

DRONE BASED MEDICAL SUPPLY USING IOT

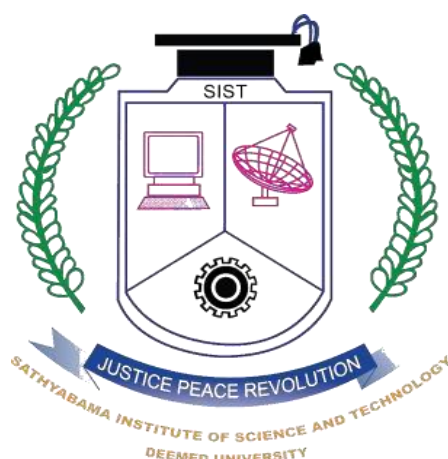
Submitted in partial fulfillment of the requirements for the
award of Bachelor of Engineering degree in Electronics And
Communication Engineering

by

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

CATEGORY -1 UNIVERSITY BY UGC

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APRIL - 2024



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **ASHIWN SASIKUMAR(40130017),DEVANAND KUMAR V(40130045)** who have done the Project work as a team who carried out the project entitled **DRONE BASED MEDICAL SUPPLY USING IOT** under my supervision from November 2023 to April 2024.


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We ASHWIN SASKUMAR(40130017), DEVANAND KUMAR V (40130045) hereby declare that the Project Report entitled "**DRONE BASED MEDICAL SUPPLY USING IOT**" done by us under the guidance of **K.B.Sathya** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

DATE: 18.04.2024

PLACE: Chennai

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ABSTRACT

The two main topics are Medical Drone Supply and Online Doctor communication using Internet of Things. This abstract introduces a ground breaking solution that combines a medical supply drone and a mobile application to improve health care delivery.

The system aims to enhance accessibility , efficiency and timelines in the delivery of critical medical supplies .The accompanying mobile application enables real time tracking, secure communication and streamlined request management.

The potential this product with its technology will revolutionize healthcare by reducing responses time and increasing access to vital medical resources. Basically the application works like a online video and audio communication between the doctor and the costumer .

After the application part has been completed the nearby clinic transports/deliver the medical supplies to the costumer via Drone technology, To avoid any drone accidents the package will be delivered via zipline attached to the drone.

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CHAPTER 1

INTRODUCTION

1.1 DESCRIPTION OF THE PROJECT

The application incorporates a comprehensive database of healthcare professionals, enabling users to schedule video conferences with their preferred physicians. Following the consultation, prescriptions issued by the doctor are seamlessly transmitted to a nearby clinic. Upon payment of the medical fees, the prescribed medical supplies are dispatched to the user's address via drone delivery, utilizing zipline technology to ensure contactless delivery and mitigate any potential drone-related incidents.

1.1.1 ENHANCED HEALTHCARE ACCESSIBILITY: Create a seamless platform for patients to communicate with healthcare professionals through virtual consultations, breaking down geographical barriers and providing medical expertise to individuals regardless of their location.

1. Convenient and Timely Medical Services: Facilitate real-time, remote access to healthcare, allowing patients to receive medical advice, prescriptions, and follow-ups without the need for in-person visits, ensuring timely care delivery.
2. Efficient and Reliable Medical Drone Supply: Develop a robust drone delivery system for transporting medical supplies, medications, and emergency equipment to underserved and remote regions, enabling faster response during emergencies and disasters.
3. Optimized Emergency Response: Improve emergency medical services by utilizing medical drones to swiftly deliver critical supplies to areas affected by natural disasters, accidents, or medical crises, thereby saving lives and reducing response times.
4. Sustainable Healthcare Delivery: Embrace eco-friendly practices in medical drone supply operations, promoting sustainability and reducing the environmental impact of healthcare logistics.

1.2 STATEMENT OF THE PROBLEM

Drone delivery accidents refer to incidents involving the use of drones for the delivery of goods or packages, resulting in unintended and potentially harmful outcomes. These accidents can occur during the process of transporting items from one location to another using drones. Here are some key factors and scenarios that can lead to drone delivery accidents:

1.2.1 COLLISION WITH OBSTACLES:

Drones used for delivery may collide with various obstacles during flight. These obstacles can include trees, buildings, power lines, vehicles, or even other drones. Such collisions can cause damage to the delivery drone, loss of cargo, or potential safety hazards on the ground.

1.2.2 LOSS OF CONTROL:

Similar to personal drones, delivery drones can experience a loss of control. This can result from various factors, such as signal interference, software glitches, or hardware malfunctions, which may lead to erratic flight or accidents.

1.2.3 ENVIRONMENTAL FACTORS:

Adverse weather conditions like strong winds, heavy rain, snow, or fog can affect the stability and performance of delivery drones. Poor weather conditions can increase the risk of accidents during flight.

1.2.4 BATTERY FAILURES:

Just like in personal drones, battery failures in delivery drones can lead to accidents. If a drone's battery malfunctions, experiences a sudden power loss, or runs out of charge mid-flight, it may crash.

1.2.5 NAVIGATION ERRORS:

Errors in the drone's navigation system or inaccuracies in its GPS coordinates can lead to incorrect delivery destinations. This can result in the package being dropped or delivered in the wrong location, potentially causing property damage or loss of the package.

1.2.6 OBSTACLE AVOIDANCE FAILURES:

Many delivery drones are equipped with obstacle avoidance sensors to detect and avoid obstacles in their path. If these sensors fail or provide inaccurate information, the drone may not be able to avoid collisions, leading to accidents.

1.2.7 HUMAN INTERFERENCE:

Intentional interference by individuals, such as attempting to intercept or damage the delivery drone, can lead to accidents. Security measures must be in place to prevent such interference.

1.2.8 REGULATORY VIOLATIONS:

Drone delivery operators must adhere to strict regulations governing airspace use, flight paths, and safety protocols. Violating these regulations, such as flying in restricted airspace or exceeding weight limits, can lead to accidents or enforcement actions.

CHAPTER 2

LITERATURE SURVEY

2.1 SURVEY:

In this review paper, we classified the relevant related works under four major groups, which represent the main research avenues by including a series of related challenges and constraints faced by these drone-based logistics systems. Thus, the main research issues and challenges can be summarized under the following headings:

(1) vehicle routing problem with drones; (2) drone assignment issue; (3) charging process and recharging station location; (4) fleet dimensioning. An review of the literature is provided for each of these issues, as well as an explanation of one or more proposed solutions. When considering the Vehicle Routing Problem with Drones (VRPD), most of the literature has addressed hybrid delivery systems, which combine two delivery modes: the vehicle-based delivery system and the drone-based delivery mode. Most issues with last-mile delivery with drones suggest that the aerial vehicle is transported close to the destination of the package by ground vehicles. From here, while the drone is delivering a package, the van can serve other customers who are not reachable by drone. As a result, the drone will be able to continue serving all customers who are within its flight zone, increasing user-friendliness and making the schedule more flexible [8,17,18,19]. In the first conducted studies in this direction, Murray and Chu [20] addressed two issues related to drone-based delivery in conjunction with trucks in order to minimize the trip time for both the drone and the truck when returning to the depot. The flying sidekick travelling salesman problem was the first to be handled, based on a mixed integer linear programming (MILP) formulation to minimize the expected delivery time, whereby the drone is assigned to the truck to deliver parcels to customers. Regarding this problem, the authors proposed a heuristic approach called “Truck First, Drone Second”, where the truck path is designed to resolve the traveling salesman problem. The truck travels along a route that begins at a depot, serves customers along the way, then finishes at the depot. The second issue tackled was the traveling salesman problem with parallel drone scheduling. In contrast to the first

problem, this problem considers that the drone and the truck perform deliveries independently. The heuristic approach proposed for this this issue assumes that the drones will serve all the customers within their maximum range, while the truck will serve the remaining customers. In contrast, many assumptions were later introduced to simplify the model, whereby the authors assumed that the number of drones is very limited, the velocity and duration of a drone's flight are constant, the drone preparation is done by a person in the vehicle (drone not autonomous), and the depot is located near the center of all customers. However, the delivery problem is considered a stochastic problem and uses a large fleet of fully autonomous drones in the delivery system, thus making the modeling very challenging. Later, Jeon et al. [21] addressed the same routing problem by using MILP models and some heuristics based on the approach proposed by Murray and Chu. This proposed method involves reducing the number of empty flights in order to increase drone utilization; it is being tested on Jeju Island, using localization and tracking data. Dorling et al. [8] addressed two multi-trip vehicle routing problems that incorporate battery and payload weights into the energy consumption calculations; the first problem deals with the cost issue of a delivery time constraint, and the second problem seeks to optimize the delivery time subject to a cost limit. Furthermore, the proposed algorithms seek to optimize the drone fleet size as well as the trips for the delivery of the package. The authors assumed that the operator has enough fully charged batteries to satisfy the drone energy requirements before the deliveries can start and that the operator deploys only one depot (charging station) in the area. In contrast, it would be very challenging and costly for a delivery company to deploy multiple depots and battery swapping stations, as well as to manage battery swapping between trips to meet the daily demand. Wang et al. [22,23] addressed the vehicle routing problem with drones, where the fleet consists of multiple trucks equipped with multi-drones to minimize the completion time. Both vehicles can deliver the packages, and the trucks must wait for the drone after it has been deployed for a delivery. They proposed a routing strategy called "The Drone Vehicle Traffic Problem", where the objective is to serve all customers within the shortest time duration. The authors show good results in terms of delivery cost reduction and delivery time when using drones and trucks instead of trucks alone, consolidating their results through simulations and the analysis of several worst-case scenarios. However, the authors did not take into consideration the automated landing of

drones on the ground vehicle, which is very challenging for this hybrid delivery mode. Thereafter, Schermer et al. [24] proposed two heuristic algorithms for solving the same problem, supported with numerical experiments on large-scale traveling salesman problems. The first algorithm, named “Two-Phase Heuristic (TPH)”, initially creates the vehicle routing problem for the truck and then the vehicle routing problem for using drones. The second algorithm, named “Single-Phase Heuristic (SPH)”, computes routes that already include drones. A similar work by Ham [25] also addressed the vehicle routing problem; the author suggested a constraint optimization formulation in order to solve scheduling problems of multiple trucks, drones, and depots, subject to time, drop-off, pick-up, and multi-visit constraints. The proposed drone delivery schedule allows drones to fly back to the depot to deliver the next order after completing the preceding drop or to fly directly to another customer to collect a returned parcel. In contrast, incorporating new drone tasks, such as collecting returned packages, necessitates a greater extension of the drone’s flight range, making the delivery system modeling extremely difficult. In addition, Wang and Sheu [26] addressed the vehicle routing problem with drones in a real-world setting by employing an arc-based integer programming approach and developing a branch and price algorithm. In comparison to other studies where the number of customers was limited, they applied their approach to a large-scale system that included multi-drones and trucks, as well as several customers being served. They used the branch-and-price algorithm to find optimal solutions for a set of instances in an average of two hours. Bertolaso et al. [27] also tackled the hybrid delivery system, which combines a drone and a vehicle, where the drones’ landing task problem was addressed. To deliver the parcel, the drone can land on the vehicle’s roof while the vehicle is moving to the desired location. The authors developed a cooperative landing model by using Petri Nets plans, with a strategy that includes multiple phases.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3.1 OBJECTIVE OF THE PROJECT:

3.1.1 GENERAL OBJECTIVE:

The primary aim of our project is to revolutionize healthcare delivery by integrating two cutting-edge solutions: Online Doctor Communication and Medical Drone Supply with zipline.

3.1.2 SPECIFIC OBJECTIVE:

The application consist of Information of Doctors where you can have a video conference to Your preferred doctor , then the prescription written by the doctor is sent to the nearby clinic. When the medical fee is paid then the medical supply is sent to your address Via drone supply with attached zipline for contactless delevory and avoid any kind of drone accidents

- To avoid contactless delevory
- To avoid any kind of drone accidents
- To get faster medical supply for emergencies
- To easily access doctors via video call

3.2 PROJECT SCOPE:

In a way to achieved above objectives, this project needs to be implemented as below:

- ☐The Zipline is to be attached to the drone.
- ☐GPS to track location
- ☐Application For Online Medical care and Medical supply

CHAPTER 4-

EXPERIMENTAL OR MATERIALS AND METHODS; ALGORITHMS USED

4.1 BASIC OVERVIEW:

In the basic overview of our project, we use sensors Flight controller, Brushless motor, Gps, Propeller, Antenna, Camera, Power, Distribution Board, Control receiver, Electronic Speed Controller, FPV Transmitter, Quadcopter frame for drone. Brushed motors & pulley for zipline. Figma for application.

4.2 HARDWARE REQUIREMENT:

4.2.1 FLIGHT CONTROLLER:

A flight controller is a critical component in the field of aviation, particularly in the context of piloted and unmanned aircraft (such as drones). Its primary purpose is to manage and control the flight of an aircraft, ensuring its stability, navigation, and safety. Flight controllers use a combination of sensors, software algorithms, and human input to make real-time decisions and adjustments during a flight. Here are some key aspects of

Flight controllers:

1. *Autonomous Control:*

Flight controllers can operate autonomously, relying on pre-programmed instructions or following a flight plan. This is common in the case of drones and some autopilot systems in manned aircraft.

2. *Real-Time Data:*

They continuously gather data from various sensors, such as gyroscopes, accelerometers, GPS receivers, altimeters, airspeed indicators, and magnetometers. These sensors provide information about the aircraft's position, orientation, speed, altitude, and environmental conditions.

3. *Stabilization:*

One of the primary functions of a flight controller is to stabilize the aircraft. By analyzing sensor data and comparing it to a desired state, the controller can make rapid adjustments to the aircraft's control surfaces (elevators, ailerons, rudders) or propulsion system to maintain stable flight.

4. *Navigation:*

Flight controllers handle navigation tasks, including waypoint following, path planning, and obstacle avoidance. They can use GPS data and other sensor inputs to determine the aircraft's position relative to its intended flight path.

5. *Safety:*

Safety is paramount in aviation. Flight controllers are designed to detect and respond to abnormal conditions or emergencies, such as engine failures, sensor malfunctions, or adverse weather. They can trigger alarms or take corrective actions to ensure the safety of the aircraft and its occupants.

6. *Human Interaction:*

In many cases, a human pilot or operator interacts with the flight controller. This can involve setting flight parameters, changing the flight mode, or taking over control in case of an emergency.

7. *Redundancy:*

In critical aviation applications, flight controllers often incorporate redundancy to ensure that even if one component or system fails, there is a backup in place to maintain control and safety.

8. *Communication:*

Flight controllers may communicate with ground control stations, other aircraft, or air traffic control systems to exchange information and ensure safe operation in shared airspace.

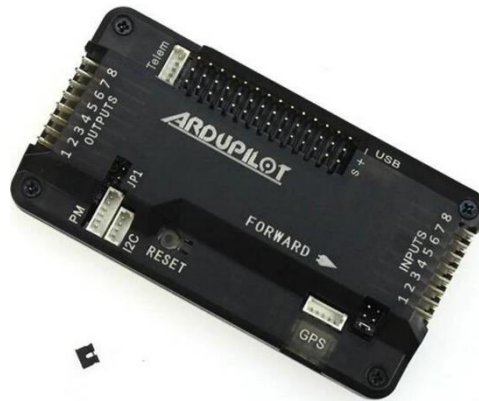


Fig:4.1:Ardupilot

4.2.2 BRUSHLESS MOTOR:

A brushless motor, also known as a brushless direct current (BLDC) motor or electronically commutated motor (ECM), is an electric motor that operates without the use of traditional brushes and commutators found in brushed motors. Brushless motors are widely used in various applications due to their efficiency, reliability, and low maintenance requirements. A brushless motor is an electric motor that operates without the use of brushes or commutators, which are common components in traditional brushed motors. Brushless motors have gained popularity due to their efficiency, reliability, and performance advantages.

brushless motors represent a significant advancement in electric motor technology, offering improved efficiency, durability, and precise control compared to their brushed counterparts. These motors have found extensive use in modern applications, contributing to advancements in various fields.



Fig:4.2:Brushless Motor

The advantages of brushless motors include:

High Efficiency:

Brushless motors are more efficient than brushed motors because there is no physical contact between brushes and commutators, reducing friction and energy loss. This higher efficiency leads to longer battery life in battery-powered applications.

Lower Maintenance:

Brushless motors require minimal maintenance because there are no brushes to wear out or replace. This makes them suitable for applications where reliability and longevity are essential.

Precise Control:

The electronic control of brushless motors allows for precise speed and torque control. This makes them ideal for applications where consistent and controlled motion is required.

Reduced Electromagnetic

Interference (EMI): Brushless motors produce less EMI than brushed motors due to the absence of brush arcing. This is beneficial in applications sensitive to electromagnetic interference, such as electronics.

High Power-to-Weight Ratio:

Brushless motors can provide a high power-to-weight ratio, making them suitable for applications where space and weight constraints are critical, such as in drones, electric vehicles, and robotics.

Common applications of brushless motors include electric vehicles (e.g., electric cars and bicycles), drones, remote-controlled aircraft, industrial automation, computer cooling fans, HVAC systems, and various consumer electronics. Their efficiency, reliability, and precise control make them a popular choice in many modern technologies.

4.2.3 GPS:

GPS, or Global Positioning System, is a global satellite-based navigation system that allows users to determine their precise geographic location and track movement anywhere on Earth. It was originally developed and is still maintained by the United States Department of Defense, but its signals are freely available for civilian use worldwide. GPS is a fundamental technology that has revolutionized navigation and positioning across a wide range of industries and applications. Its accuracy and global coverage make it an invaluable tool for everyday use and for specialized applications that rely on precise location information.



Fig:4.3:GPS

key components and features of a GPS sensor:

Antenna:

The GPS antenna is responsible for receiving signals from GPS satellites. It captures signals transmitted by multiple satellites simultaneously, allowing the receiver to calculate its position accurately.

Receiver Chipset:

Inside the GPS sensor, there is a specialized receiver chipset that processes the signals received from the satellites. This chipset performs tasks such as signal acquisition, tracking, and data processing.

Satellite Constellation:

The GPS system consists of a constellation of at least 24 satellites orbiting the Earth. These satellites continuously transmit signals that include information about their precise positions and the current time.

Triangulation:

GPS sensors use a process known as triangulation to calculate their position. By receiving signals from multiple satellites, the sensor can determine its distance from each satellite based on the time it takes for the signals to travel. Using this information, the sensor calculates its precise position on the Earth's surface.

Accuracy:

The accuracy of GPS sensors can vary depending on factors such as the number of satellites in view, signal obstructions (e.g., tall buildings or dense tree cover), and the quality of the sensor itself. In ideal conditions, modern GPS sensors can provide position accuracy within a few meters, while high-end receivers can achieve centimeter-level accuracy using augmentation systems like RTK (Real-Time Kinematic).

Update Rate:

GPS sensors provide updates on their position at a specific rate, often measured in Hertz (Hz). Common update rates range from 1 Hz to 10 Hz or more. Higher update rates provide more frequent position updates, which can be important for applications that require real-time tracking and responsiveness.

Applications of GPS sensors:

Navigation:

Personal navigation devices (e.g., GPS navigation systems in cars), smartphones, and handheld GPS units for hiking and outdoor activities use GPS sensors to provide directions and track location.

Vehicle Tracking:

GPS sensors are used in fleet management systems and vehicle tracking solutions to monitor the real-time position and movement of vehicles.

Surveying and Mapping:

High-precision GPS sensors, often used in surveying and geodetic applications, help create accurate maps and measure land boundaries.

Aerospace and Aviation:

GPS is crucial for aircraft navigation, including commercial airliners and unmanned aerial vehicles (UAVs or drones).

Agriculture:

Precision agriculture relies on GPS sensors to guide tractors, control planting and harvesting equipment, and optimize crop management.

Emergency Services:

GPS is used by emergency services to locate 100 callers and responders accurately.

4.2.4 PROPELLER:

A propeller is a rotating mechanical device with blades that generate thrust or propulsion by moving through a fluid, typically air or water. Propellers are used in various applications, including aircraft, boats, ships, submarines, and industrial machinery. propellers are essential components in a wide range of applications, where they play a crucial role in generating thrust and propulsion. Their design and materials are carefully chosen to match the specific requirements of the application, and proper maintenance is essential to ensure safe and efficient operation.



Fig:4.4:Propeller

Drone propellers play a critical role in the operation and performance of unmanned aerial vehicles (UAVs) or drones. The choice of propellers can significantly impact a drone's flight characteristics and capabilities. Here are some key applications of drone propellers:

Lift and Flight:

The primary function of drone propellers is to generate lift and thrust to allow the drone to take off, hover, and maneuver in the air. Propellers create a pressure difference between the top and bottom surfaces, generating upward thrust that counteracts the force of gravity.

Aerodynamic Efficiency:

Different propeller designs and sizes can affect a drone's efficiency and flight time. Efficient propellers can maximize the drone's endurance by optimizing thrust while minimizing power consumption. **Agility and Maneuverability:** Drone propellers are used to control the drone's orientation and enable agile flight maneuvers. By varying the speed of the propellers on different arms of the drone, it can perform maneuvers like rolls, flips, and sharp turns.

Stability and Altitude Control:

Propellers play a role in maintaining the drone's stability and controlling its altitude. By adjusting the speed and thrust of the propellers, the drone can maintain a stable

hover or climb/descend smoothly.

Payload Capacity:

The choice of propellers is crucial when it comes to drones designed for carrying payloads. Larger, more powerful propellers may be required to lift and transport heavy cargo, such as cameras, sensors, or delivery packages.

Noise Reduction:

Drone manufacturers are increasingly focusing on reducing noise emissions to improve user experience and minimize disturbances in residential areas. Propeller design can influence noise levels, and quieter propellers are desirable for various drone applications.

4.2.5 ANTENNA:

Communication:

Drones use antennas to establish communication links with remote operators or ground control stations. This communication is crucial for sending flight commands, receiving real-time telemetry data, and maintaining situational awareness.

Control:

Antennas are used for remote control of the drone, allowing operators to send commands to change the drone's direction, altitude, speed, and other parameters. This control link typically operates in the radio frequency (RF) range.

Video Transmission:

In the case of drones equipped with cameras or other sensors, antennas are used to transmit live video feeds or sensor data to the operator in real-time. This allows for remote surveillance, photography, and monitoring.

Navigation:

Some drones use GPS or other global navigation satellite systems (GNSS) to determine their precise position and navigate autonomously. Antennas are used to receive signals from GNSS satellites, enabling accurate positioning and navigation.



Fig:4.5:Antenna

Frequency Range:

Drone antennas are designed for specific frequency bands, such as 2.4 GHz or 5.8 GHz for common remote control and telemetry communication. Some drones also use other frequency bands for specialized purposes. The frequency range determines which signals the antenna can transmit and receive.

Gain:

Gain is a measure of how effectively an antenna can direct or concentrate radio signals in a particular direction. Higher gain antennas can extend the effective range of communication but may have a narrower beamwidth. Antennas with lower gain may have a wider coverage area but shorter range.

Directionality:

Antennas can be classified as omni-directional or directional. Omni-directional antennas emit and receive signals in all directions, providing 360-degree coverage. Directional antennas, like patch or Yagi antennas, focus signals in a specific direction, enhancing range in that direction but reducing coverage in other areas.

Polarization:

Antennas have a polarization, which refers to the orientation of the electromagnetic

wave's electric field. Common polarizations for drone antennas include linear (vertical or horizontal) and circular (right-hand or left-hand). Matching the polarization of the drone's antenna with the receiving antenna is essential for optimal signal reception.

Radiation Pattern:

The radiation pattern of an antenna describes how it distributes electromagnetic energy in space. It determines the coverage area and shape of the signal beam. Understanding the radiation pattern helps drone operators plan for signal coverage and range.

4.2.6 CAMERA:

A drone camera, also known as an aerial camera or UAV (Unmanned Aerial Vehicle) camera, is a specialized camera system mounted on a drone or UAV. These cameras are designed to capture photos and videos from unique aerial perspectives and are widely used in a variety of applications, including photography, videography, surveying, mapping, surveillance, and more. Drone cameras have opened up new possibilities for aerial photography and data collection across various industries. Their versatility, along with advancements in technology, has made them valuable tools for professionals and enthusiasts alike.



Fig:4.6:Camera

Sensor Type:

Drone cameras typically use one of the following types of sensors: CMOS (Complementary Metal-Oxide-Semiconductor): CMOS sensors are commonly

found in consumer and prosumer drones. They offer good image quality and are power-efficient. CCD (Charge-Coupled Device): CCD sensors are used in some professional-grade drones and tend to provide higher image quality, especially in low-light conditions.

Sensor Size:

The sensor size determines how much light the camera can capture and affects image quality, particularly in low-light situations. Larger sensors generally yield better image quality, but they can also increase the overall size and weight of the drone.

Megapixels (Resolution):

The number of megapixels indicates the camera's resolution. Higher megapixel counts allow for larger and more detailed images, which can be useful for photography and post-processing. However, higher megapixels alone do not guarantee better image quality.

Lens Type and Quality:

Drone cameras feature fixed or interchangeable lenses. Lenses with a low aperture (e.g., f/2.8) can capture more light, improving performance in low-light conditions. The quality of the lens, including the use of glass elements and anti-reflective coatings, also affects image quality.

Stabilization:

Stabilization mechanisms, such as gimbal systems, are crucial for capturing smooth and steady footage. A gimbal stabilizes the camera in multiple axes, compensating for drone movements and vibrations.

Zoom Capability:

Some drones offer optical zoom capabilities, allowing the camera to change focal lengths. Zoom can be valuable for various applications, including wildlife photography, inspection tasks, and surveillance.

ISO Range:

The ISO range determines the camera's sensitivity to light. A wider ISO range allows for better performance in low-light conditions, but higher ISO settings may introduce noise in photos and videos.

Shutter Speed:

The ability to adjust shutter speed is essential for controlling exposure and capturing fast-moving subjects. Drones with manual camera settings offer more flexibility in adjusting shutter speed.

Aperture:

The aperture (expressed as an f-number) controls the amount of light entering the camera. Lower f-numbers (e.g., f/2.8) allow for larger apertures and better low-light performance.

Video Capabilities:

For videography, consider the camera's ability to shoot in various video resolutions (e.g., 4K, 1080p) and frame rates (e.g., 24fps, 30fps, 60fps). Drones may also offer video recording formats like H.264 or H.265.

4.2.7 POWER DISTRIBUTION BOARD:

A power distribution board (PDB) for a drone is an essential component that serves as the central hub for distributing electrical power from the drone's battery to various onboard components and subsystems. It helps ensure efficient and organized power distribution, prevents electrical interference, and simplifies the wiring of the drone. When assembling a drone or making modifications to an existing one, selecting the right power distribution board is crucial to ensure proper electrical connections and reliable performance. Additionally, proper soldering techniques and wire management are essential when connecting components to the PDB to prevent electrical issues and interference that could affect the drone's flight capabilities.

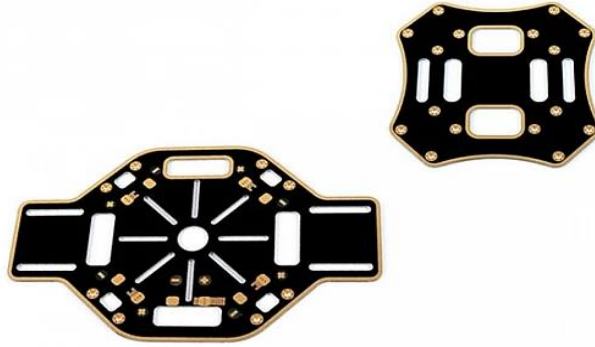


Fig:4.7:Power Distribution Board

A Power Distribution Board (PDB) for a drone is an essential component of its electrical system, responsible for distributing electrical power from the drone's battery to its various subsystems, including motors, flight controllers, cameras, and other electronic components. The properties and features of a drone PDB play a critical role in ensuring the safe and efficient operation of the drone. Here are some key properties and considerations related to a Power Distribution Board for drones:

Voltage Compatibility:

The PDB must be compatible with the voltage of the drone's battery pack. Most consumer drones operate on 3S or 4S LiPo (Lithium-Polymer) batteries, which have nominal voltages of 11.1V (3S) or 14.8V (4S). High-performance drones may use higher voltage battery packs.

Current Handling Capacity:

The PDB should be rated to handle the maximum current draw of all connected components, including motors, flight controllers, LED lights, cameras, and more. The PDB should have ample current-carrying capacity to prevent overheating and voltage drops.

Number of Outputs:

A PDB typically features multiple output pads or connectors to distribute power to various components. The number and type of outputs should match the drone's configuration and the number of components it needs to power.

ESC (Electronic Speed Controller) Connections:

The PDB should have ESC connections for each motor, allowing for easy and secure soldering or connector attachment. These connections should be designed to handle high currents.

Voltage Regulation:

Some PDBs include built-in voltage regulation, ensuring a stable output voltage to sensitive electronic components like the flight controller and FPV (First-Person View) equipment. This can help prevent voltage spikes or drops.

Integrated BEC (Battery Eliminator Circuit):

In some cases, a PDB may feature an integrated BEC that provides regulated and filtered power for the flight controller, receiver, and other low-voltage components. This can simplify wiring and reduce the need for additional voltage regulators.

LED Indicators:

Some PDBs include LED indicators to provide visual feedback on the status of individual power circuits, making it easier to diagnose issues with power distribution.

Overcurrent Protection:

PDBs may incorporate overcurrent protection mechanisms, such as fuses or polyfuses, to safeguard against short circuits or excessive current draw.

Size and Weight:

Consider the physical dimensions and weight of the PDB, as they can impact the overall size, weight, and balance of the drone. Smaller and lighter PDBs are often preferred for smaller and lightweight drone builds.

Durability and Build Quality:

A PDB should be well-constructed and durable to withstand the vibrations, impacts, and environmental conditions typically encountered during drone flights.

4.2.8 CONTROL RECEIVER:

A control receiver, often referred to simply as a receiver or RC receiver, is a crucial component in a drone's remote control system. It receives wireless signals from the transmitter (remote control) operated by the drone pilot and translates those signals into commands that control the drone's flight. A control receiver is an integral part of a drone's remote control system, allowing the pilot to command the drone's flight and other functions. The choice of receiver depends on factors such as compatibility, channel requirements, and desired features, and it should be selected carefully to ensure reliable and safe drone operation.



Fig:4.8:Control Receiver

A drone control receiver, often referred to as an RC (Radio Control) receiver, is a critical component that allows a pilot to remotely control a drone. It receives radio signals from a transmitter or remote controller and translates them into commands for the drone's flight controller. The properties and features of a drone control receiver are essential for reliable and precise drone control. Here are key properties and considerations:

Frequency Band:

Drone control receivers typically operate in the 2.4 GHz or 5.8 GHz frequency bands, which are widely used for radio control applications. These frequency bands provide reliable communication and are less susceptible to interference.

Number of Channels:

The number of channels on a receiver determines how many functions or controls can be operated simultaneously. For basic drone control, 4 to 6 channels are usually

sufficient. More advanced drones with additional functions may require 8 or more channels.

Protocol Compatibility:

The receiver must be compatible with the transmitter or remote controller you intend to use. Common protocols include DSMX, DSM2, FrSky ACCST, Futaba FASST, and more. Ensure that both the transmitter and receiver support the same protocol.

Range:

The range of a receiver is crucial for drone operations. It determines how far the drone can be flown while maintaining a reliable control signal. Range can vary widely depending on the receiver's design and the transmitter used. Long-range drones may require specialized receivers with extended range capabilities.

Antenna Diversity:

Some high-end receivers feature antenna diversity, where multiple antennas are used to improve signal reception. This helps reduce signal dropout and enhances control reliability, especially in challenging environments.

Fail-Safe Function:

A fail-safe function is critical for safety. When signal loss or interference occurs, the receiver should be capable of executing a pre-defined fail-safe behavior, such as returning the drone to a specified home position or initiating a controlled descent.

Telemetry Support:

Advanced receivers may offer telemetry capabilities, allowing them to transmit real-time data, such as battery voltage, GPS information, and signal strength, back to the transmitter for monitoring. Telemetry can provide valuable feedback to the pilot during flight.

Binding Process:

The binding process is how the receiver establishes a secure connection with the transmitter. Some receivers have a simple one-button binding process, while others may require more complex procedures. Choose a receiver with a binding process

that suits your needs and preferences.

Size and Weight:

The physical size and weight of the receiver should be compatible with the drone's frame and available space. Smaller and lighter receivers are often preferred for compact and lightweight drone builds.

Voltage Compatibility:

The receiver should operate within the voltage range supported by the drone's power system. Most receivers are designed to work with 3.3V to 8.4V, but this can vary.

4.2.9 ELECTRONIC SPEED CONTROLLER:

ESC is used to connect the battery to the electric motor for the power supply. It converts the signal from the flight controller to the revolution per minute (RPM) of the motor. An ESC is provided to each motor of the drone. An Electronic Speed Controller (ESC) is a crucial component in electrically powered devices, particularly in the context of drones, quadcopters, and remote-controlled vehicles. It is responsible for controlling the speed and direction of a brushless motor by regulating the electrical power supplied to it.



Fig:4.9:ESC

Electronic Speed Controllers (ESCs) are critical components in the operation of multirotor drones and other electric motor-driven vehicles. ESCs regulate the speed and direction of the motors by controlling the power supplied to them. The properties and features of ESCs are crucial for safe and efficient drone operation. Here are key

properties and considerations:

Voltage Rating:

ESCs are designed to operate within a specific voltage range, typically corresponding to the voltage of the drone's battery. Ensure that the ESC voltage rating matches the voltage of your drone's battery.

Current Rating:

The current rating, often expressed in amps (A), represents the maximum current the ESC can handle. Select ESCs with current ratings that exceed the maximum current draw of your drone's motors and components for safety and reliability.

Number of Outputs:

Each ESC typically controls one motor, so the number of ESCs you need depends on the number of motors your drone has (e.g., quadcopters typically have four ESCs, hexacopters have six, etc.).

Type of Motor Control:

ESCs come in different types based on the motor control protocol they use. Common types include: PWM (Pulse-Width Modulation): Basic ESCs that receive throttle signals through PWM. OneShot: An improved PWM protocol with faster response times for smoother motor control. Multishot: A high-speed PWM protocol with even faster response times. DShot: A digital protocol for accurate and fast motor control, commonly used in modern drones.

BEC (Battery Eliminator Circuit):

Some ESCs feature integrated BECs, which provide regulated and filtered power to the flight controller, receiver, and other low-voltage components. This eliminates the need for a separate BEC in the drone's power distribution system.

Programming Options:

Many ESCs offer programming options through a user-friendly interface. This allows you to adjust settings such as motor timing, brake strength, and throttle response to fine-tune your drone's performance.

Firmware Compatibility:

Ensure that the ESCs are compatible with the firmware used on your flight controller. Some flight controllers require specific ESC firmware protocols for proper communication.

Overcurrent Protection:

ESCs may include overcurrent protection mechanisms to safeguard against excessive current draw, which can damage the ESC or motor.

Thermal Protection:

ESCs can incorporate thermal protection to prevent overheating. If the ESC's temperature exceeds a safe threshold, it may reduce power output or shut down temporarily to cool down.

Signal Input Compatibility:

Ensure that the ESCs can accept input signals from your flight controller. Common signal input types include PWM, PPM, SBUS, and IBUS.

4.2.10 FPV TRANSMITTER:

An FPV (First Person View) transmitter is a critical component in FPV systems used in drones, remote-controlled vehicles, and other applications where real-time video transmission is required. It is responsible for transmitting the live video feed from an onboard camera to a receiver or goggles worn by the operator. In FPV racing and recreational flying, the choice of an FPV transmitter is critical for a seamless and immersive experience. Ensuring compatibility with other FPV equipment, understanding local regulations, and optimizing signal quality are essential considerations when selecting and operating an FPV transmitter.



Fig:4.10:Transmitter

A First-Person View (FPV) transmitter is a crucial component in FPV drone racing and aerial photography setups. It sends live video signals from the drone's camera to the FPV goggles or monitor, allowing the pilot to see real-time footage from the drone's perspective. The properties and features of an FPV transmitter are essential for achieving a reliable and immersive FPV experience. Here are key properties and considerations:

Frequency and Channel:

FPV transmitters operate on specific frequency bands, such as 5.8 GHz, 2.4 GHz, or 1.3 GHz. It's important to choose a transmitter that matches the frequency supported by your FPV goggles or receiver. Additionally, the transmitter should have multiple selectable channels within that frequency band to avoid interference when flying with others.

Transmitting Power (Output Power):

Transmitting power is measured in milliwatts (mW) and determines the range and signal strength of the FPV video feed. Higher transmitting power typically results in greater range, but it's essential to comply with local regulations and respect transmission power limits to avoid interference with other devices and communication systems.

Antenna Connector:

FPV transmitters may have various types of antenna connectors, such as SMA or RP-SMA. Ensure that the transmitter's antenna connector matches the antenna you plan to use.

Voltage Input Range:

Check the voltage input range of the FPV transmitter to ensure it is compatible with your drone's power system. Some transmitters operate on a wide voltage range (e.g., 7-24V), while others may require a specific voltage input.

Video Input:

The FPV transmitter should accept video input from the drone's camera. Common input formats include analog PAL or NTSC video signals. Make sure the transmitter's video input is compatible with your camera.

Camera Control (Optional):

Some advanced FPV transmitters support camera control features, allowing you to change camera settings remotely through your transmitter or OSD (On-Screen Display). This can be useful for adjusting camera settings like brightness, contrast, and exposure in-flight.

On-Screen Display (OSD):

Some FPV transmitters include an OSD feature that overlays flight data, such as battery voltage, flight time, and GPS information, onto the FPV video feed. OSD information can help you monitor important data while flying.

SmartAudio or Tramp Protocol:

SmartAudio and Tramp Protocol are communication protocols that enable remote control of transmitter power and channel selection through an OSD or remote control. This feature allows you to adjust the transmitter's settings without needing physical access to the transmitter itself.

Built-in Microphone:

An integrated microphone on the FPV transmitter can capture ambient audio, providing a more immersive FPV experience by allowing you to hear the sounds of the environment while flying.

Size and Weight:

Consider the physical dimensions and weight of the FPV transmitter, especially if you have space and weight constraints on your drone. Smaller and lighter transmitters are often preferred for FPV racing.

4.2.11 QUADCOPTER FRAME:

A quadcopter frame is the structural foundation of a quadcopter or drone, serving as the central structure to which all other components, such as motors, propellers, flight controllers, and batteries, are attached. The choice of a quadcopter frame is a fundamental decision when building or customizing a drone, as it affects the drone's performance, durability, and compatibility with various configurations.

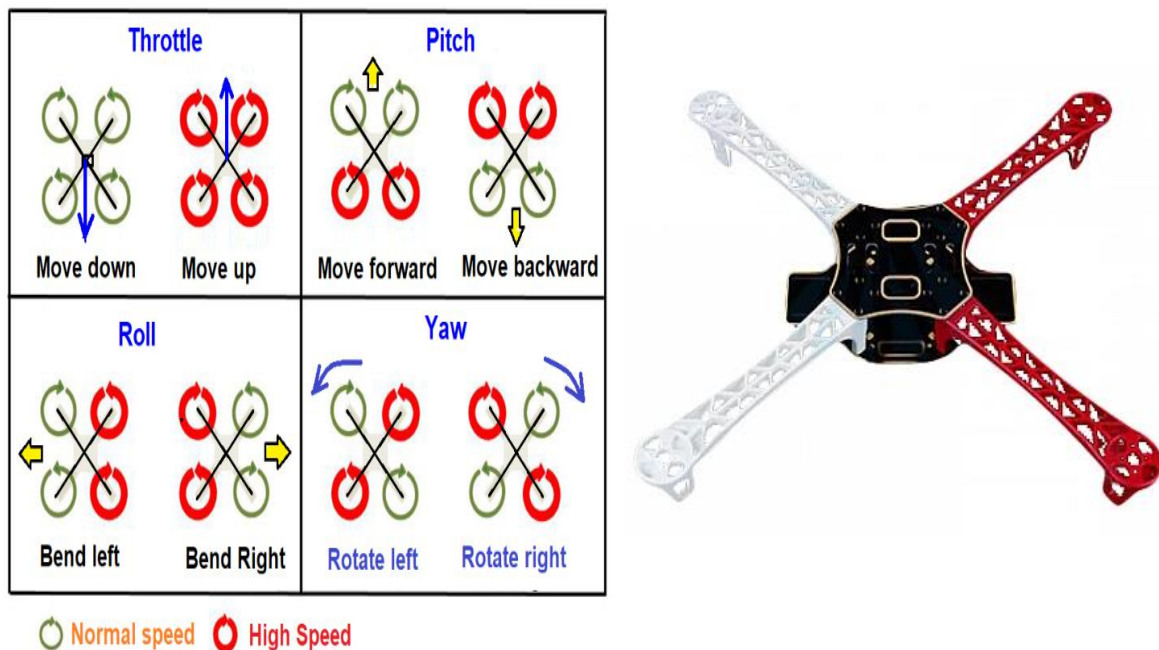


Fig:4.11:Quadcopter Frame

Frame Size:

Quadcopter frames come in various sizes, ranging from small micro quadcopters for indoor use to large frames for heavy-lift drones. The size determines the overall dimensions and payload capacity of the drone.

Frame Material:

Common materials used for quadcopter frames include carbon fiber, aluminum, fiberglass, and plastic. Carbon fiber frames are popular due to their strength-to-weight ratio, making them lightweight and durable. Aluminum frames are also durable but can be heavier. Fiberglass and plastic frames are generally more budget-friendly but may be less robust.

Frame Design:

Quadcopter frames can have different designs, including X-shaped, H-shaped, and H-shaped with extended arms (Y6 or X8). The design affects the drone's flight characteristics, stability, and maneuverability.

Motor Mounting Configuration:

The frame should have the appropriate motor mounting configuration to accommodate the specific motor and propeller size you plan to use. Common motor configurations include X, H, and V.

Payload Capacity:

Consider the maximum payload capacity of the frame, which is the weight it can carry in addition to its own weight. Ensure that the frame can support the components and payload required for your intended application.

Number of Arms:

Quadcopters have four arms by definition, but some designs incorporate more arms for increased redundancy and stability. Hexacopters have six arms, and octocopters have eight.

Foldable or Non-Foldable:

Foldable frames are convenient for portability and storage, making them suitable for travel and transport. Non-foldable frames may offer more rigidity but can be bulkier.

Frame Weight:

The weight of the frame itself affects the overall weight of the drone, which can impact flight time and performance. Lighter frames are often preferred for agility and

longer flight times.

Flight Controller Mounting:

Ensure that the frame has adequate mounting options for your flight controller, GPS module, and other onboard electronics.

Battery Compartment:

The frame should have a designated area or mounting points for the drone's battery, ensuring a secure and balanced placement.

4.2.12 NODE MCU:

NodeMCU, utilizing the ESP8266 module, empowers IoT projects with Wi-Fi connectivity and GPIO pins for sensor interaction. Lua scripting and Arduino IDE compatibility streamline programming. USB connectivity enables easy programming and power supply. The device's built-in TCP/IP stack facilitates seamless communication over networks. It offers a versatile platform for interfacing with sensors and actuators, enabling a wide range of IoT applications, from home automation to industrial monitoring and beyond.



Fig:4.12:Node MCU

4.2.13 MOTOR DRIVER:

A gear motor is a type of electric motor that incorporates a gearbox to modify the output speed and torque of the motor. The gearbox consists of a series of gears with different sizes, which mesh together to provide the desired speed reduction or

increase. Gear motors are commonly used in applications where precise control over speed and torque is necessary, such as in robotics, conveyor systems, and automotive mechanisms. They offer advantages such as increased torque output, improved efficiency, and smoother operation compared to direct-drive motors. Gear motors come in various configurations, including spur, planetary, and worm gear designs, each suited for different applications and performance requirements.



Fig:4.13:Gear Motor

4.3 SOFTWARE REQUIREMENTS:

4.3.1 ARDUINO IDE:

The Arduino Integrated Development Environment (IDE) is a software application used for writing, compiling, and uploading code to Arduino microcontroller boards. It provides a user-friendly interface for programming Arduino-based projects using the C++ programming language. The IDE includes a text editor with syntax highlighting, as well as built-in libraries and examples to facilitate coding. It also



Fig:4.14:Arduino

features tools for compiling and uploading code to the Arduino board, as well as serial monitoring for debugging and communication with the board. The Arduino IDE is free and open-source, available for Windows, macOS, and Linux operating systems, making it widely accessible to hobbyists, students, and professionals alike for developing various electronic projects.

4.3.2 FIGMA:

Figma is a cloud-based design tool used for creating user interfaces, prototypes, and collaborative design projects. It allows designers to create vector-based graphics, wireframes, and interactive prototypes directly within a web browser or using desktop applications for macOS and Windows. Figma enables real-time collaboration, allowing multiple users to work simultaneously on the same design project, with changes being instantly visible to all team members. It also offers features such as version history, comments, and design libraries to streamline the design process and facilitate teamwork. Figma is widely used in the design industry for its versatility, accessibility, and collaborative capabilities.



Fig:4.15:Figma

4.3.3 MISSION PLANNER:

Mission Planner is a ground control station software used primarily with ArduPilot-based autonomous vehicles, such as drones and unmanned aerial vehicles (UAVs). It provides a user-friendly interface for planning, monitoring, and controlling autonomous missions. Mission Planner allows users to define waypoints, set flight parameters, and create complex mission plans for autonomous vehicles. Additionally, it offers features for real-time telemetry monitoring, data logging, and firmware configuration. Mission Planner supports various ArduPilot-compatible hardware platforms and is commonly used by hobbyists, researchers, and professionals for drone missions, aerial photography, surveying, and other applications requiring autonomous vehicle control.



Fig:4.16:Mission Planner

4.4 SYSTEM DESIGN AND ANALAYSIS:

4.4.1 BLOCK DIAGRAM:

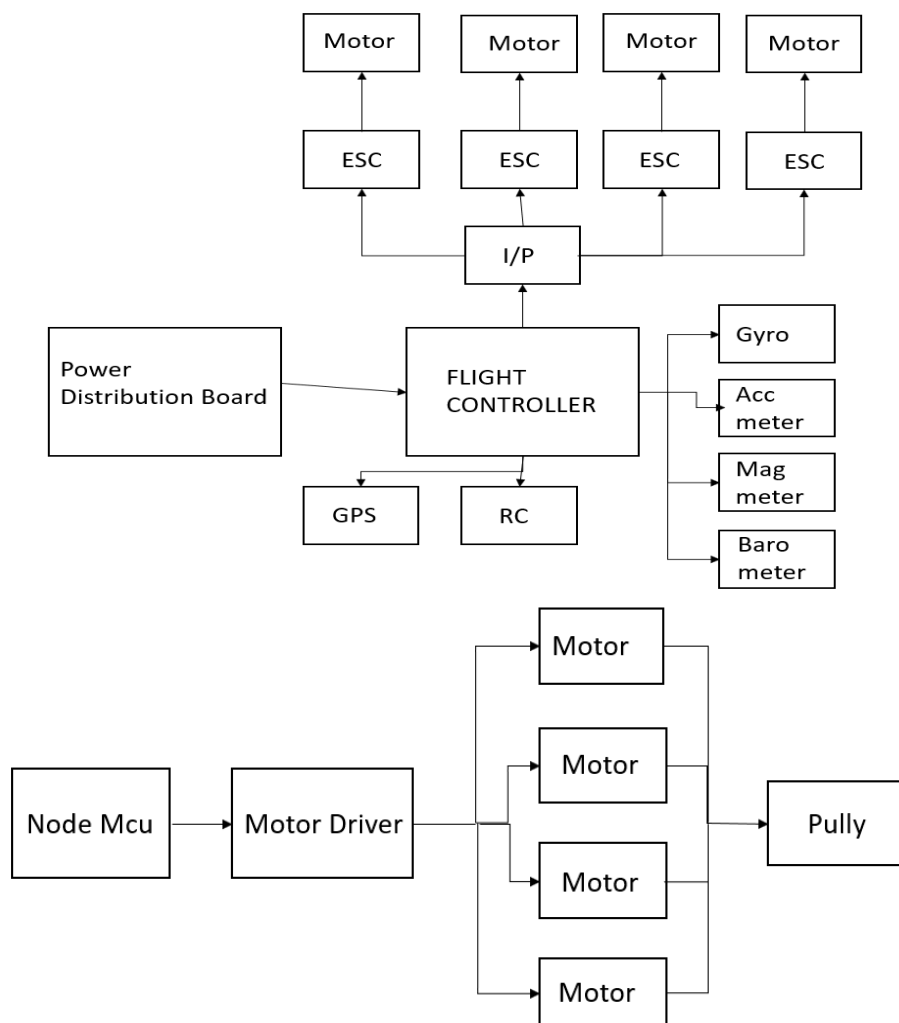


Fig:4.17:Block Diagram

Power Source:

The power source, usually a lithium-polymer (LiPo) or lithium-ion (Li-ion) battery, provides electrical energy to the entire drone system. The power source is connected to the Power Distribution Board (PDB).

Power Distribution Board (PDB):

The PDB distributes power from the battery to various components on the drone. It may include voltage regulation and current protection to ensure a stable power supply.

Flight Controller:

The flight controller is the "brain" of the drone, responsible for stabilizing the aircraft, calculating motor outputs, and controlling the drone's flight dynamics. It processes data from various sensors and communicates with other components.

Sensors:

Drones are equipped with various sensors to gather information about their environment and position. Common sensors include: Accelerometers: Measure acceleration and provide data for maintaining stable flight. Gyroscopes: Measure orientation and angular velocity, aiding in stability. Magnetometers: Detect magnetic fields for compass and heading information. GPS (Global Positioning System): Provides accurate position and velocity data for autonomous navigation. Barometers: Measure air pressure to estimate altitude and assist in altitude hold. LiDAR or Ultrasonic Sensors: Measure distance from the ground for terrain following or obstacle avoidance.

Remote Controller:

The remote controller is used by the pilot to manually control the drone's flight. It sends control signals to the flight controller, which interprets the commands and adjusts the drone's motors accordingly.

Communication Module:

Drones often include communication modules, such as radio receivers or Wi-Fi transceivers, for receiving control signals from the remote controller and transmitting telemetry data back to the pilot or ground station.

Motor and Propulsion System:

The motor and propulsion system consists of multiple electric motors and propellers. The flight controller adjusts the speed of each motor to control the drone's movement and attitude.

Electronic Speed Controllers (ESCs):

ESCs are connected between the flight controller and motors. They regulate the speed and direction of each motor in response to signals from the flight controller.

Frame:

The frame is the physical structure of the drone that holds all the components together. It provides the necessary structure and aerodynamics for flight.

Camera and Gimbal (optional):

Many drones are equipped with cameras for capturing photos and videos. Some have gimbals to stabilize the camera and maintain a level view during flight.

FPV System (optional):

In FPV (First-Person View) drones, there may be additional components like FPV cameras, video transmitters, and goggles or monitors for live video feed transmission to the pilot.

4.4.2 SOFTWARE DESIGN:

The program creation (development) cycle to create a C program:

- Do the requisite mental work. This is the most important part.
- Create the C source code. This can be done using a text editor but is normally done within the IDE (Integrated Development Environment). C source files are plain text and saved with a “.c” extension.
- Compile the source code. This creates an assembly output file. Normally,

compiling automatically fires up the assembler, which turns the assembly file into a machinelanguage output file.

- Link the output file with any required libraries using the linker. This creates an executable file. For desktop development, this is ready to test.
- For embedded development, download the resulting executable to the target hardware (in our case, the Arduino development board). For the Arduino, steps 3, 4, and 5 can be combined by selecting “Build” from the IDE menu.
- Test the executable. If it doesn’t behave properly, go back to step one.

A program is text that you write using a programming language that contains behaviors that you needs a processor to acquire. It basically creates a way of handling inputs and producing outputs according to these behaviors.

Designing a program is the fact you have to think about first, before you begin coding it. It generally involves writing, drawing, and making schematics of all the actions you want your processor to make for you. Sometimes, it also implies to write what we call pseudo code. I hope you remember that this is what we created in the previous chapter when we wanted to define precisely all the steps of our desired LED behavior. Debugging is a very important step when you are trying to find out why that program doesn't work well as expected. You are tracking typo errors, logic discrepancies, and global program architecture problems. You'll need to monitor things and often modify your program a bit in order to precisely trace how it works. Maintaining the source code is the part of the program's life that helps to avoid obsolescence. The program is working, and you improve it progressively; you make it up to date considering hardware evolutions, and sometimes, you debug it because the user has this still undiscovered bug. Programming is the process of designing, writing, testing, debugging and maintaining the source code of computer programs.

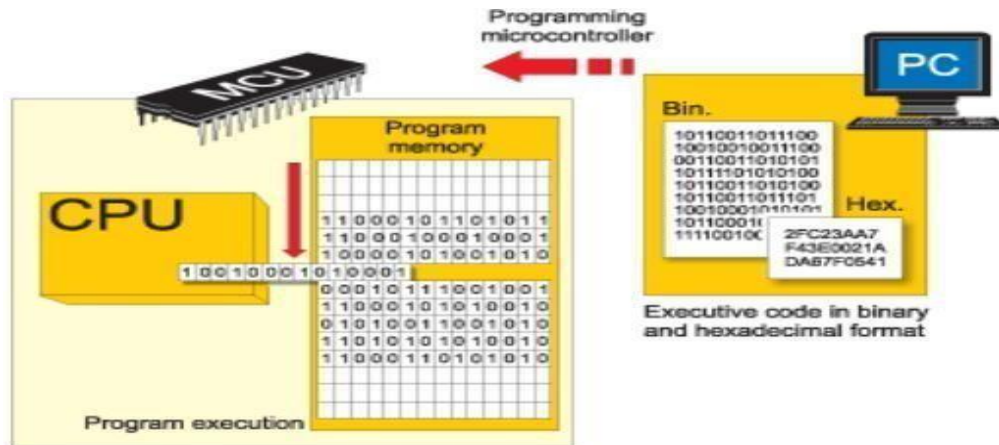


Fig:4.18:Program creation

The microcontroller executes the program loaded in its Flash memory. This is the so- called executable code comprised of seemingly meaningless sequence of zeros and ones. It is organized in 12-, 14- or 16-bit wide words, depending on the microcontroller's architecture. Every word is considered by the CPU as a command being executed during the operation of the microcontroller.

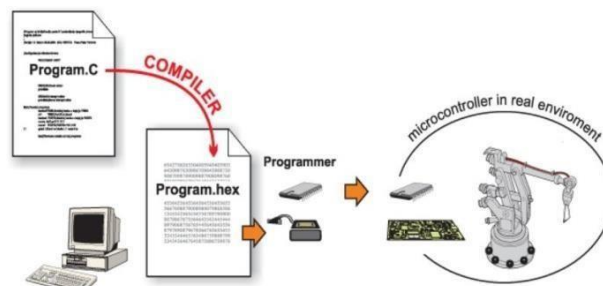


Fig:4.19:Generating hex file

For practical reasons, as it is much easier for us to deal with hexadecimal number system, the executable code is often represented as a sequence of hexadecimal numbers called a Hex code. It used to be written by the programmer. All instructions that the microcontroller can recognize are together called the Instruction set. Every sketch needs two void type functions that do not return any value, setup () and loop (). The setup () method is run once, just after the Arduino board is powered up and the loop () method is run continuously afterwards. The setup () is where you want to do any initialization steps, and loop () is for codes you want to run over and over again to program ATMEGA328P at first, we have to burn boot loader of new ATMEGA328P using ARDUINO-UNO R3 Programmer. For burn boot loader connect new ATMEGA328P with programmer. Connection is shown below.

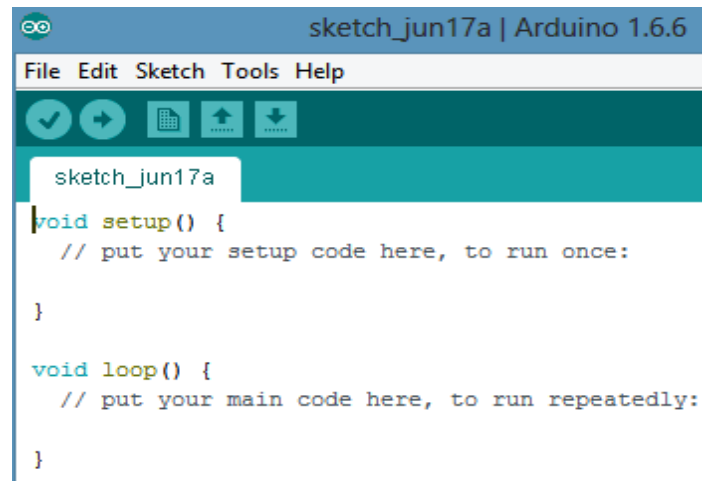


Fig:4.20:Arduino Sketch

Caution: make sure Programmer is not connected to external power source because it get required power from USB cable connected to computer and circuit with ATMEGA328P have regulated +5v supply. Then this System is ready for burn boot loader, to do this action simply open IDE on computer then upload configuration code which is consists of two different code named “optiLoader.h” and “optiLoader.pde”. Then upload both code to microcontroller, process is shown below

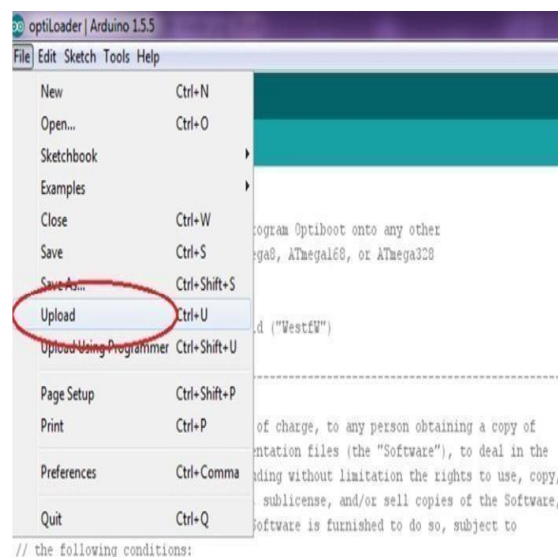


Fig:4.21:Upload bootloader

Figma:

Figma is a cloud-based design and prototyping tool used for user interface (UI) and user experience (UX) design, as well as for collaborative design projects. It is known for its real-time collaboration features, making it popular among designers and

design teams. Here are some key features and aspects of Figma:

Cloud-Based:

Figma operates entirely in the cloud, which means you can access your design projects from any device with an internet connection. This eliminates the need for software installations and allows for real-time collaboration among team members.

Cross-Platform Compatibility:

Figma is available for use on both Windows and macOS operating systems, as well as on web browsers. This cross-platform compatibility makes it versatile for designers who may use different devices and platforms.

Real-Time Collaboration:

One of Figma's standout features is its real-time collaboration capabilities. Multiple designers can work on the same project simultaneously, viewing each other's changes in real time. This fosters efficient teamwork and eliminates the need for sending files back and forth.

Vector Editing:

Figma provides a vector-based design environment, allowing users to create and edit vector shapes, icons, and illustrations. This makes it suitable for designing icons, logos, and other graphical elements.

Prototyping:

Figma offers prototyping features that allow designers to create interactive prototypes. You can define transitions and interactions to simulate how a user would navigate through a digital product or website.

Design Components:

Figma enables the creation and use of design components and libraries. This is particularly useful for maintaining consistency in UI design and easily updating recurring design elements across multiple screens.

Version History:

Figma keeps a detailed version history of your design files, allowing you to review and revert to previous versions if needed. This is valuable for tracking changes and collaboration.

Plugins:

Figma supports plugins that extend its functionality. Designers can install plugins to automate tasks, integrate with other design tools, or add additional design features.

Team Collaboration:

Figma offers team collaboration features with role-based access control. Designers and stakeholders can collaborate within a secure environment with controlled permissions.

Export Options:

Figma provides various export options, allowing designers to export assets in different formats (e.g., PNG, SVG) and at different resolutions for development purposes.

Design Handoff:

Designers can use Figma to generate design specifications and style guides for developers. This helps facilitate the handoff process from design to development.

Offline Mode:

Although Figma primarily operates online, it also offers a limited offline mode that allows you to access and work on your files when you don't have an internet connection.

CHAPTER 5

RESULTS AND DISCUSSION,PERFORMANCE ANALYSIS

5.1 RESULT:

The primary aim of our project is to revolutionize healthcare delivery by integrating two cutting-edge solutions: Online Doctor Communication and Medical Drone Supply. The concept of Zipline's drone delivery service is to utilize advanced drone technology to provide rapid and efficient delivery of critical medical supplies, including blood, vaccines, medications, and medical equipment, to remote and underserved areas. This innovative approach aims to bridge the healthcare accessibility gap by overcoming challenging terrain, poor road infrastructure, and long travel times, ultimately saving lives and improving healthcare outcomes in these regions. The key components of this concept include specialized medical supply delivery drones, strategically located distribution centers, autonomous flight, real-time order processing, precision delivery, and close collaboration with regulatory authorities to ensure safety and compliance. Zipline's drone delivery system demonstrates the potential for technology to address pressing healthcare logistics challenges and increase access to essential medical resources in hard-to-reach communities.

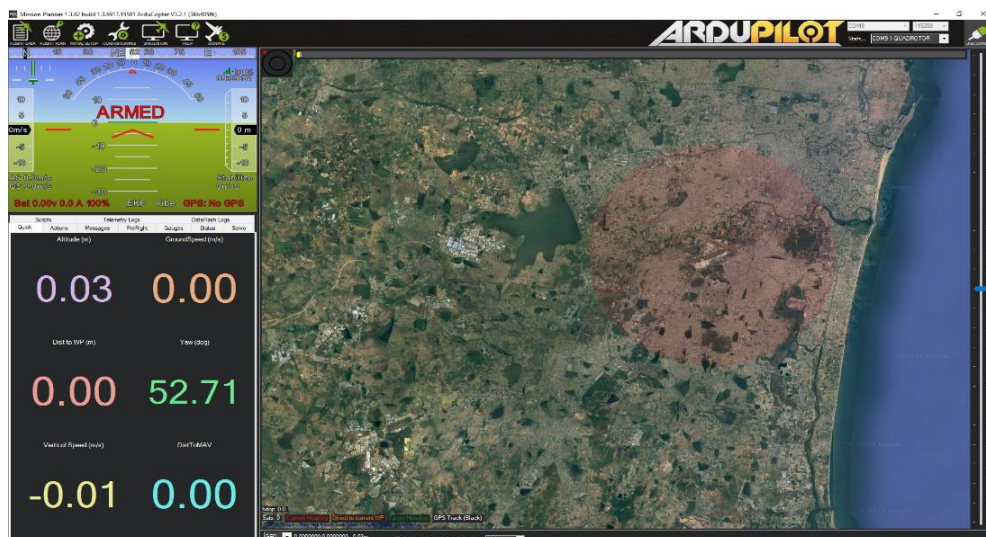


Fig:5.1:Mission planner

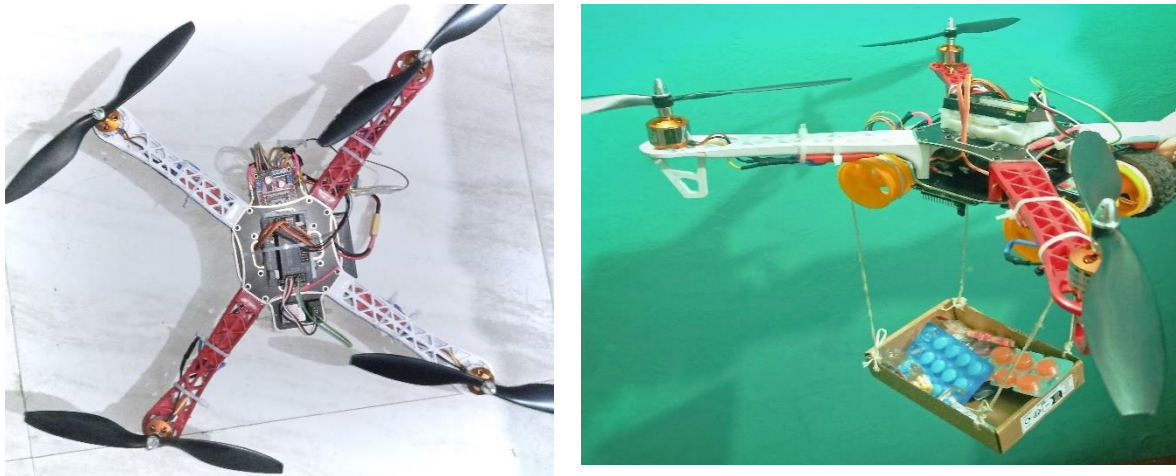


Fig:5.2:Result

5.2 DRAWBACKS / LIMITATION OF THE THESIS:

Limited Payload Capacity:

Most drones used for medical supply delivery have limited payload capacity. They can carry only a small number of medical packages or items. This limits their ability to transport a wide range of medical supplies or handle large volumes of deliveries.

Restricted Range:

Drone range is constrained by battery life and operational limitations. Drones typically have a limited flight range, which may not cover remote or distant locations without frequent recharging or battery swaps.

Weather Sensitivity:

Drones are sensitive to adverse weather conditions such as high winds, rain, snow, and fog. Weather-related disruptions can affect the reliability and timeliness of medical supply deliveries.

Regulatory and Legal Challenges:

The operation of drones for medical supply delivery is subject to regulatory frameworks that vary by region and country. Obtaining the necessary permits and adhering to regulations can be complex and time-consuming.

Limited Payload Types:

Drones are suitable for delivering lightweight and compact medical supplies but may not be able to transport large or fragile items. Some medical supplies, like temperature-sensitive medications, require specialized transport conditions that drones may not provide.

Battery Life and Recharging:

The limited battery life of drones can result in restricted flight times and longer turnaround times for recharging. This may reduce the efficiency of medical supply delivery operations. Navigation Challenges: Drones need accurate navigation systems to avoid obstacles and follow predefined flight paths. Navigation errors or technical issues can lead to accidents or delivery failures.

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 CONCLUSION:

Using drones for medical supply delivery with IoT (Internet of Things) integration is a promising and innovative approach that has the potential to bring about significant benefits to healthcare systems worldwide. In conclusion, here are some key points to consider:

1. **Efficiency and Speed:** Drone-based medical supply delivery offers the potential to significantly reduce delivery times, especially in remote or hard-to-reach areas. This can be critical in emergency situations and for delivering medical supplies like vaccines, blood, or medications quickly.
2. **Accessibility:** Drones can reach areas with poor infrastructure or limited road access, ensuring that medical supplies can be delivered to even the most remote and underserved communities.
3. **Reduced Human Contact:** Particularly relevant during health crises such as pandemics, drone delivery reduces the need for direct human contact during the supply chain, reducing the risk of disease transmission.
4. **IoT Integration:** IoT technology adds another layer of efficiency and control to drone-based medical supply delivery. Sensors and data collection devices can monitor temperature, humidity, package integrity, and other critical parameters in real-time, ensuring that medical supplies remain viable during transport.

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