Quad Copter (UAVs) For Border Security with GUI System

Jinay S. Gadda, Rajaram D. Patil

ME Electronics, Dept. Of Electronics Engg, PVPIT Engineering College Budhgaon.
Assistant professor, Dept. Of Electronics Engg, PVPIT Engineering College Budhgaon, India.

Abstract

The authors are designing the Quad-copter (UAVs) for Border Security with GUI System. Now-a-days the security issues of borders are daily increasing. Terrorist activities, firing, etc. at border are increasing day by day. Monitoring is becoming more difficult and also risk of losing life of soldier is also increasing. So I want to design a unmanned air vehicle which will monitor the border area from long distance. I am using GPS to track the position of intruder or our troops or vehicles. This GPS data will be received by ARM processor and conveyed to observer or controller via zigbee. The Quad-copter is controlled by observer via a IR remote. Observer will fly the Quad-copter from a distance to area which has to be monitored. The Audio-Visual will be transmitted to PC via Wireless camera mounted on assembly. Also recording will be done.

Keywords—Quad-copter, GPS, Zigbee, wireless camera, IR remote, Battery, ARM processor, GUI.

1. Introduction

The military use of unmanned aerial vehicles (UAVs) has grown because of their ability to operate in dangerous locations while keeping their human operators at a safe distance. The larger UAVs also provide a reliable long duration, cost effective, platform for reconnaissance as well as weapons. These UAVs are designed with different filters such as adaptive high-gain extended Kalman filter (AEKF) [1], cost reference particle filter (CRPF) approach in estimating 1-D "tilt" with "Accelerometer" and "gyroscope" sensors for large perturbations [2]. Some quad-copters were design with robust control law to make the elevation & pitch angles of the 3-DOF helicopter practically track the time-varying reference signals that belong to a fixed family of function of time [3]. Also new adaptive law for attitude tracking extended state observer (ESO) were developed for effective compensation for the external disturbances & uncertainty in inertial matrix [4]. Some quad-copters were designed with Unscented Kalman filter (UKF) and an IMU with three-axis accelerometers, gyro meters & magnetometers with GPS receiver for attitude angles estimation [5]. Some designs were with vision system using camera, tracking the object using image processing & also calculating distance between unmanned air vehicle & ground target to control the UAV using computer [6]. Also some quad-copters were designed to the map or monitoring the areas in danger zones, disaster areas, etc. These systems were designed with payload of GPS, CCD cameras, laser scanner mounted on it [7].

The design caught my interest is the smaller UAVs can serve more tactical operations such as searching a village, rivers, surveillance, tracking for enemy positions etc. Smaller UAVs, on the order of a couple feet to a meter in size, should be able to handle military tactical operations as well as the emerging commercial and industrial applications.

It was therefore a vehicle in the one foot to one meter class size with bearable payload of GPS, video camera, zigbee ARM processor mounted on it that caught my interest and is the basis for my project. Although most of the large military UAVs are fixed wing aircraft, I felt that a small UAV should have greater maneuverability and versatility since it was likely to be useful for a broader range of applications than the larger or smaller versions. The quad-copter will meet the goal of producing a small UAV that could perform useful missions in both military and commercial arenas, time and funding constraints forced to design a UAV to meet our functional requirements but not to meet harsh environmental conditions such as those encountered during military missions. However, UAV design certainly could be

re-implemented with newer and more robust technology which would allow it to be used for military functions, surveillance & target tracking. The Quad copter configuration UAV will be capable of being remotely controlled to fly specific pre-determined missions with manual control. Quad-copter will be designed to select a few mission scenarios to show the range of control and monitoring capabilities of such a platform. Such missions might include inspection of a difficult to reach location, rapid deployment video from the location of a fictitious campus incident, or surveillance video from a pre-planned route around campus. As a stretch goal for the project, the quad-copter will be of autonomous/remote controlled flight where the UAV must avoid objects or sustain a flight path in the face of side winds or to find intruders at border. A scenario requiring autonomous/remote controlled flight would be a search and border surveillance, rescue situation where a building has collapsed and the search route is blocked by unknown objects that must be avoided during the search.

2. Quad-copter

Quad-copter can be useful for many applications industrial, commercial, military etc. It is mainly designed for surveillance. It can be also useful for disaster management, land slide, earthquakes, for finding the persons were people cannot reach. Quad-copter also be used for video shooting for movies or collecting evidences for reporters.

At border it is used to detect intruders, land mines, enemy troops etc. keeping our soldier at safe distance.

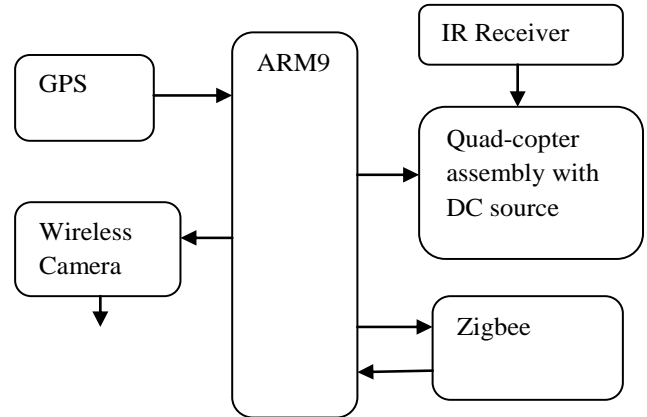# 3. Quad Copter (UAVs) For Border Security with GUI System Design
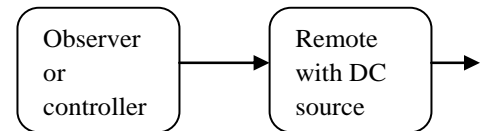

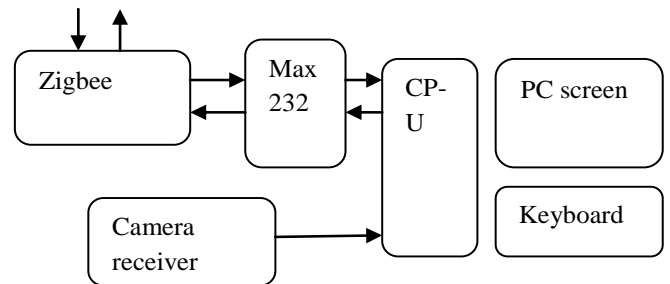Figure1. Quad-copter Assembly

Figure2. IR Remote

Figure3. Receiver with GUI System

A. MCU: (microcontroller unit)

It is the heart of system. All the controlling functions, data transmitting function are done by this unit. Following functions will be carried out by microcontroller unit.

1) Decode the signals from IR decoder & compare with stored value & make decision which function to be executed

2) Data from GPS will be received by MCU & send to server via zigbee.
3) To adjust the camera position.
4) To monitor battery voltage & check whether discharge or not & give information about battery status to server.

B. CC2500 zigbee module:-

Zigbee CC2500 is used as a media for communication between quad copter & pc. Zigbee uses RF link with carrier frequency 2.4 GHz. It is bidirectional with data anti collision protection.

C. Camera:

It is used to take videos of the surrounding environment.

D. Copter assembly:

It is used to fly the unit & take to position where we want. It consists of motors, base, fans.

E. Power supply requirement:

power supply required is 5v dc/2A max. for all system.

F. IR receiver:

It is used to receive the signals from transmitter remote.

G. IR remote:

It is used to send commands to fly the copter.

H. Monitoring side:

1) At this side we will receive the data of position in terms of latitude & longitude given by GPS via zigbee cc2500.
2) This data is given to PC via a max232 ic which is TTL-CMOS, CMOS-TTL converter to PC.
3) PC will contain GUI which will have map of area & through map we will plot position with the help of GPS data.
4) Through camera we are going to monitor the area also recording will be done.

4.   CONCLUSION

Through quad-copter we will be able to monitor the border with a distance & guide our soldier with safety & provide security. Quad-copter can also be used for disaster management

5.   Acknowledgment

6.   References

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