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Autonomous Drone for Surveillance

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Abstract - In past stealth airplane and helicopters were utilized for reconnaissance which are presently supplanted by UAVs (Unmanned Aerial Vehicles) or Drones. The point behind this framework is observation in military, law requirement and search and salvage activities independent of any topographical zone. Since it is regular capacity of drone, this task looked to make an automaton that will be constrained by an App named 'Quad copter'. Through this designed App location is fed to Raspberry Pi. According to that area Raspberry Pi orders pixhawk to follow that course. Additionally it guarantees that the automaton returns back through a similar course for example Self-ruling route. The drone houses camera pi module with remote transmission framework that gives live feed from the camera to the client. Future advancements can be made to convey a payload. In spite of the fact that the automaton satisfied size and weight guidelines and could effectively restrict its situation with GPS and pixhawk, at that point too security of automaton was a significant testing task in the venture. What's more, its activity was comprehended through testing and recreation.

***Key Words*:** Automaton, raspberry pi, pixhawk, reconnaissance, self-ruling, payload

1. INTRODUCTION

The objective behind this task is to cryptically catch and investigate the objectives from significant distance and elevation so as to give reconnaissance. Automaton controlling is performed remotely by radio waves or self-ruling (with a foreordained course). The regular things utilized in drone are suspension, batteries, motors, ESCs and propellers. As automatons don't have explicit size, shape and type and are accessible in numerous structures relying on the prerequisites. They are frequently furnished with frill required for reconnaissance and checking. To address the issues, for example, hard to convey and costly, this undertaking looked to actualize an independent automaton fit for performing observation while correspondence progressively to the client. As it is independent, an App is structured, through which area is taken care of to the flight controller so as to follow the predetermined course.

There exists number of drones or UAVs (Unmanned Aerial Vehicle) in today's era, but the things that make them differ from each other are some basics such as estimating weight of drone, choosing appropriate thrust-to-weight ratio as per systems requirements. Also for which selecting desired trio of propeller, motor & battery is also essential. A noteworthy preferred position of automaton is amazingly short response opportunity with regards to appointing.

These automatons can be utilized to perform programmed lifesaving activity in mountains without human assistance, additionally drones have been as of late used to battle against covid-19 pandemic to purify enormous regions wiping out the need of numerous cleaners. It can likewise be utilized to get a criminal in a major mass of individuals as the automatons explore consequently with GPS and the camera.

2. LITERATURE REVIEW

In order to implement the project "Autonomous Drone for Surveillance", a research had been made on several theoretical and hardware technologies through various research reports. The review includes advance technology used in drones or UAVs.

This paper focuses on the design of a biocompatible payload and a modified drone to accomplish medical supply delivery to remote areas. The design of the payload and UAV arm mechanism must consider the safety of medical supplies, medical equipment and blood biocompatibility throughout the duration of the delivery. [1]

This paper focuses challenge regarding the operation of autonomous delivery drones is the development of a robust sense & avoid technology. This term refers to a drone's capability to takeoff, fly and land at the intended location and in the intended manner without colliding on the way. In order to do so the device has to have a continuously functioning and accurate geo-location device; clear vision through cameras (or radar) and well-developed algorithms to execute accurate landing. [2]

This paper proposed a system for autonomous path following using visual information acquired from drone mounted camera. Furthermore, visual data can be used to attain robust navigation since images represent rich source of information with discriminative features that sufficiently describe waypoint along a certain path. [3]

This paper represents a quadcopter that is capable of being given a GPS coordinate using a PC and attempts to fly to that coordinate by running through constructed program. To simplify the problem, many drones fly at a certain altitude free of obstacles, as the quadcopter of this project is meant to, so sensors for detecting nearby objects are unnecessary and thus are not included. [4]

This paper represents that Quadcopter are classified as rotorcraft, as opposed to fixed-wing aircraft, because their

lift is generated by a set of rotors (vertically oriented propellers). The aircraft primarily is governed by control of the three major axes namely; pitch, roll and yaw. GPS is a space based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. [5]

Autopilot is necessary to allow a quadcopter to make it autonomously locate and land on a station's target with certain pay loading capability. The quadcopter can also be used for sensing various climatic conditions such as heat, pressure and humidity in land. Provide real time audio or video transmission from areas which are physically inaccessible by humans. [6]

3. PROBLEM STATEMENT

To design an Autonomous drone for surveillance with live location tracking that can accept the location of area which is to be surveyed from sender through an app, and return back to original location. This project aims to enigmatically capture and scrutinize the targets from long distance and altitude in order to provide surveillance. As this system offers autonomous navigation, factors such as flight time, range, weather, energy consumption & stability are the challenging things to be dealt with.

3.1 Objectives

a) To design a drone that can be remotely controlled with wireless transmission system.

b) To equip system with camera module for live streaming.

c) To reduce human efforts.

4. PROPOSED SYSTEM

Proposed system is having following modules:

- Module 1: **User**

User will start the drone. After that user has to visit app and apply the intended location to the drone.

- Module 2: **Drone**

Drone will track the location and will survey the given location using camera and send the live stream to user.

4.1 System requirements:

4.1.1 Raspberry Pi-3B plus model:

Fig 1: Raspberry Pi-3B plus model

Raspberry pi board plays most important role in the system. It is used to control the drone autonomously and direct it to the delivery location. Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC) which includes a 700MHz ARM1176JZF-S processor, Video core IV GPU and RAM.

4.1.2 Camera Module

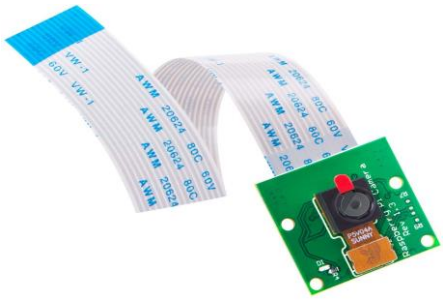

Fig 2: Camera Module

Camera is used to capture the live streaming of the route through which drone travels with wireless transmission system that provides live feed from cameras to the user.

4.1.3 Pixhawk

Fig 3: Pixhawk

It is main controlling unit which is used to take input and control the rotation of motor. This flight controller allows the user to turn any fixed-wing, rotary-wing, or multirotor vehicle (even boats and cars) into a fully autonomous vehicle; capable of performing a wide range of tasks even programmed GPS missions with waypoints with the optional GPS Module.

4.1.4 GPS Module:

Fig 4: GPS Module

It is used to determine the location of the drone. A GPS can be used to help determine its own altitude, longitude and latitude positions. It receives a signal from a satellite to calculate these positions.

4.1.5 App (Quad copter)

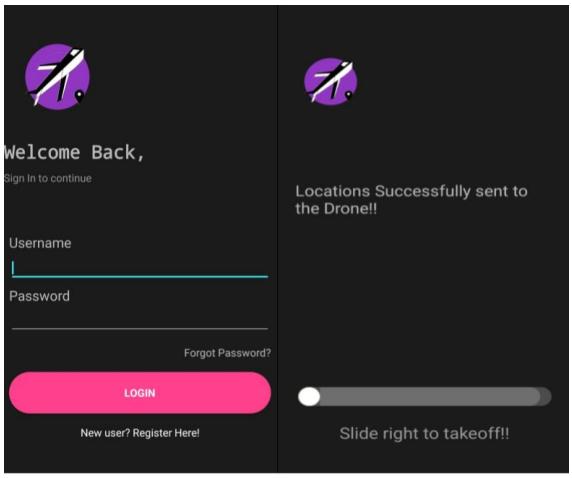

Fig 5: App

Through this designed App, location is fed to to Raspberry pi. As per that location pi commands pixhawk to follow the route.

4.1.5 Google Map

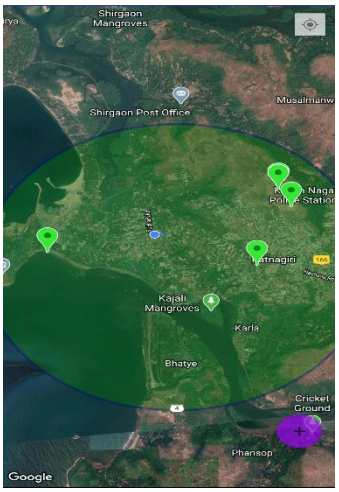

Fig 6 : Google Map

Google Map is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° interactive panoramic views of streets (Street View), real-time traffic conditions, and route planning. Its satellite view is a "top-down" or bird'seye view; most of the high-resolution imagery of cities is aerial photography.

4.2 System Working:

4.2.1 Algorithm

1. Initialize the Raspberry pi, Camera and open the App.
2. Firstly the sender will start the drone then he will select the location on map/already saved in the database.
3. After giving location sender will simply give fly command to drone by clicking on go button.
4. When sender clicks on go button drone will start flying and take certain altitude.
5. When drone reaches at certain altitude it travels towards location. By using GPS sensor drone will get its location and compare its location with given location every time and decide the path. Drone will also send its location to sender. That location will be used to track the drone.
6. After reaching on desired location drone will do the desired task and then start its journey towards main location.

4.2.2 Block Diagram

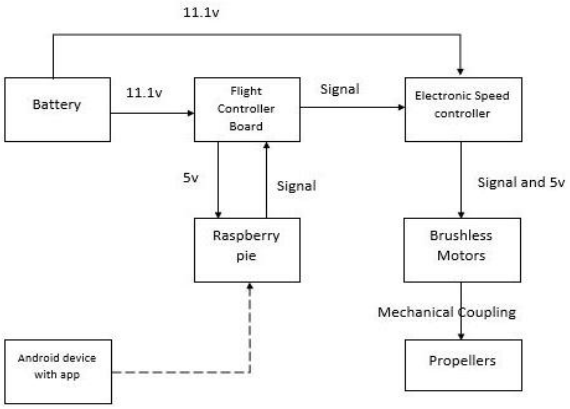

Fig 7: Block Diagram

For the complete system we are using Raspberry pi 3B+ model. It is the main control unit and all the components are interface with this module. It is used to control the drone autonomously and direct it to the delivery location. A 11.1v battery supply is provided to the entire system. The Raspberry pi receives 5v from Flight controller to get powered up. Flight controller i.e. Pixhawk is the main controlling unit which is used to take input and control the rotation of motor. GPS is used to determine the location of the drone. ESCs, motors & Propellers are the mechanical part of the system which are mounted on the chassis by performing appropriate caliberation. An Android device with desired App is used to provide the delivery location and to track the progress in real time.

5. METHODOLOGY

In this project, we design a system that can help us in surveillance . Surveillance is considered to be one of the crucial part in SAR operations, disaster management, military applications, law enforcement, etc. To survive in this era of emerging smart technologies & for a continuous growth, the sectors should have smart and high tech systems, also the data must be in encrypted form specially in military applications.

The autonomous system consists an App through which user will select the location on the map or from already stored database. The user must have its account which generally consits an username & password, after which the user is supposed to login. After feeding the location the user simply needs to give fly command to drone for takeoff. After takeoff the drone will take a certain altitude & then travels towards the loaction. The drone gets its location by using GPS sensor and then it compares its current location with the given location everytime & decide the path. Also the drone sends its location to the user at the ground station; so that the drone can be tracked. Once the drone reaches the destination, it will perform the assigned task and again start ist journey towards main location. This is how the whole autonomous system is going to work and provide surveillance.

6. RESULT

Fig 8: Drone: Ready for surveillance

Fig 9. Drone: while surveillance

The drone is set to a certain altitude of 10m in order to avoid obstacle. Its altitude can be increased more than 10m for surveillance depending upon the application.

7. CONCLUSION

We designed the framework which decreases human endeavors and give reconnaissance in remote territories. Proposed framework is light weight, solid and segments are effectively accessible. It is likewise compact and effectively upgradable. The host can get to the live gushing remotely. The speed of web assumes a significant job right now. There were a few tests performed to guarantee the planned model would effectively fly. Raspberry pi ends up being keen, financial and productive stage for executing the development observation framework. In spite of the fact that we confronted a few issues, for example, free associations, staff parts, alignment of ESCs and dependability of automaton, however then too all objectives were completely accomplished by the venture effectively.

8. FUTURE SCOPE

The system can be modified to carry a payload which can be used for delivery of medicines, hotel orders etc. The night vision camera can be used. It provides ability to fly drone at night, which makes detection of night activities possible. Thermal sensors can also be used in order to prevent from fire sources in building.

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