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AUTOMATIC SURVEILLANCE USING DRONE TECHNOLOGY

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Abstract :

The goal of this proposed method is to design an X-shaped quad copter drone that can fly safely and reliably while also housing a camera with a wireless transmission system for real-time surveillance and a battery swapping mechanism. The transmitter-receiver section of our project is where it all starts. (two) By pressing the Arm and Disarm buttons on the controller, the Pixhawk must first be turned on. After this step is completed, the quad copter is made to move in the desired direction using Electronic Speed Control (ESC). The ESC is a device that connects to the controller and allows it to use the controller's inputs to control the motor's speed. This is an excellent example. How the movement of the quad copter is controlled Surveillance is carried out with the help of a mobile phone mounted on the quad copter. The Raspberry Pi OS allows you to view and save the video or image file that was captured. The landing platform must be large enough for the drone to land safely.

Keywords :- Electronic Speed Control (ESC), Pixhawk,, The Raspberry Pi.

1. Introduction

1.1 Drones are infiltrating civilian space at an alarming rate. Drones have the potential to make certain jobs easier, especially those that previously required an expensive helicopter trip, such as aerial photography. While these applications have been on the horizon for some time, one recent trend is the advantage gained by using drones during a contagious disease outbreak. As low-impact monitoring devices, drones also actively conserve energy and contribute to more sustainable practises.

1.2 Aim of the Proposed method

1) Make a drone that can lift itself vertically into the air.
2) Capture an image or video with the Raspberry Pi imager.
3) To look into the theoretical and practical performance of drone parameters like flight time and height.

Motivation of the Proposed method

1.3 percent Because of its increasing accessibility, drone technology is poised to displace many of the most dangerous and high-paying jobs in the commercial sector. Drones are now capable of performing increasingly complex tasks, such as disease control, ocean waste vacuuming, and food delivery, to name a few. 1st A drone camera's field of view is

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relatively narrow when compared to a human observer in a helicopter who can scan a larger area

1.4 **Working Principle**

Fig 2.1 shows the forces acting upon a drone in flight. The main impact comes from lift and thrust forces.

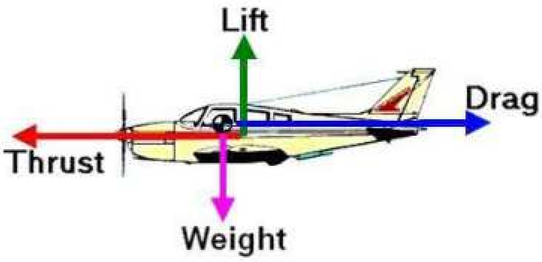

Fig 1.1: Working Principle of drone

Thrust: A force that moves aircraft forward

1) Needs to overcome drag (frictional force)
2) Produced by the engine

Lift: A force that “lifts” the aircraft up

1) Needs to overcome weight
2) Created by airflow over wings

1.5 **Drone Frame (150mm x 210mm, F450)**

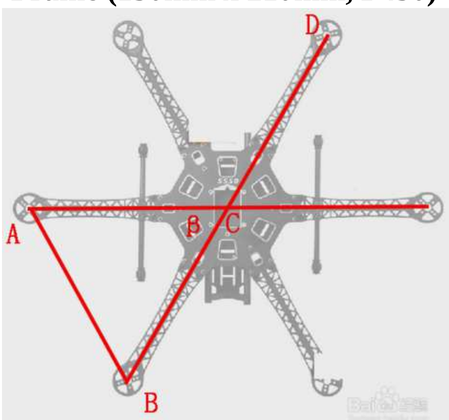

Fig 1.2 Basic drone frame **Fig 1.3: Drone frame calculation**

The straight line distance between two adjacent axes, which is the distance of the AB line in the figure, and the distance of the AB line is simply the propeller's maximum diameter, as shown in figure 1.2, is used to determine drone frame sizes.

Formula: For any triangle, the square of any side is equal to the sum of the squares of the other two sides minus the product of the cosine of the two sides and their angle.

$$c^2 = a^2 + b^2 - 2ab\cos(\gamma) \longrightarrow 3.1$$

Equation 3.1 is used to find the distribution drone arms for quad copter and helps find frame length

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1.6 **Electronic Speed Controller (4 – Simonk, 30A)**

This 30A BLDC ESC is fully programmable and has a 5V, 3A BEC. Motors with a continuous load current of 30 amps can be driven. With two separate PCBs for the controller and ESC power MOSFETs, it's well-built. It can be powered by 2-4 lithium polymer batteries or 5-12 NiMH / NiCd batteries. The microcontroller has its own voltage regulator, which helps to prevent jamming. [number four] [nine] [number four] [nine] [4][7][4][7][4][7][[UAVs, planes, and helicopters are the best candidates.

1.7 Lithium-Polymer Battery (2200mAH)

1) When choosing a battery, the first thing to consider is how much current your drone can draw, such as the current drawn by the motor and other components.
2) The battery size is the second factor to consider. For long and balanced flights, the right battery size is critical. Choose a battery with the smallest size and the highest energy output.
3) The C-rating, or discharge rating, is another important aspect of a lithium polymer battery. The C-rating is a battery's performance indicator. For your drones, a battery with the highest C-rating is a good choice.
4) For longer flight times, choose the battery with the highest capacity.

1) Transmitter(FS-i6)

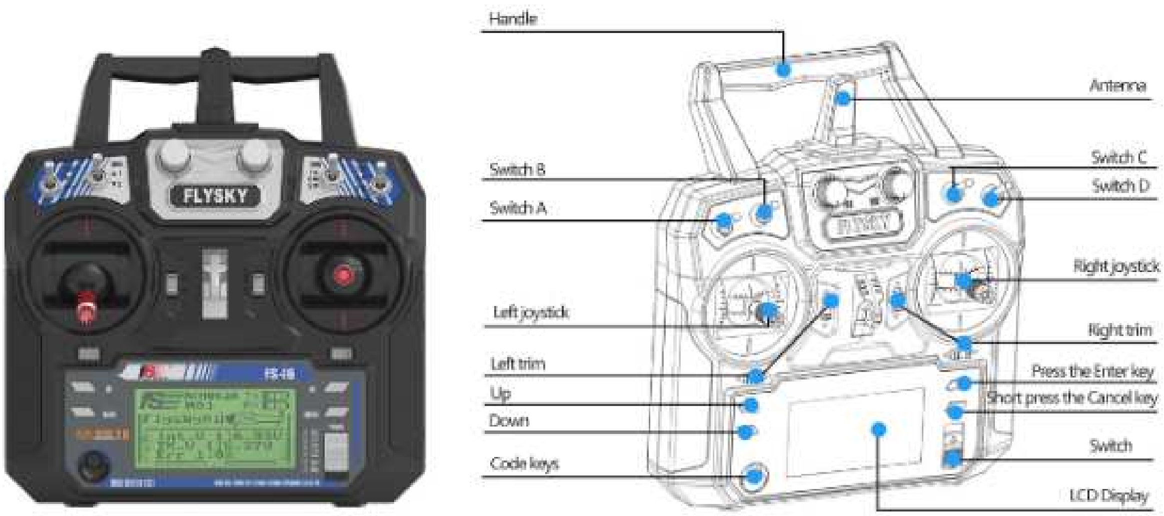

Fig1.4: Representation of channels in transmitter

1.8 Brushless DC motor (4 – A2212/13T, 1000KV)

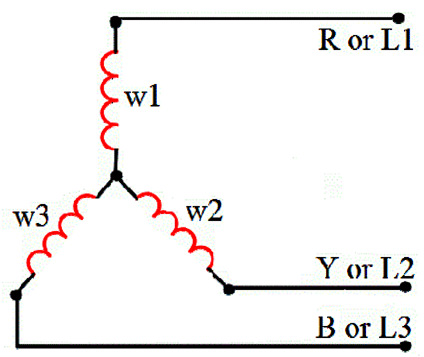

Fig 1.5: Circuit Diagram of BLDC Motor

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Pin Name	Description
R or L1	Connected to winding 1 or phase 1
Y or L2	Connected to winding 2 or phase 2
B or L3	Connected to winding 3 or phase 3

Table 3.4: Pin description of BLDC motor

2 Flight Controllers

The drone's flight is controlled by a flight controller, which is a circuit board. Simply put, the flight controller's job is to respond to information from the drone controller by controlling the power, or RPM (Revolutions Per Minute), for each individual motor on the drone. [6] The drone flight controller is what moves the drone to the right when the drone pilot shifts the joystick to the right on the drone controller. You could consider the flight controller to be the drone's nervous system. [nine]It receives raw data from the drone controller, transmits it via the receiver, and then makes the necessary movements to the drone's rotors to achieve the desired result. However, the job of the flight controller entails much more than simply supplying power to the drone's motors. [6] Because drones have multiple rotors, the job of the flight controller is to interpret the data sent by the drone.then act on it so that each individual rotor receives the proper amount of power to carry out the requested movement.When a flight controller is properly configured, the drone pilot's commands should precisely correspond to how the drone moves in the air. Some flight controllers can be configured and programmed by the pilot, but this necessitates a high level of expertise.

2.1About Raspberry pi 3

The Raspberry Pi is a computer with a quad-core 64-bit processor, WiFi, and Bluetooth. The Raspberry Pi 3 Model B is the Raspberry Pi's third generation. [nine] This powerful credit-card sized single board computer replaces the original Raspberry Pi Model B+ and the Raspberry Pi 2 Model, which is 10 times faster than the first generation Raspberry Pi. [nine] It also includes wireless LAN and Bluetooth connectivity, making it an excellent choice for connected designs.

2.1.1 Raspberry pi 3 specifications

1. Broadcom BCM2387 chipset
2. 1.2GHz Quad-Core ARM Cortex-A53
3. 802.11 bgn Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)
4. 1GB RAM
5. 64 Bit CPU
6. 4 x USB ports
7. 4 pole Stereo output and Composite video port
8. Full size HDMI
9. 10/100 BaseT Ethernet socketbr
10. CSI camera port for connecting the Raspberry Pi camera
11. DSI display port for connecting the Raspberry Pi touch screen display
12. Micro SD port for loading your operating system and storing data
13. Micro USB power source

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2.1.2 Raspberry pi 3 features

1. Now 10x faster - Single Board Computer powered by Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor running at 1.2GHz!
2. You now have 1GB of RAM, allowing you to run larger and more powerful applications.
3. Compatible with the HAT
4. 40-pin extended GPIO for use in "real-world" projects.
5. Attach a Raspberry Pi camera and a touch screen display to the Raspberry Pi (each sold separately)
6. Stream and view 1080p high-definition video output
7. Micro SD card slot for storing data and installing operating systems.
8. Ethernet socket (10/100 BaseT) for quickly connecting the Raspberry Pi to the Internet.

Fig 2.1: Raspberry pi 3

2.1.3 Raspberry pi pin description

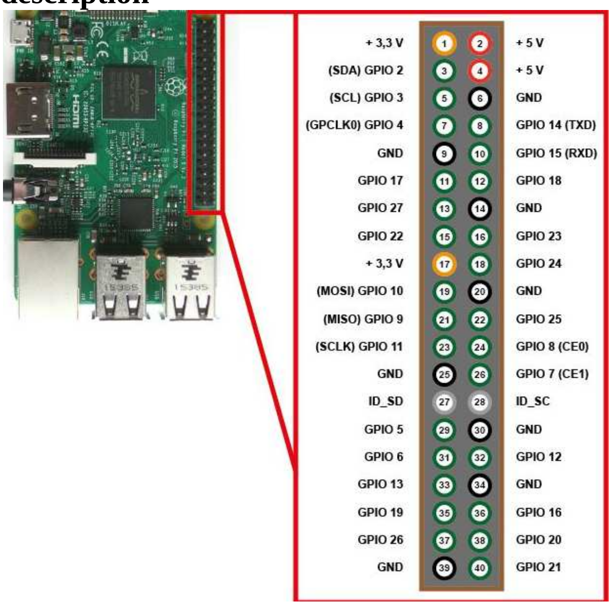

Fig 2.2: Pin diagram of Raspberry pi 3 Model

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Pin Group	Pin Name	Description
Power Source	+5V, +3.3V, GND and Vin	+5V -power output +3.3V -power output GND – GROUND pin
Communication Interface	UART Interface(RXD, TXD) [(GPIO15,GPIO14)]	UART (Universal Asynchronous Receiver Transmitter) used for interfacing sensors and other devices
SPI (Serial Peripheral Interface) Interface	MOSI,MISO,CLK,CE) SPI0-(GPIO10,GPIO9, GPIO11 ,GPIO8)] SPI1--(GPIO20 ,GPIO19, GPIO21 ,GPIO7)]	SPI (Serial Peripheral Interface) used for communicating with other boards or peripherals.
TWI(Two-Wire ***Interface***) Interface	(SDA, SCL) [(GPIO2, GPIO3)][(ID_SD,ID_SC)]	TWI (Two Wire Interface) Interface can be used to connect peripherals.
Input/output Pins	26 I/O	Although these some pins have multiple functions they can be considered as I/O pins.
PWM	Hardware PWM available on GPIO12, GPIO13, GPIO18, GPIO19	These 4 channels can provide PWM (Pulse Width Modulation) outputs. *Software PWM available on all pins
External Interrupts	All I/O	In the board all I/O pins can be used as Interrupts.

Table 2.1: Pin Description of Raspberry pi 3 model

2.1.4. Raspberry pi Applications

1. Hobby projects.
2. Low cost PC/tablet/laptop
3. IoT applications
4. Media center
5. Robotics
6. Industrial/Home automation
7. Server/cloud server
8. Print server
9. Security monitoring
10. Web camera
11. Gaming
12. Wireless access point
13. Environmental sensing/monitoring

2.1.5 Comparison of Raspberry pi model

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The following are the reasons why we chose the Raspberry Pi 3 model:
1) Massive processing power in a small package.
2) There are numerous interfaces (HDMI, multiple USB, Ethernet, onboard Wi-Fi and Bluetooth, many GPIOs, USB powered etc.,)
3) Linux and Python are supported.

3.1 SOFTWARE IMPLEMENTATION

About Zen Map

NMap is another name for it. Network Mapper (abbreviated as NM) is a free, open-source vulnerability scanning and network discovery tool. Nmap is a network administrator's tool for discovering what devices are running on their systems, discovering available hosts and the services they provide, discovering open ports, and detecting security risks.

3.1 .1 Port Scanning

Nmap sends out packets that return IP addresses and a wealth of other information, allowing you to identify a variety of network attributes, create a network profile or map, and create a hardware and software inventory. Different protocols employ various packet structures. TCP (Transmission Control Protocol), UDP (User Datagram Protocol), and SCTP (Stream Control Transmission Protocol) are among the transport layer protocols used by Nmap, as are supporting protocols such as ICMP (Internet Control Message Protocol), which is used to send error messages.

3.1 .2 Network mapping

Nmap can discover the devices on a network, such as servers, routers, and switches, as well as how they're physically connected (also known as host discovery). Nmap is capable of detecting the operating systems that are installed on network devices. Network managers can determine their vulnerability to specific flaws by determining what versions of operating systems and applications are running on network hosts.

3.1 .3 Service discovery

Nmap can not only identify hosts on a network, but also whether they're serving as mail, web, or name servers, as well as the specific applications and versions of the software they're using.

3.1.4 VNC viewer

On the local computer, a VNC viewer (or client) is installed, which connects to the server component, which must be installed on the remote computer. The server sends the viewer a copy of the remote computer's display screen.
It also interprets the viewer's commands and executes them on the remote computer.
[nine] VNC is platform agnostic, meaning it works with any operating system. TCP/IP must be used to connect computers, and open ports must be available to allow traffic from IP addresses of devices that may need to connect.

4.1 Contruction Techniques

1) The quadcopter is generally constructed in a similar manner when viewed from any angle.
2) The arms of the quad frame are the same length and at right angles to one another.
3) The motors are chosen based on the frame and payload of the quadcopter.

4) Electronic Speed Controllers are used according to the KV rating of the motor.

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5) The Multi-rotor Stabilization Controller is chosen to take into account both the payload and the stability of the quadcopter.

6) The radio system is chosen based on the maximum range of the flight.

5. The Proposed method's Output

We were able to fly the drone up to about 10 metres, but due to law enforcement restrictions, we are not allowed to fly higher than that. We can, however, fly up to 100 metres if we solve it theoretically. The battery power was reduced due to the importance of weight. As a result, the drone's flight time is calculated to be 20 minutes, which matches the theoretical calculations. The motor has a thrust of 3.08 kg/motor. The RPM/v of each motor was around 1395.5KV. Figures 5.1 and 5.2 show the hardware output, which is flying the drone in an open area, while Figures 8.7 and 8.8 show the software output, which is captured by the drone's camera.

Fig 5.1 (a) soldering of ESC (b) Mounting the components (c) Automatic Surveillance Drone

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Fig 5.2 (a) flying drone under the guidance of instructor (left)
(b) Drone in flight (right)

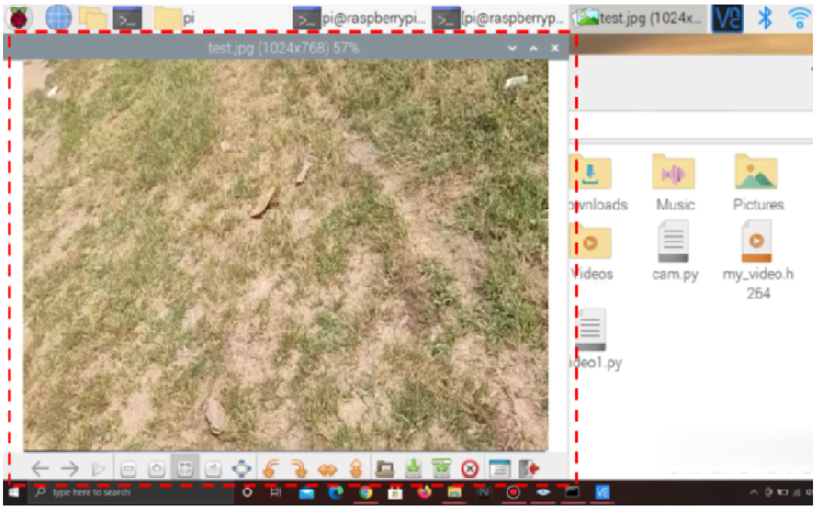

Fig5.3 Aerial photography

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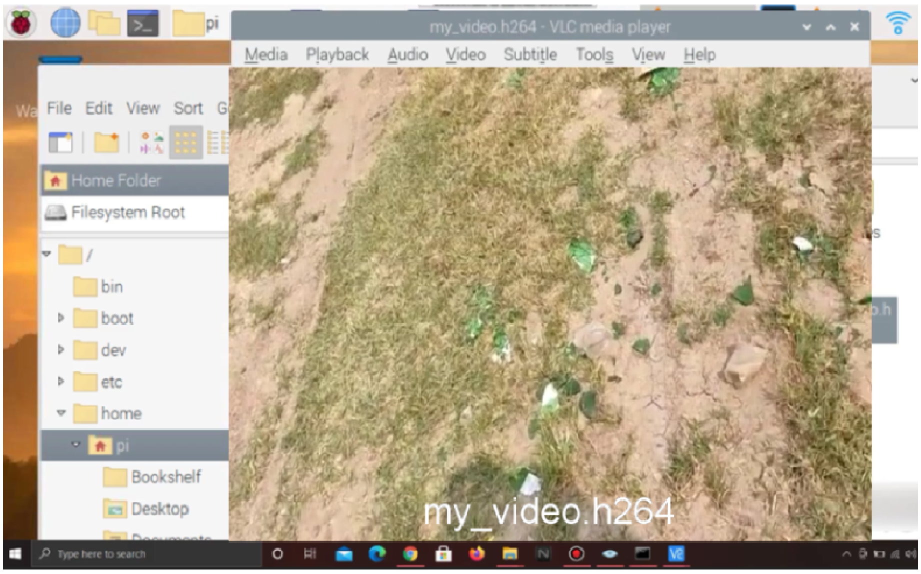

Fig 5.4 Aerial videography

5. Conclusion & Future Scope

As the cost and size of drones decrease, they will become more accessible to the general public. A drone in flight is currently uncommon, but in a few years, the public market will be flooded with drones. This prediction is based on current drone production and sales rates. First and foremost, Quad copters are a popular Christmas and birthday gift for teenagers.

They're also popular among photographers and sports fans. Furthermore, the number of companies providing drone services is increasing.

As drone autonomy improves, many new applications become possible. Drones used to be nothing more than remote-controlled planes, but now they have intelligent autonomous modes that reduce the amount of human interaction and control. Software flight stabilisation and the ability to pre-program flights are now standard features on professional drones. Drones that can navigate using GPS, avoid collisions, and adapt to changing weather conditions will become more common in the future.Drones that are able to work together exhibit swarm behaviour. Swarms can increase range, flight duration, and payload capacity for a variety of applications. [4] For example, if one drone's battery is low, the mission can be delegated to another drone. This could extend the flight range beyond that of the first drone. [8] Larger payloads could be carried by multiple drones, allowing the payload capacity of a single drone to be exceeded.Taking advantage of a communication infrastructure that is based on energy-efficient transmission technology that is reliable and low-latency. Furthermore, they are particularly useful for providing remote connectivity or emergency/disaster connectivity. Drones can also be used as flying base stations or gateways to help terrestrial communication networks (cellular radio networks) expand their coverage and/or capacity. Drone technology is constantly evolving in the areas of miniaturisation, autonomy, and swarms. The most gradual of these three developments is miniaturisation. (Every new drone generation is smaller, lighter, and less expensive than the one before it. New materials, as well as more efficient and lighter batteries, enable better trade-offs between, for example, a drone's flying range, maximum altitude, and payload capacity. [nine] Right now, the tiniest drone available is the size of a credit card. In a few years, however, we can expect to see drones the size of insects.

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