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Autonomous Drone using Pixhawk Flight Controller with Live Stream and Mask Detection Features

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***Abstract*— Drones (Unmanned Aerial Vehicle) are rapidly gaining popularity as a target tracking, and monitoring facility, surveillance tool. A lot of situations, more than a number of Unmanned Aerial Vehicle must fly to an area of interest as live video is being streamed to a ground station, where one or more operators inspect the area of interest and fine-tune the Drone's location.**

Keywords—Drone, Flight Controller, Multi rotor, Live stream

I. INTRODUCTION

Drone is the other name of the unmanned aerial vehicles; they are small aircraft that fly by them. Unmanned aerial vehicles (UAVs) are a type of unmanned aircraft. The unmanned aircraft system (UAS) consists of a UAV, a ground-based controller, and a communication system between the two. Drone can fly with various angle with autonomously and also with the help of human under control of remote.

II. ROTOR

A. Fixed Wing

A fixed-wing drone is one with a single rigid wing that can only fly in one direction. To resemble an aeroplane in appearance and operation. What distinguishes fixed-wing drones from other types of drones? With vertical lift rotors, they can't remain in one position for long, so they float along a fixed as long as their electricity permits. As a result, they can be significantly more effective than the other two types of drones. Wings that have been fixed in the military, unmanned aerial vehicles (UAVs) are commonly used when manned flight is deemed too dangerous or difficult. In addition, they are employed in the private sector.

B. Vertical Take off and landing

The benefits of fixed-wing UAVs are combined with the ability to hover in a new form of hybrid that can take off and land vertically. There are a number of different styles in production; some of them are only modified fixed-wing planes with vertical lift motors attached. 'Tail sitter' aircraft, for example, are another choice. which resemble conventional planes However, 'tilt rotor' planes, which can swivel their rotors or even the entire wing with propellers attached from pointing upwards for takeoff to pointing horizontally for forward flight, rest on their tails on the ground, pointing straight up for takeoff before pitching over to fly normally, and 'tilt rotor' planes, which can swivel their rotors or even the entire wing with propellers.

C. Single Rotor

Single-rotor drones are powerful and resemble helicopters in terms of construction and design. They have a single large rotor that resembles a revolving wing. A small rotor for direction and stability on the tail.

D. Multi Rotor

The most popular type of drone for getting a "eye in the sky" is the multi-rotor drone. This camera is commonly used for aerial photography, recording, and surveillance. It is used by both professionals and hobbyists due to its small size and ready-to-fly capabilities. Multi-rotor drones are also the least expensive and easiest to build. Their bodies are covered in rotors and can be further classified according to the number of them on the drone's platform. There are three rotors on a tricopter, four on a quadcopter, six on a hexacopter, and eight on an octocopter. Quadcopters are the most popular multi-rotor drones.

III. QUADCOPTER

Before choosing a drone that meets the application's requirements and specifications, there are many factors to

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consider. These characteristics and before constructing or installing a new drone, requirements are taken into consideration.

• Standard type
• Easy to set up
• Plenty of frame choices are only a few of the specifications to think about when choosing a drone.
• No servos needed
• Less expensive than the competition
• Simple to manoeuvre

A. Flying Principle

A propeller convert the rotational motion in the thrust for the power required for the aircraft. Both Bernoulli's theory and the principle of conservation of momentum can be used to model propeller dynamics. The third law of Newton is a set of rules that governs how things should be done.

B. Principle and Working

A propeller's theory and operation are based on Newton's Third Law and Bernoulli's Principle. A drop in pressure or the potential energy of the fluid occurs concurrently with an increase in the fluid's speed. Any Newton's third law states that any action has an equal and opposite reaction. The top of a propeller's aero foil is formed such that air flows faster over it than under it. As a result, there is more pressure under the aero foil than above it. The pressure difference is what causes the boost. The lift coefficient is a dimensionless coefficient that compares the lift generated by an aerodynamic structure to the lift produced by an aerodynamic body such as a wing or an entire aircraft, as well as the dynamic pressure of the fluid flow around the body and a reference area associated with the body

C. Live Streaming

It's impossible to beat the mix of live streaming and drone cameras. Humans gain two incredible superpowers thanks to drone live streams: the ability to see and hear. All that is happening right now, as well as the ability to fly and see the ground from a bird's eye view. Video footage for live events is one of the many new drone-based live streaming applications on the horizon.

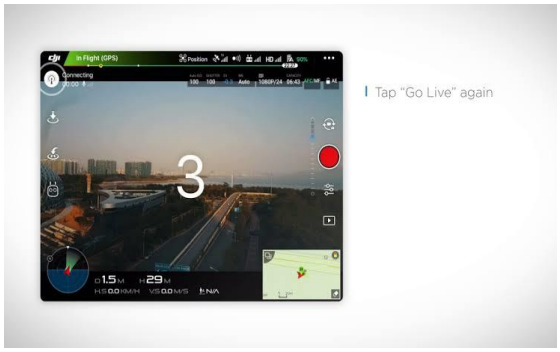

Figure 2

Our system guarantees soft real-time delays, enabling operators to pilot UAV fleets interactively while optimising performance. In terms of video quality, dependability SENSOR AoI GS R3 R2 R1 SENSOR AoI GS R3 R2 R1 SENSOR AoI GS R3 R2 R Two UAVs (sensors) are manually controlled using video streams to detect desired features in the area of interest. Meanwhile, other UAVs across the network are relaying the Streams to the Ground-Station. We show how a simplistic solution based on commodity WiFi hardware struggles with both reliability and timeliness on commercial multi rotor UAVs.

D. Face Mask Detection

Following the outbreak of the worldwide pandemic COVID-19, there is an immediate need for protective mechanisms, the most important of which is a face mask. The project's main goal is to detect the effect of a Face mask on human faces in both live streaming video and photographs. Our face detector model was created using deep learning. Because of its high performance accuracy and speed, the Single Shot Detector (SSD) architecture is used for object detection. In addition, we used basic to output the presence or absence of a face mask in a picture or video stream, neural networks are used to learn concepts. Our model performs well on the test data, according to the results of our experiments. With 100 per cent accuracy and 99 per cent recall, respectively.

Figure 1

Forest fires have been and continue to be major issues in all countries. A high-altitude UAV detects fire in the forest [1].

A low-altitude drone is used in the forest to assist ground vehicles in identifying the specific location of the fire. A long-range (LoRa) optical wireless communication technology embedded with raspberry pi is used for early fire detection because of its long-range communication capabilities and suitability for telemetry applications. Forest fires are a natural calamity. The forest will be monitored by a drone that records vide [2].The video is forwarded to the data receiving module during recording, which provides frame selection and geo location information in real time. Transmission of video data via telemetry following these measures, the frames are sent to the report generation module for fire detection. Smoke is detected in the forest [3], to implement the smoke detection operation; a commercial drone called the DJI Mavic pro is used. The aim of this paper is to introduce a smoke detection method that makes use of CNN and Deep learning. Tensor Flow serves as a learning plat form. A CCTV camera is built into the drone to capture video from an aerial perspective. It appears from the footage that for detecting fire in the forest, a technique known as a colour-based detection system is used. Fire-pixels can be extracted directly from a picture frame using a particular RGB colour model.

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IV. PIXHAWK FLIGHT CONTROLLER

The PX 4 autopilot system is an open source autopilot system aimed at low-cost autonomous aircraft. Hobbyists will use it because of its low cost and availability. Remotely piloted aircraft are small planes that can be controlled from afar. PIXHAWK is a high-performance autopilot-on-module that can be used in fixed wing, multi rotor, helicopter, vehicle, boat, and any other robotic platform that can roll. It caters to the needs of high-end science, amateurs, and industry

Figure 3

A. *Global Positioning System*

The Global Positioning System (GPS) is a radio navigation system based on satellites that provides geo location and time information to a GPS receiver anywhere on or near the earth's surface. The part of the Earth where four or more GPS satellites have an unobstructed line of sight GPS signals are blocked by mountains and houses, which are relatively small. While these innovations will improve the utility of GPS positioning The GPS does not allow the User to send any data and operates independently of any cellular or internet reception. Industrial, civil, and commercial users all over the world depend on the GPS for vital positioning. Ublox NEO-M8N is a new generation of Ublox. High Precision GPS Module for PIXHAWK and APM FC (Ready to Attach to PIXHAWK FC) with on board Compass, low power consumption, and high precision, the overall accuracy is 0.6 metres, almost 0.9 metres, which is better than the previous generation NEO-7N 1.4-1.6 metres. GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1 protocol accuracy are all supported.

Figure 4

Additionally, after swapping the extra 5-pin connector, we can attach the same module to the APM Flight Controller. This brand-new generation Ublox GPS NEO-M8N has 0.6-meter accuracy, which is a major improvement over previous versions. The search for and acquisition of satellites is extremely fast, taking just ten seconds on average to track down and capture up to six satellites This GPS module also has a built-in compass with a 10GHz refresh rate and low noise figure, ensuring that it performs well.

B. *Rasperry Pi Camera Board*

The Raspberry Pi Camera Board attaches directly to the CSI connector on the Raspberry Pi. It can produce images with a 5MP resolution that are crystal clear, or it can deliver a 4MP resolution image. Video recording in 1080p HD at 30 frames per second. The Raspberry Pi Camera Board is a fixed focus module with a 5MP Omni vision 5647 sensor developed and produced in the United Kingdom by the Raspberry Pi Foundation. A 15-pin ribbon cable connects the module to the Raspberry Pi's dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed specifically for connecting cameras. The CSI bus is dedicated to bringing pixel data to the BCM2835 processor and can carry extremely high data rates. The board is thin, measuring 25mm x 20mm x 9mm and weighing just over 3g, making it suitable for mobile or other applications where size and weight are important. The sensor itself has a 5 megapixel native resolution and a fixed focus lens. The camera can capture static images with a resolution of 2592 x 1944 pixels and record video in 1080p @ 30 frames per second, 720p @ 60 frames per second, and 640x480p 60/90 frames per second. The camera is supported by the latest version of Raspbian, the Raspberry Pi's favourite operating system.Figures and Tables.

V. RULES FOR FLYING DRONES

- Your drone must not be flown higher than 120 meter above the earth.
- You must not fly your drone over or near an area where public safety is at risk or where emergency operations are taking place (without prior approval). This could involve things like a car accident.
- You must not fly after a collision, police operations, a fire and related firefighting activities, and search and rescue operations.
- Unless the other person is involved in controlling or navigating the drone, you must not fly the drone within 30 meter of people. Just one drone can be flown at a time.
- If your drone weighs more than 100 grams, you must keep it at least 5.5 kilometer away from controlled aerodromes (usually those with a control tower). If your drone weighs less than 100 grams, you may fly within 5.5 kilometer of a non-controlled aerodrome.
- Do not fly your drone inside the airfield's perimeter
- Do not fly your drone in the aerodrome's approach and departure paths. Just fly during daylight hours and keep your drone within visual line of sight.

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- This entails being able to orient, navigate, and see the aircraft through your own eyes (rather than through a device) at all times.
- You are not permitted to travel over or over citizens. Festivals, sporting ovals, crowded beaches, parks, busy roads, and footpaths are all examples of this.
- You must not operate your drone in a way that puts another aircraft, human, or object in danger.
- Please respect the privacy of others. Don't film or photograph people without their permission; this could be illegal in some states.

VI. CONCLUSION

The main aim is to investigate Quadcopter's entire design process from the engineering perspective and improve its equilibrium and System of Stability. The main purpose of this project is to detect the presence in live streaming videos as also images of a face mask on human face. Our face detector model was developed with profound knowledge and in many practical applications the live streams are used.

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