A PROJECT REPORT ON

AERODROID

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE

OF

MASTER OF COMPUTER APPLICATION (Under Engineering)

SUBMITTED BY

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2022 -2023

CERTIFICATE

This is to certify that the project report entitles

"AERODROID"

Submitted by

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is a bonafide student of this institute and the work has been carried out by him/her under the supervision of **Prof. Dr. N.J Uke** and it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University, for the award of the degree of **Master of Computer Applications (Under Engineering)**

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1. INTRODUCTION

1.1 Abstract:

The Aerodroid project is an innovative endeavor that focuses on developing a drone using Arduino technology. This abstract provides an overview of the project's objectives, methodology, and key contributions.

The primary aim of the Aerodroid project is to design and build a functional drone utilizing Arduino, an open-source microcontroller platform. The project acknowledges the support and guidance provided by the project supervisor and the generous funding and resources from a specific organization.

Various individuals and organizations have provided guidance, technical advice, and feedback, further enriching the project's direction and overall quality. Lastly, the support and encouragement from friends and family have been instrumental in motivating the project lead.

1.2 Project Introduction:

This project explores the realm of drones by building a drone using Arduino technology. Drones, or unmanned aerial vehicles (UAVs), have become increasingly popular due to their versatile applications. By utilizing Arduino, an open-source microcontroller platform, we have the flexibility to construct and control the drone's functionalities. The project focuses on stages such as drone assembly, flight control programming, and prioritizes safety and responsible operation. Documentation of our progress and experiences will contribute to the knowledge base surrounding Arduino-based drone development, providing insights for others interested in this field. Through this project, we aim to expand our knowledge, develop practical skills, and appreciate the potential of drones in various industries.

1.3 Scope:

1. Drone Assembly: Building a drone using Arduino technology, involving component selection, physical construction, and electrical connections.

2. Flight Control System: Programming basic flight control maneuvers using Arduino, such as takeoff, landing, and stable hovering.

3. Testing and Calibration: Conducting tests to ensure proper drone functionality and stability, including motor adjustments, flight control parameter tuning, and sensor verification.

4. Hands-on Flying Experience: Gaining practical experience through piloting the drone, practicing basic flight maneuvers, and ensuring safe operation within designated areas.

5. Troubleshooting and Problem Solving: Identifying and resolving issues during construction, programming, or flight, such as sensor errors, motor issues, or flight control inconsistencies.

6. Documentation and Knowledge Sharing: Documenting project progress, assembly steps, programming code, troubleshooting approaches, and lessons learned for knowledge sharing and future reference.

The project's scope focuses on hands-on learning, basic flight control, and assembly using Arduino technology. Advanced features like complex navigation or payload integration are not within the project's scope.

2. LITERATURE SURVEY

Building a quadcopter drone using an Arduino Uno as a controller has become increasingly popular with hobbyists and enthusiasts. A wealth of resources, including tutorials, guides, and open-source code libraries, are available online to help people get started with the project. Several studies have examined the feasibility of using an Arduino Uno as a flight controller for a quadcopter drone, concluding that it is a cost-effective and accessible solution for developing stable and responsive flight control. Additionally, the platform's ease of programming and sensor integration makes it a viable option for developing autonomous quadcopter drones using GPS and ultrasonic sensors. The literature emphasizes the flexibility and programmability of the Arduino Uno as a platform for controlling the various components of a quadcopter drone, such as the frame, motors, propellers, and sensors. Furthermore, the review article highlights the different control methods used in quadcopter drones, including manual, semi-autonomous, and autonomous control. In summary, the literature suggests that using an Arduino Uno as a controller for building quadcopter drones is an accessible and customizable option for hobbyists and enthusiasts. However, the project can be challenging and complex, requiring knowledge and skills in electronics, programming, and mechanics.

The advent of drones has revolutionized various industries, including aerial photography, package delivery, surveillance, and agriculture. Building your own drone using Arduino, an open-source electronics platform, has become increasingly popular due to its flexibility and affordability. In this literature survey, we explore the existing research and resources available on drone making using Arduino, focusing on the hardware components, software development, and applications of Arduino-based drones.

Software Development:

- Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a widely used platform for programming Arduino boards. Researchers have developed libraries and code examples specifically tailored for drone applications, simplifying the development process.

Hardware Components:

- Arduino Board:

Arduino boards, such as the Arduino Uno or Arduino Mega, serve as the brain of the drone. They provide a programmable microcontroller that controls the flight operations, sensor integration, and communication with other peripherals.

- Motor and Propeller Systems:

A key component of any drone is the motor and propeller system. Brushless DC (BLDC) motors are commonly used for their efficiency and reliability. Researchers have explored different motor and propeller configurations to achieve optimal flight performance.

- Sensors and Actuators:

Various sensors, such as accelerometers, gyroscopes, barometers, and GPS modules, enable drones to gather data about their surroundings and maintain stability during flight. Actuators like servos are used for controlling the movement of components like camera gimbals or landing gear.

Applications:

- Aerial Photography and Videography:

Arduino-based drones have found extensive use in aerial photography and videography, providing a cost-effective solution for capturing stunning aerial shots and footage.

- Environmental Monitoring:

Drones equipped with sensors can be employed for environmental monitoring tasks, such as measuring air quality, monitoring wildlife, and assessing vegetation health.

- Search and Rescue Operations:

In emergency situations, drones can be instrumental in search and rescue operations, aiding in locating missing persons or assessing disaster-affected areas.

- Precision Agriculture:

Drones equipped with specialized sensors can assist in precision agriculture by monitoring crop health, optimizing irrigation, and analyzing soil conditions.

3. PROBLEM STATEMENT

The project addresses the need for practical learning opportunities in drone technology, specifically the construction and operation of drones using Arduino technology. The lack of accessible and hands-on resources for individuals interested in gaining experience in drone assembly and flight control using Arduino presents a challenge. This project seeks to bridge this gap by providing a structured learning environment and documentation to guide others interested in building and operating drones with Arduino. The project aims to address the need for a comprehensive resource that emphasizes safety, technical understanding, and practical application in the field of Arduino-based drone development.

Aim:

The aim of this project is to explore the realm of drones by building a drone using Arduino technology, focusing on stages such as drone assembly, flight control programming, and prioritizing safety and responsible operation. The project aims to expand knowledge, develop practical skills, and appreciate the potential of drones in various industries.

Objectives:

- To research and understand the fundamental concepts and components involved in drone construction and operation.
- To gather necessary hardware components and assemble the drone using Arduino technology.
- To program the flight control and integrate sensors for stability and maneuverability.
- To implement safety measures and responsible operating practices to ensure safe operation of the drone.
- To analyze and discuss the potential applications of drones in different industries, highlighting their advantages and limitations.
- To contribute to the knowledge base surrounding Arduino-based drone development, sharing insights and recommendations for future projects in this field.
- To showcase the project's outcomes and learnings through presentations, reports, and demonstrations, encouraging others to explore the possibilities of drone technology.
- To foster a deeper understanding and appreciation of the interdisciplinary nature of drone technology, incorporating elements of electronics, programming, mechanics, and safety considerations.

By achieving these objectives, the project aims to provide a comprehensive understanding of building and operating drones using Arduino technology, contributing to the advancement of knowledge in the field and inspiring further exploration and innovation in drone development.

4. System Study and Analysis

4.1 Existing System:

The existing system analysis involves evaluating the current state of drone technology, including components, flight control systems, software, safety regulations, applications. By assessing these aspects, we can gain insights into the strengths, limitations, and advancements in the field of Arduino-based drone development. This analysis informs the design and development of our project, enabling us to leverage existing knowledge and address identified challenges.

4.2 Proposed System:

The proposed system involves developing an Arduino-based drone with enhanced flight control, expanded functionality, user-friendly interface, autonomous features, safety enhancements, performance optimization, and comprehensive documentation. These improvements aim to create a versatile and reliable drone platform for various applications while prioritizing safety and knowledge sharing.

4.3 Feasibility Study:

The feasibility study assesses the practicality and viability of the proposed drone project using Arduino technology. It evaluates technical, economic, time, skills, legal, and safety aspects to determine if the project is achievable. Considerations include component availability, affordability, project timeline, required skills, legal compliance, and safety measures. Regular review and updates ensure ongoing feasibility and adaptability to potential challenges

4.3.1 Technical Feasibility:

Evaluate the technical feasibility of building the drone using Arduino. Assess the availability of necessary components, tools, and resources required for assembly, programming, and integration. Consider the compatibility and reliability of Arduino in achieving the desired functionalities.

4.3.2 Economic Feasibility:

Analyze the economic feasibility of the project. Evaluate the costs associated with acquiring the required components, materials, and tools. Consider any additional expenses for testing, calibration, and documentation. Assess the affordability and cost-effectiveness of the project within the allocated budget.

4.3.3 Time Feasibility:

Determine the time feasibility of completing the project. Evaluate the availability of sufficient time to assemble the drone, program the flight control system, conduct testing and optimization, and document the project progress. Consider any potential delays or constraints that may affect the project timeline.

5. Project Requirements

5.1 Hardware Requirements:

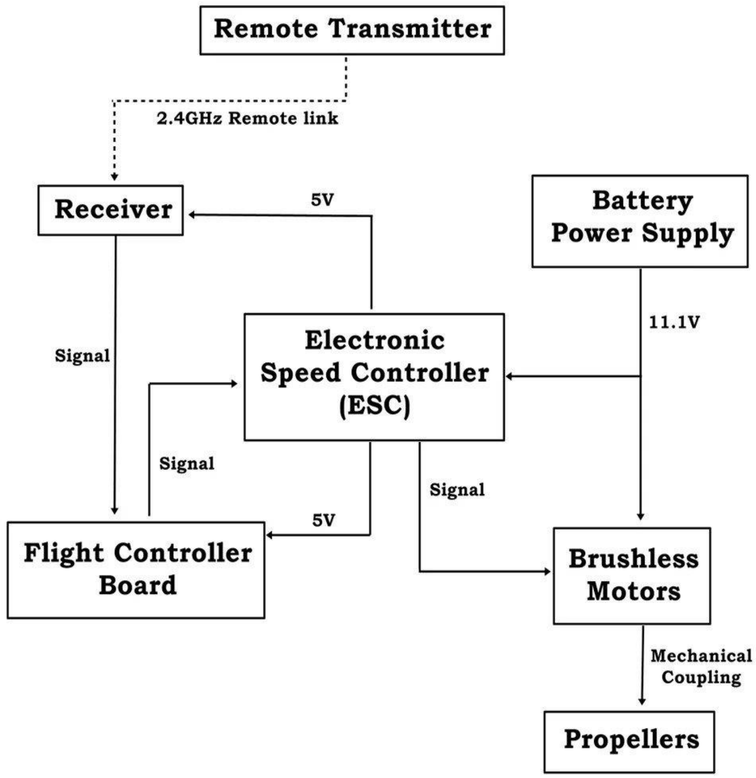
Drone Frame	Drone frame F450
Motors	4* 2212 KV1000 Brushless motors
Gyroscope	MPU6050 - Triple Axis Gyro Accelerometer
Flight Controller	Arduino UNO
Electronic Speed Controllers (ESCs)	4 x 30A ESC
Power Distribution Board (PDB)	Drone frame F450
Battery	2200 mAh battery
Radio Control System	Fly Sky FS-i6 6-Channel 2.4 Ghz Transmitter and FS-iA6
Miscellaneous Hardware	connectors, wires, soldering tools, mounting brackets, and fasteners

5.2 Software Requirements:

Operating System	Linux, Windows 7/8/10/11
IDE	Arduino IDE

6.System Design

6.1 Flow:



The remote control transmitter sends a 2.4GHz signal to the receiver. The receiver gets power from the battery and sends the signal to the flight controller. The flight controller works in 5V and sends a signal to the ESC. The ESC controls the speed of the brushless motors.

The battery provides power to the entire system. The remote control transmitter and receiver use a small amount of power, but the flight controller and ESC use more power. The brushless motors use the most power.

Here are some additional details about flow in drone:

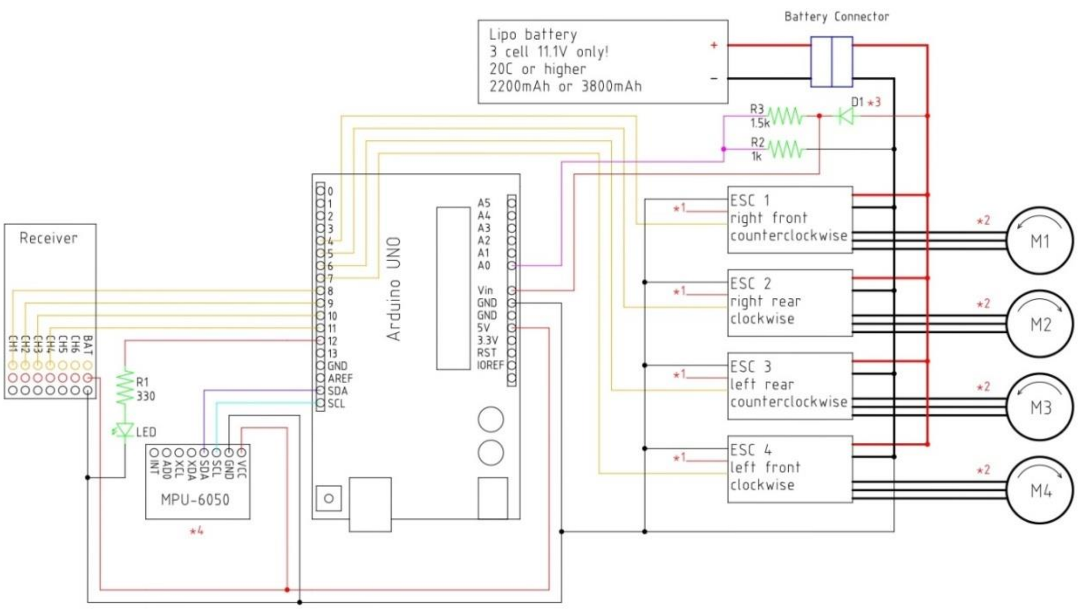
- The remote control transmitter sends a signal that is modulated at 2.4GHz. This is a common frequency for remote control systems because it has good range and penetration.

- The receiver decodes the signal from the remote control transmitter and sends it to the flight controller. The flight controller is a small computer that controls the drone's movement.

- The ESC controls the speed of the brushless motors. The brushless motors are what actually make the drone fly.

- The battery provides power to the entire system. The battery needs to be able to provide enough power for the remote control transmitter, receiver, flight controller, ESC, and brushless motors.

6.2 Connections:



The battery provides power to the entire drone. The battery is connected to the Arduino Uno using the VIN pin and the A0 pin. The VIN pin provides 5V power to the Arduino Uno, and the A0 pin provides a voltage reading that can be used to monitor the battery's remaining power.

The Arduino Uno is connected to the MPU6050 using the SDA and SCL pins. These pins are used to communicate with the MPU6050, which is a sensor that measures the drone's orientation and movement.

The Arduino Uno is also connected to the receiver using the GND, 5V, and CH1-CH4 pins. The GND and 5V pins provide power to the receiver, and the CH1-CH4 pins receive signals from the receiver. These signals are used to control the drone's movement.

The ESCs are connected to the Arduino Uno using the GND and 5V pins. The GND and 5V pins provide power to the ESCs, and the 4 signal pins (D4, D5, D6, and D7) are used to control the ESCs. The ESCs control the speed of the motors, which in turn control the movement of the drone.

The motors are connected to the ESCs using the signal pins. The signal pins send a signal to the ESCs, which in turn control the speed of the motors. The motors move the drone.

Here are some additional details about the connections in drone:

- The battery is a 3-cell 11.1V lithium polymer battery. This type of battery is commonly used in drones because it provides a high voltage and a good energy density.
- The Arduino Uno is a microcontroller board that is used to control the drone. The Arduino Uno is programmed using the Arduino programming language.
- The MPU6050 is a sensor that measures the drone's orientation and movement. The MPU6050 provides data on the drone's roll, pitch, and yaw.
- The receiver is a device that receives signals from the remote control. The receiver decodes the signals from the remote control and sends them to the Arduino Uno.
- The ESCs are electronic speed controllers. The ESCs control the speed of the motors.
- The motors are what actually make the drone fly. The motors are powered by the ESCs and produce thrust that lifts the drone into the air.

7. Screen Design

8. Advantages

- Learning Opportunity: The project provides hands-on experience and fosters understanding of drone technology and operation.
- Cost-Effective: Building a drone using Arduino is a cost-effective alternative to purchasing a commercial drone.
- 3Customization: The project allows for customization to meet specific requirements and integrate desired components and functionalities.
- Arduino Technology: Utilizing Arduino offers a versatile and accessible platform for development, with extensive community support.
- Knowledge Sharing: Documenting the project progress promotes knowledge sharing and collaboration within the Arduino and drone communities.
- Safety Awareness: The project emphasizes safety considerations and promotes responsible drone usage.
- Skill Development: The project enhances technical skills, problem-solving abilities, and project management expertise.
- Future Opportunities: The knowledge and experience gained open doors to future prospects in the drone industry.

9. Conclusion

In conclusion, the project of building a drone using Arduino technology offers a valuable learning opportunity, cost-effective solution, and customization possibilities. It leverages Arduino's versatility and promotes knowledge sharing within the community. The project enhances skills, fosters safety awareness, and opens doors to future opportunities in the drone industry. With a focus on innovation and creativity, this project paves the way for exploration and practical application of drone technology.

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