

QUADCOPTER VIDEO SURVEILLANCE AND CONTROL USING COMPUTER

**Prem Kumar.P¹, Amirtharaja.S², Harie. S³,
Kishore Rohy.S⁴, Kiruba.V⁵**

¹Professor & Head of Dept., of EIE, K.S.Rangasamy College of Technology, Tiruchengode, (India)

^{2,3,4,5}UG Students, Dept., of EIE, K.S.Rangasamy College of Technology, Tiruchengode, (India)

ABSTRACT

In the past decade Unmanned Aerial Vehicles (UAVs) have become a topic of interest in many research organizations. UAV can engage in finding a unusual objects and they can perform their surveillance. Unmanned Aerial Vehicle (UAVs) is controlled from the control room. Now a day's UAVs used in many sector like rescue, cost guard etc. The project expose that the UAV is controlled to surveillance the desired location and the information of the location and the activities are send thorough the mini cam built in the UAV. The capturing clips are simultaneously displayed in the connected computer according to the command. The received Clips of the surveillance location is also been saved. The commands given to the UAV receiver is a human command rather than the machine command. The receiver in the controller fetch the commands and they act according to that. Quadcopter can be controlled or they can travel automatically by encoding the map pattern. Quadcopter changes direction by manipulating the individual propellers speed and does not requires cyclic and collective pitch control. Here the project explains by handling manually through the computers instead of the RC. They can perform their action only within the limited distance. The Quadcopter can perform their mission at any risk places and based on the risk factor no humans are injured or killed.

Keywords : Quadcopter, Microcontroller, Wireless Camera, RF Transmission and Receiving

I.INTRODUCTION

The quadcopter is a unique type of UAV which has the ability of Vertical Take Off and Landing (VTOL). The quadcopter has an advantage of maneuverability due to its inherent dynamic nature. Quadcopter has advantages over the conventional helicopter where the mechanical design is simpler. Besides that, Quadcopter changes its direction by manipulating the individual propeller's speed and does not require cyclic and collective pitch control. The

Quadcopter configuration will also be capable of being remotely controlled to fly a specific pre-determined area such as used for surveillance from a pre-planned route around campus

The quadcopter control requires joystick or a remote controller to control it. But we use computer for controlling the quadcopter. The monitoring process is also done by the computer instead of using separate display. Controlling of the quadcopter using separate control is a tedious process and it requires more practice. But, the control by the computer is an easy process as it requires less practice. The quadcopter can be controlled by varying the speed of the four rotors and no mechanical linkages are required to vary the rotor blade pitch angles as compare to a conventional helicopter.

The main applications include they can used for rescue missions, in military for discovering the mines by using certain metal detector in the quadcopter and made them fly over the area, in film making, in agriculture and others. Nowadays in most of the developed and developing countries UAVs especially quadcopter is being used in Coast Guard maritime search and rescue mission.



II. PROJECT OVERVIEW

The ultimate goal of the project is to create a live aerial video feed which can be sent to the computer for the surveillance purpose. This technology can be used for search and rescue operations, fire fighting, law enforcement, military, news reporting and filming by being able to deploy aerial correspondence much faster than normal ones. The results in providing digital video signal to the computer which will pave us a way for future expansions such as UAV sentience, target tracking and video compression. There are many components to this project and we must decide which areas will be developed by ourselves and which areas will be implemented with many other products.

III. FLIGHT PLATFORM

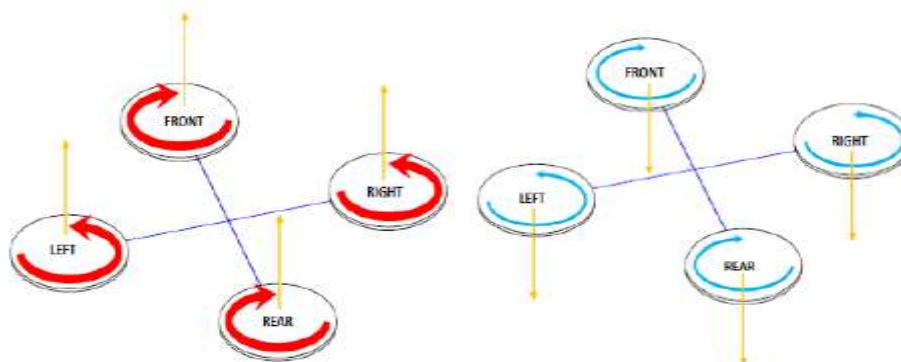
There are various types of quadcopter platforms for designing methodology. The project objective is to reduce the cost of the already existing methods and make the quadcopter comfortable and user-friendly. The frames or arms of the quadcopter are made of fibres to reduce the weight of the vehicle. So, the quadcopter design is based on the embedded system platform. In embedded system, it consists of microcontrollers which control the overall performance of the quadcopter such as flying mechanism and live streaming of the videos. After the microcontroller, the electronic speed controller (ESC) is to be used to control the propeller speed depending on the signal from the computer. The power supply for the quadcopter is given by the battery. As the application is surveillance it requires long life battery which is capable of giving power for longer duration more than 45 mins. Lithium polymer battery satisfies our requirement. These requirements make sure that the quadcopter maintains stable flight while moving or hovering.

IV. FLYING MECHANISM

Quadcopter can be described as a small vehicle with four propellers attached to rotors located at the cross frame. This aim for fixed pitch rotors are used to control the vehicle motion. The speeds of these four rotors are independent. By independent, pitch, roll and yaw attitude of the vehicle can be controlled easily. There are six major operations or movements which have to be controlled. They are Take off, Landing, Forward, Backward, Right and Left motion.

4.1 Take-Off and Landing Motion Mechanism

Take-off is the movement of a quadcopter that lifts up from the ground to a hover position and a landing position is the reverse of the take-off position. Take-off (landing) motion is controlled by increasing (decreasing) the speed of four rotors simultaneously, which means changing the vertical motion. The take-off and landing motions of a quadcopter are shown below.

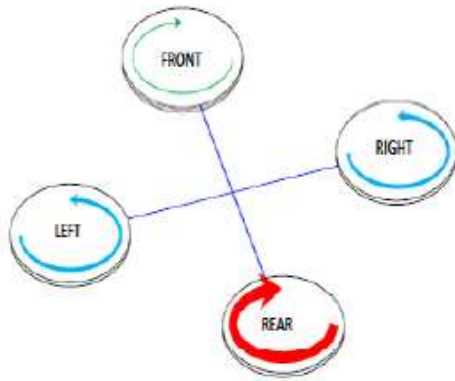


Take off Motion

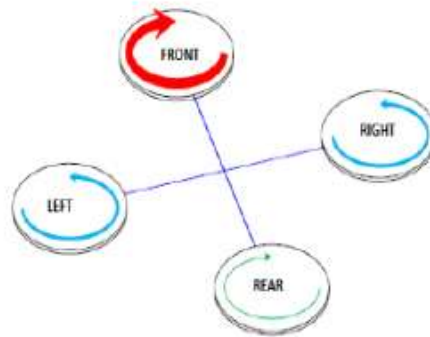
Landing Motion

4.2 Forward and Backward Motion

Forward (backward) motion is control by increasing (decreasing) speed of rear (front)rotor. Decreasing (increasing) rear (front) rotor speed simultaneously will affect the pitch angle of the Quadcopter. The forward and backward motion of the quadcopter is shown in below respectively.



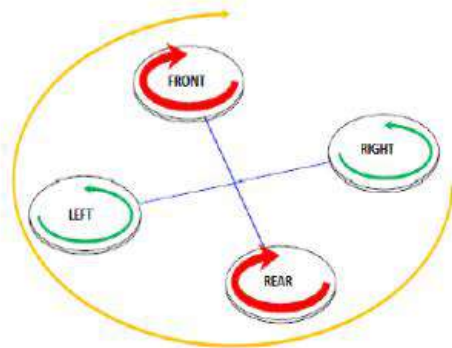
Forward Motion



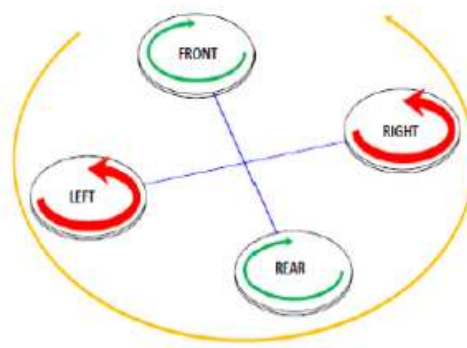
Backward Motion

4.3 Left and Right Motion

For left and right motion, it can control by changing the yaw angle of Quadcopter. Yaw angle can control by increasing (decreasing) counter-clockwise rotors speed while decreasing (increasing) clockwise rotor speed. Figure below shows the right and left motion of Quadcopter respectively



Right Motion

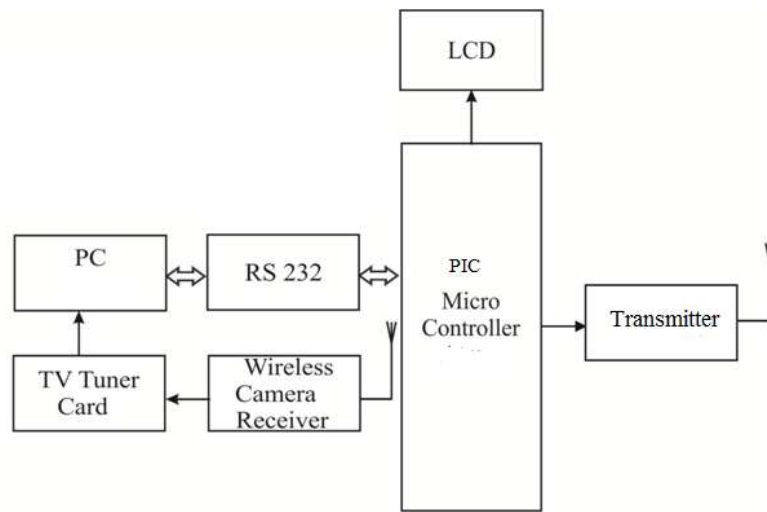


Left motion

V. BLOCK DIAGRAM

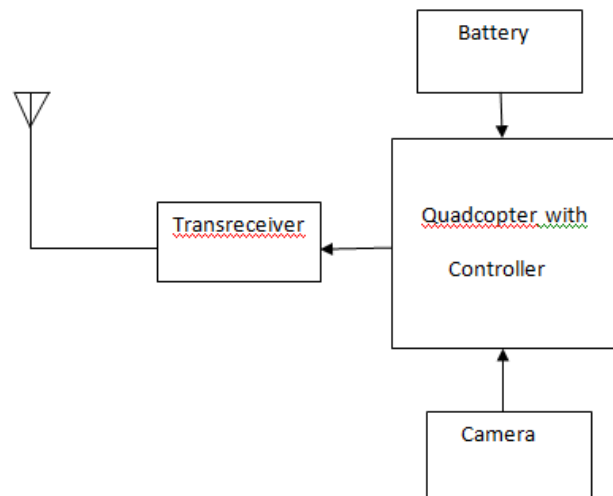
The computer side consists of Personal Computer , Micro controller, RS 232 and TV tuner cards. Initially, the control from the computer is decoded using microcontroller and is send to the quadcopter through the transmitter.

On receiving the video signal from the quadcopter system, the TV Tuner card helps to live telecasting of the video. Here RS 232 Cable acts as the communication channel between the microcontroller and Computer.



Computer Side

Quadcopter side consists of the quadcopter module which has speed controller , wireless camera and Power supply i.e Battery. The wireless camera records the video signal and sends to the computer as the radio signal. The ESC is used to control the speed of the propellers and the power required by the whole system is supplied by the Battery.



Quadcopter Side

VI. VIDEO RECORDING AND TRANSMISSION

The choice of video system is one of the most crucial decisions for the project. The camera needs to be light enough so that the unmanned aerial vehicle can fly unabated and compact enough so that it does not interfere with the landing gear and rotors. The video transmission system must also be able to transmit a suitable distance over open space without any interference or losing signal. For this design criteria, consider 100m to be a suitable range.

VII. CONCLUSION AND FUTURE WORK

The project going to play a major role in civilized countries. In all civilized countries surveillance of the terrestrial areas is very important. The core intension of the project is to study the complete designing process of quadcopter from the engineering prospective and improving their balancing and stability system. The main goal of the project is to use that quadcopter for the civil surveillance and live telecasting of the video obtained. This will also be able to shoot the videos and record it for the film industries, managing traffics and other applications.

Quadcopter will be able to do surveillance by live recording the video and provide security for selected areas. Our work is do implement the wireless camera in that quadcopter to record the video and dual antenna to transmit the acquired video signal to the control room. The future work consists of developoing a prototype that controls the quadcopter by using computer instead of Remote to reduce the complexity in flying control.

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