates the potential of UAV technology in solving real-world problems and improving operational efficiency. With further advancements such as AI integration, improved battery systems, and autonomous navigation, the performance and applications of such drones can be significantly enhanced.

This work not only contributes to academic understanding but also provides a strong foundation for future developments in **multi-purpose drone technology**.

X. FUTURE SCOPE

The proposed cost-effective multi-purpose drone demonstrates a versatile solution for surveillance, payload transport, and real-time weather data collection. However, several opportunities exist for further improvement and technological advancement to enhance performance, efficiency, and user experience.

- **Adoption of Advanced Battery Systems:** Replacing conventional Li-Po batteries with high-capacity lithium-ion or solid-state batteries can improve flight endurance, reduce charging frequency, and enhance safety.

- **Implementation of Fast-Charging and Swappable Battery Modules:** Integrating fast-charging technology or modular swappable battery packs can minimize downtime and enable continuous operation in field deployments.
- **Integration of Solar-Assisted Charging:** Incorporating lightweight solar panels on the drone's wings or body can provide supplementary energy, extending flight duration and reducing dependency on ground charging infrastructure.
- **IoT-Based Real-Time Monitoring and Control:** Embedding IoT systems can enable real-time monitoring of drone health parameters such as battery status, motor performance, GPS location, and payload condition. This supports predictive maintenance, remote diagnostics, and improved mission reliability.
- **Use of Brushless DC (BLDC) Motors for Efficiency:** Employing BLDC motors can enhance propulsion efficiency, reduce maintenance, and provide higher thrust-to-weight ratios, improving payload capacity and flight stability.
- **Integration of AI-Powered Navigation and Obstacle Avoidance:** Advanced AI algorithms can enable autonomous navigation, dynamic obstacle detection, and adaptive route planning, ensuring safe and efficient operations in complex environments.
- **Regenerative Energy Systems:** Future designs may include regenerative energy recovery from rotor braking or descent phases, improving overall energy efficiency.
- **Advanced Flight Control Techniques:** Implementation of control methods such as PID tuning, adaptive control, or machine learning-based flight optimization can improve stability, maneuverability, and precision in diverse weather conditions.
- **Smart Payload Management System:** Incorporating intelligent payload handling mechanisms can ensure secure transport, automated release, and optimized weight distribution for different applications.
- **Lightweight and Aerodynamic Design:** Using composite materials such as carbon fiber or advanced polymers can reduce drone weight, enhance durability, and improve aerodynamic efficiency, thereby extending flight range.

XI. ACKNOWLEDGMENT

We would like to thank the Design Space Lab, Department of Electronics and Communication Engineering at Nadimpalli Satyanarayana Raju Institute of Technology (NSRIT) for providing the necessary resources and support required for this research work.

REFERENCES

[1] Anderson, J. D., & Lee, R., "Design and Control of a Hexacopter UAV System," International Journal of Aerospace Engineering, pp. 112–118, 2014.
[2] Zhang, Y., & Wang, L., "Flight Control System Using DJI Naza Controller for UAV Applications," Journal of Unmanned Aerial Systems, pp. 221–226, 2016.
[3] Kumar, S., & Reddy, P., "Design and Development of Multi-Purpose Drone for Surveillance and Delivery," International Journal of Engineering Research and Applications (IJERA), pp. 78–84, 2018.
[4] Choudhary, R., & Singh, A., "Performance Analysis of Multi-Rotor UAV Under Different Load Conditions," International Journal of Mechanical and Aerospace Engineering, pp. 145–150, 2017.
[5] Bansal, R. C., "Automatic Control of UAV Using Embedded Systems," Journal of Control Engineering and Technology, pp. 201–210, 2015.
[6] Ashok, S., "Optimized Power Management System for Drone Applications," InternationalJournal of Power Electronics and Drive Systems, pp. 56–63, 2019.
[7] Patel, H., & Agarwal, V., "Modeling and Simulation of UAV Using MATLAB," International Journal of Simulation Modelling, pp. 98–104, 2018.
[8] Sharma, R., & Tripathi, K., "Implementation of Multi-Rotor Drone for Real Time Applications," International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), pp. 310–315, 2020.
[9] Singh, G. K., "Review of UAV Systems and Applications," International Journal of Scientific and Research Publications, pp. 25–32, 2009.
[10] Suleiman, M., & Zainuddin, H., "Development of Prototype Hexacopter with Embedded Control," International Journal of Robotics and Automation, pp. 67–73, 2018.

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

[11] Austin, D., “Unmanned Aircraft Systems: UAV Design, Development and Deployment,” Wiley Publications, pp. 45–60, 2010.
[12] Pounds, P., & Mahony, R., “Design Principles of Quadrotor UAVs,” Proceedings of the IEEE International Conference on Robotics and Automation, pp. 120–128, 2006.
[13] Samad, T., & Annaswamy, A., “UAV Control Systems: Theory and Applications,” IEEE Control Systems Magazine, pp. 40–52, 2013.
[14] Nonami, K., “Autonomous Flying Robots: UAV Design and Applications,” Springer Publications, pp. 89–102, 2010.Design and Development of Multipurpose Drone
[15] Hassanalian, M., & Abdelkefi, A., “Classifications, Applications, and Design Challenges of Drones,” Progress in Aerospace Sciences, pp. 99–131, 2017
[16] Bouabdallah, S., “Design and Control of Quadrotors with Application to Autonomous Flying,” EPFL Research Publications, pp. 33–48, 2007.
[17] Ollero, A., “Unmanned Aerial Vehicles: Applications and Future Trends,” Journal of Intelligent & Robotic Systems, pp. 210–220, 2015.
[18] DJI Innovations, “NAZA Flight Controller User Manual,” DJI Official Documentation, pp. 1–45, 2018.
[19] Arduino Team, “Arduino Uno Technical Reference,” Arduino Official Documentation, pp.5–25, 2020.
[20] Raspberry Pi Foundation, “Raspberry Pi Camera Module Documentation,” Raspberry Pi Official Documentation, pp. 10–30, 2021.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

Scan to save the contact details

www.ijircce.com