

Quadcopter (UAVs) for Effective Human Resource Management with Full-Duplex Wireless A/V Communication for Academic Utility

Dr. M. Kannan

*Department of Electronics & Communication Engineering
Kathir College of Engineering, Neelambur, Coimbatore,
India*

Annie Shilpa S

*B.E Student
Department of Electronics & Communication Engineering
Kathir College of Engineering, Neelambur, Coimbatore,
India*

Kavya S

*B.E Student
Department of Electronics & Communication Engineering
Kathir College of Engineering, Neelambur, Coimbatore,
India*

Mahesh Kumar S

*B.E Student
Department of Electronics & Communication Engineering
Kathir College of Engineering, Neelambur, Coimbatore,
India*

Abstract

The authors are designing the Quad-copter (UAVs) for monitoring and to transmit information within an institution. Now-a-days information transmission within an institution is done only by human. Information transmitted by mankind will increase the risk of time consumption. Designing an unwanted air vehicle which will monitor and transmit information within an institution, border security, movie shooting etc, from long distance can be a good option. The Quad-copter is controlled by observer via RF control. Observer will fly the Quad copter from a distance to area which has to be monitored and the information to be delivered. The Audio-Visual will be transmitted to Pc via Wireless camera mounted on assembly. Also recording will be done.

Keywords: Quad copter, KK Controller, RF module, 6-channel transceiver, Brushless DC motor (BLDC), Electronic Speed Control (ESC)

I. INTRODUCTION

The use of unmanned air vehicles (UAVs) has grown because of their ability to operate from distance location. The larger UAVs also provide a reliable long duration, cost effective, platform for transmitting information. Some designs were with vision system using camera, tracking the object i.e. ground target following using image processing. Also calculating distance between unmanned air vehicle & ground target to control the UAV using computer [1]. Some quad-copters were designed for 3D-mapping 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 [2]. Also some quad copters were designed for border security with GUI system. This system uses ARM9 processor and controlled via IR remote [3].

The design caught our interest is the smaller UAVs can serve more tactical operations such as searching a village, rivers, surveillance, communication, movie shootings, etc. Smaller

UAVs, on the order of a couple feet in size, should be able to handle surveillance within an institution as well as the emerging commercial and industrial applications.

It was therefore a vehicle in the one foot in size with bearable payload of video camera, 6-channel transceiver, RF module, KK controller mounted on it that caught our interest. Although most of the large UAVs are fixed wing aircraft, we felt that a small UAV should have greater maneuverability and versatility since it was likely to be useful for communication 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 commercial arenas, time and funding constraints, battery backup forced to design a UAV to meet the functional requirements but not to meet harsh environmental conditions. However, UAV design certainly could be re-implemented with newer and more robust technology which would allow it to be used for communication purpose, 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 an institution, surveillance video of an institution and for communicating with the pupils. 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

transmit information to the pupils. A scenario requiring autonomous/remote controlled flight would be a search and surveillance, communicate and when the search route is blocked by unknown objects that must be avoided during the search.

A. QUAD –Copter:

A quad-copter, also called a quad rotor helicopter or quad rotor, is a multi-rotor helicopter that is lifted and propelled by four rotors. Quad copters are classified as rotorcraft, as opposed to fixed-wing aircraft, because their lift is generated by a set of rotors (vertically oriented propellers) [4].

B. QUAD-Copter Assembly:

The quad-copter is designed with, Frames, Propellers, Bluetooth speaker, Mike, Brushless dc motor (BLDC), Electronic speed control (ESC), KK controller, Camera module, Battery. Frames, propellers, mike, Wireless camera are assembled. Bluetooth speaker is assembled with the quad-copter which has the SD card slot inbuilt.

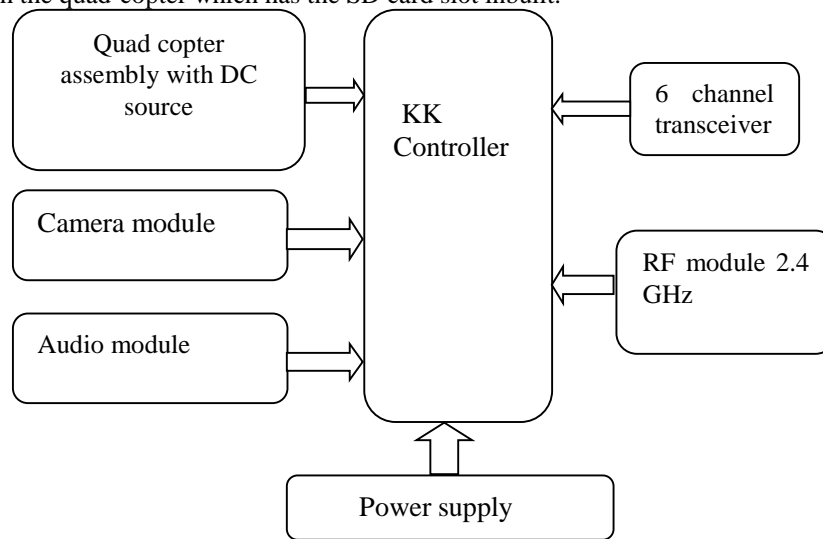


Fig. 1: Quad copter assembly

II. HARDWARE

Quad copter, Brushless dc motor (BLDC), Electronic speed control (ESC), KK controller, Wireless camera, RF module, and 6 channel transceiver.



Fig. 2: Quad copter design

A. KK Controller:

It is the heart of system. All the controlling functions, data transmitting function are done by this unit. At the heart of the KK2.1 is the AT Mega 644PA 8-bit AVR RISC-based microcontroller with 64k of memory [5].

Following functions will be carried out by KK controller unit.

- KK controller board consists of ON board LCD display, ESC pins, receiver pins.
- Load motor layout is used to select the correct configuration of the quad copter.
- ESC and sensor calibration can be done. The safe mode notification is shown in the LCD display after when the power is applied.



Fig. 4: Electronic speed control

1) Features:

- Forward/Brake with Reverse or Forward/Brake settings
- 100A continuous current with 540A peak
- Four LEDs to indicate functions
- Losi EC3 power connector pre-wired
- High-speed cooling fan for lower running temperatures and protection
- Two preset drive profiles with unlimited potential with a PC.

D. Battery:

The industry standard is lithium-ion polymer (Li Po) batteries. Relatively lightweight, compact, and offering high discharge rates, Li Pos are well-suited for multi-rotors.

E. Camera Module:

It is used to take videos of the surrounding environment (monitoring).

F. RF Module:

RF transceiver module which provides easy to use RF communication at 2.4 GHz. It is used to control the Quad-copter through RF remote. It works in Half Duplex mode i.e., it provides communication in both directions, but only one direction at same time [7].



Fig. 5: RF module

1) Features:

- Receiver frequency 433MHz
- Receiver typical frequency 105Dbm
- Receiver supply current 3.5mA
- Low power consumption
- Receiver operating voltage 5v
- Transmitter frequency range 433.92MHz
- Transmitter supply voltage 3v~6v
- Transmitter output power 4v~12v

G. 6 Channel Transceiver:

6 channel transceiver is used as audio transceiver. The used 6 channel transceiver in our design is Fly sky fu-t6 2. 4 GHz digital proportion 6 channel transceiver.

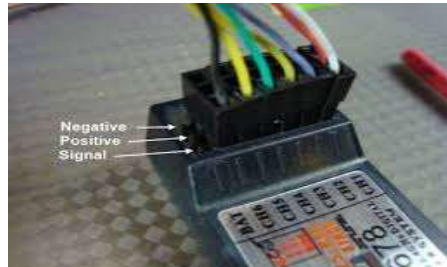


Fig. 6: 6Channel Transceiver

})Features:

- 6 channel 2. 4GHz transmitter with servo reversing.
- Easy to use control for basic models.
- Includes 6 channel receiver Trainer system option.
- This system must be programmed via PC cable.

III. APPLICATIONS

- Quad-copter is used for industrial, commercial, military etc.
- It is mainly designed for surveillance.
- It can be also useful for disaster management, landslide, earth quakes for finding the persons were people cannot reach Quad-copter can also be used for shooting purposes, conferences and also collecting evidences for reporters keeping them at safe distance.

IV. CONCLUSIONS

Through quad-copter will be used to monitor the corner with a distance & guide our soldiers with safety & to provide security. Quad-copter can also be used for disaster management at the time of floods, earthquakes, landslide, in laboratories where it is difficult to reach. This quad-copter will also be able to shoot the videos & record it for film industries. Quad-copter is also used for managing road traffics & accident recording.

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