

Design and Development of an Autonomous Pilot Drone for Security and Rescue Assistance

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Abstract: The proposed project is to design an Autonomous Pilot Drone to assist the police & rescue team or an ambulance in order to rescue the casualties during accidents or in emergency situations and to monitor the area during that incident. There are many commercially available drone platforms, but all of them require manual interaction through a remote controller. This resulted in building an Autonomous Pilot Drone for Security and Rescue Assistance. In the proposed system the drone is a design using an autonomous guiding system with GPS technology. Such drones can fly and hover with programmed input from the on-board computer. Several unexpected issues made to sort out problems like slight weight imbalance, noisy sensor data, error in PID tuning and problem occurred when the battery gets voltage droplet. To fly such drone in autonomous mode, obstacle avoiding sensor is used to avoid accidents. The results are presented and discussed to demonstrate the technical feasibility of the proposed drone through Mission planning software and hardware result.

Keywords—Autonomous drone, Rescuing drone, Quadcopter, Pilot drone.

I. INTRODUCTION

DRONE (Dynamic remotely operated navigation equipment) is an unmanned aerial vehicle that is used for civil and military purposes. This project mainly emphasis on the area of security and surveillance with autonomous system guided by the onboard computer, connected with the pre-programmed flight controller. During a natural disaster or in an emergency situation this technology will be very helpful for rescuing the peoples.

Various situations like car accidents or crime scenes visibility during emergency situations, it takes the police cars and ambulances a long time to reach the desired destination due to many challenging conditions [2].

When the person is in trouble or meet with an accident, they can make a call to the control room. After receiving the call, the control room and the drone will identify the location through GPS then with the help of the software the drone will automatically take off to reach the location to identify the person and the live scene of the location will be shared continuously with the help of streaming video signals.

The purpose of this project is to use the quadcopter drone for scanning the GPS location of the persons who are all in an emergency situation. The drone will escort police cars or rescue team or ambulances by tracking the GPS location of needy and navigating the rescue team to reach the destinations safely and quickly to rescue the people[4].

The people those who are all in an emergency situation who contact the control room were rescue by the drone by identifying the GPS location of the people. By the GPS location, the drone will takeoff automatically and reaches the location then identifies the person and share the video stream to a police or rescue team or an ambulance.

This method is very useful for police or an ambulance to see the real footage of the situation. According to the situation the rescue team can prepare themselves before reaching the location. Our drone is design with an auto piloting mode.

There is no availability of autonomous drones in the field of rescue and surveillance.

II. PROPOSED METHODOLOGY

The proposed approach for the rescuing mission is presented as follows:

- The autonomous system of the rescue drone is based on the Flight controller.
- It includes a Computer Processor, Geographic Positioning System (GPS), Data Logger, Temperature and Pressure sensor, Airspeed sensor, Triple axis gyroscope and Accelerometer.
- During the flight test the drone was powered by 3300mah (milli ampere) battery which allows it to fly for 25 minutes per mission and to distance of 5 kms.

- Initially, mission planner software is used and programmed with the flight path for every mission by clicking on waypoints in a Google satellite map interface.
- The drone can be programmed to take off and land autonomously and encircle over the waypoint for specified number of turns or duration [3].
- The user can also program other flight parameters such as ground speed and altitude of each waypoint each pre-programmed mission which was uploaded to the drone can also allow to fly the mission autonomously.
- After the location is acknowledged, the quadcopter will take off and speed up to reach location.
- It takes a live video stream and sends it to police or rescue team or ambulance and to the control room before they reach the location.
- The operation of this pilot drone can performs automatically by auto pilot mode, in this way the idea is innovative.
- To design a quadcopter class 450 ‘X’ type, because it has the capability of weight handling and cost efficient. It consists of BLDC motors, ESC, Flight controller, onboard computer, GPS, camera and battery. We have used Python programming, because it has ability to communicate easily with open source system.

Objectives:-

The main objective of the project is to rescue the people who are in emergency situations as well as for surveillance.

- To study and analyze the performance of autonomous system with an onboard computer.
- To implement the autonomous system in drones for rescuing operation.
- In addition, it can be used for surveillance in deep forest and other inaccessible areas, accident zone and crime scene.

Quadcopter UAV.

Quadcopter is a type of unmanned aerial vehicles (UAVs) that utilizes 4 propellers for directional movements and generation of thrust [5]. The drone is fully automated for rescue operation and the ultra sound sensors help the drone to adjust the altitude accordingly during the emergency. Various signals are channelized with the help of routers for effective service. Due to acknowledgements location will be send and tracking the devices will be on the high alert[1].

The quad copter used in this project is composed of the following components:

1.Motor and propellers:

Motors are the main source to drain the battery power on the quadcopter, therefore getting an efficient quadcopter it is very important to have a combination of propeller and motor. Remember that the propellers have to be tighten with the motors and with the propeller assembly. If the propellers slip this will cause erratic behavior in flight. Quadcopter has four motors which are in the same size,

weight and specifications.



Fig.1:Quadcopter

2.ESC:

An ESC is a device that interprets signals from the flight controller, and translates those signals into phased electrical pulses to determine the speed of a brushless motor. In our system the ESC has 4 input terminals, two inputs are for incoming signals from the FC Signal and signal ground are wired to the FC, the 2 heavier wires are for Positive and Negative, and they carry the high current supply to the ESC to motor. The positive and negative terminals are wired to the PDB. An ESC has 3 output terminals, which are connect to the brushless motor[8].

3.Main Controller Board:

It is the brain of the quadcopter because it guides and controls the movements of Quadcopter.

4.Frame:

The frame gives shape, stability, look and structure to the Quadcopter. The frame of a quad copter is the main structure. In the frame skeleton where the rest of components will be attached. Frame is available in varied materials but the frame must be durable, strong and light weight. The most commonly used frames are made from aluminium[7].



Fig.2 : Drone

5. Receiver and Transmitter:

A radio control system consists of two elements, the transmitter in the control room or in the hands of operator and the receiver is in the drone. The drone transmitter will read the inputs and transmits the signals through air to the receiver in the quadcopter. When the receiver receive the command signal it passes the information to the flight controller which controls the movement of the drone.

6. System's Ratings:

- Battery Power:

Three cell Lithium polymer(LiPo)3500mAh Batteries.

- Propellers and Motors:

Four propellers of 10"x4.5" fiber propellers and Brushless out runner type motors of 4 x 1000kv.

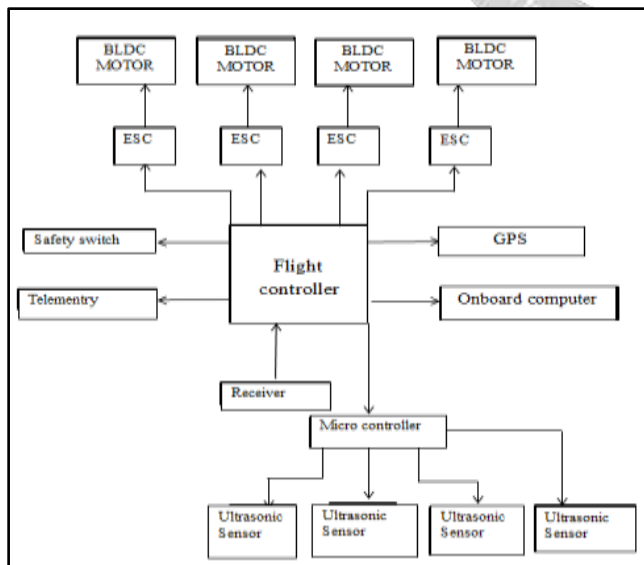
7.GPS(Global Positioning System):

In our project we use GPS[NEO-8M].It consumes low power and highly precision. It has 6 pin connectors. The accuracy range from 0.6 to 0.9meters.It has also onboard compass. In addition it has data-logger for position, velocity, and time.



Fig.3: GPS module

Block diagram of the proposed system.



Testing:

At the starting stage of testing, we have faced many problems such as Take-Off and landing, later we rectified those problems successfully.

We have completed the work; further development is progress such as implementing distance sensor and aerial mappings.

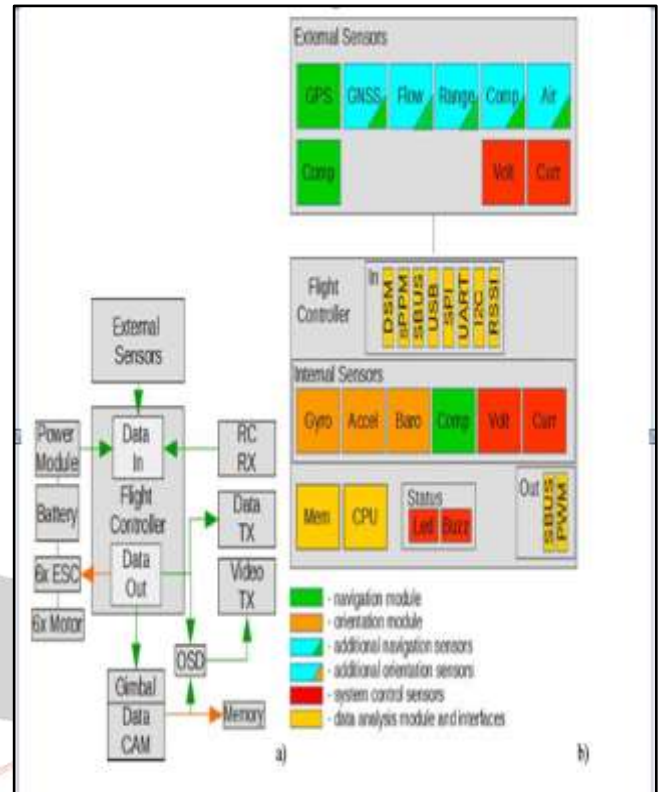


Fig4.:Testing



Fig.5.: Flying

III. RESULT

The experiment is conducted successfully using 2200mah lipobattery. It gives overall flight time of 7 mins approximately as we expected. As a sample of the experiment we have done a sample mission which is held in a campus with some mission plans. We use Mission planning software for monitoring the drone operation. This graph represents the path of the drone and analyzing the height of the drone.

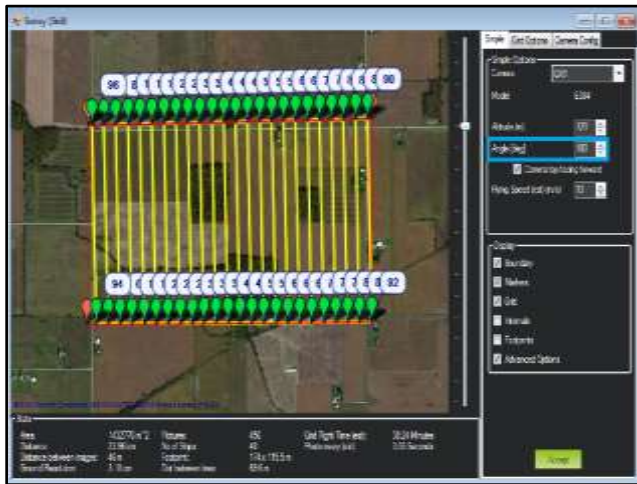


Fig:6 Mission plan

IV. CONCLUSION

This proposal presents a rescue methodology in emergency situations by using a Quad copter UAV. The aerial vehicle is used for scanning the location of the emergency area or crime places by using GPS sensing camera fixed on it. To reduce the number of accidents and crimes, the drone will automatically take off before the police cars or ambulances by scanning the location, and continuously send the video stream of the location and navigation to reach the destinations safely and quickly for help the people. This is very useful for the society and also for people. Drone will covering a large area in short period of time, a drone can help to save a life of person is much more quickly than police or ambulance. This project will help in an rescue operation where the people are suffer in an emergency situation and also women who are faced a critical situation in the society that time our drone will provide a security tracking through GPS location with an advanced technology. This project will help the people to be safe and decreases the crime activities.

Applications:

- It can be used for women safety.
- It can be used for crime situations.
- It can be used for military surveillance.
- It can be used in rescue operation during accidents.

FUTURE SCOPE

Besides these highlights the project team is advanced level possibilities and taking this to the advanced level being a novel idea the project will be highly useful for mankind during crime situations and emergency situations.

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