FIGHTER QUADCOPTER CONTROL USING COMPUTER SYSTEM

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Abstract

This research is developed for military rescue mission for target tracking and minimize the loss of military solders and also reduce the man power. This project mainly based on remotely control via computer system. The Quadcopter is controlled through graphical user interface (GUI). Communication between GUI and Quadcopter is done by using wireless communication system. The Quadcopter balancing condition is sensed by F3 controller and CC3D, 6DOF sensor. For smooth landing, Quadcopter is equipped with ultrasonic sensor. All signals from sensors are processed by Arduino Uno microcontroller board. Output from Arduino Uno microcontroller board used to control Quadcopter propellers. GUI is designed using Visual Basic 2008 Express as interface between control base and Quadcopter. The experiment shows that Quadcopter can hover with maintain it balancing and stability. Quadcopter can accept load disturbance up to 400g (without battery) during it hover condition. Maximum operated time of Quadcopter is 10-14 minutes using 1500mAh 25c Lip (4s ready) battery and operate time can be increase by using largest battery capacity. Quadcopter with camera 1000TVL w/low light.

Keywords- *Quadcopter, Microcontroller, Wireless Camera, Lesser Gun, RF Transmission and Receiving, Computer System.*

I Introduction

Research and development of unmanned aerial vehicle (UAV) and micro aerial vehicle (MAV) are getting high encouragement nowadays, since the application of UAV and MAV can apply to variety of area such as rescue mission, military. Quadcopter operated by thrust that produce by four motors that attached to it body. Quadcopter or quad rotor aircraft is one of the UAV that are major focuses of active researches in recent years. Compare to terrestrial mobile robot that often possible to limit the model to kinematics, Quadcopter required dynamics in order to account for gravity effect and aerodynamic forces. Quadcopter has advantages over the conventional helicopter where the mechanical design is simpler. Besides that, Quadcopter changes direction by manipulating the individual propeller's speed and does not require cyclic and collective pitch control.

II Existing System

In existing system, Quad copter can be controlled automatically by encoding the map pattern. UAV can engage in finding an unusual objects and they can perform their surveillance. Unmanned Aerial Vehicle (UAVs) is controlled from the control room. The commands given to the UAV receiver is a human command rather than the machine command. The received Clips of the surveillance location is also been saved.

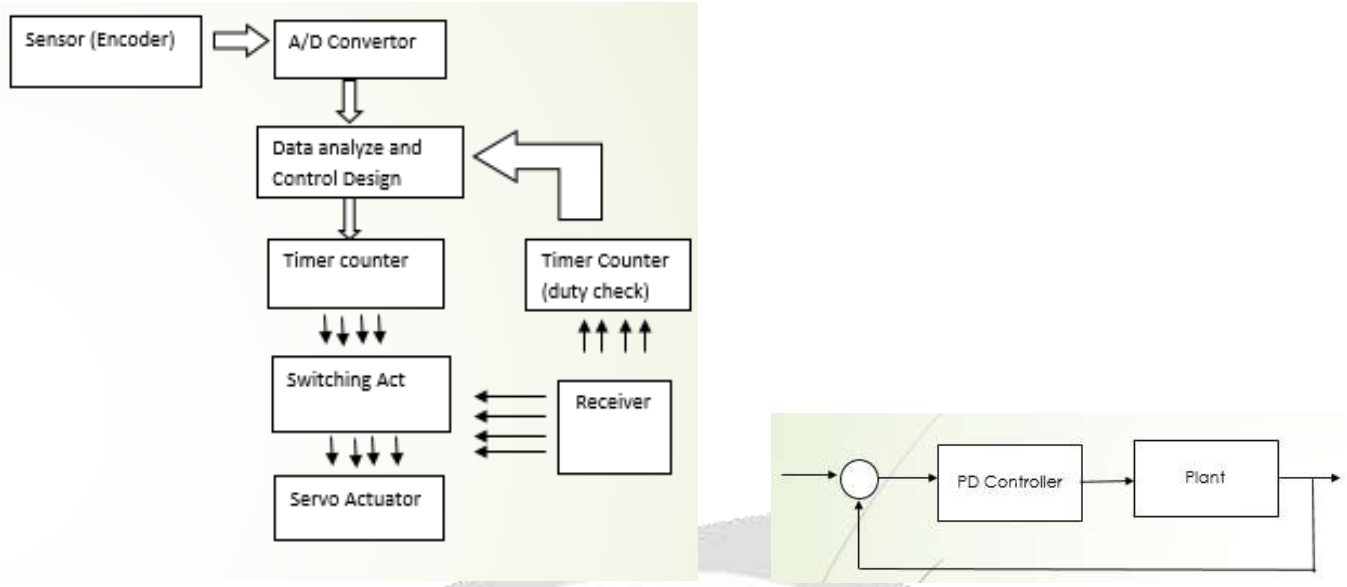

Figure 1. Flow of existing System

III Proposed System

In this approach, provide an application which allows to find out the specific target and if it found then shoot and injured them via laser gun by controlled using computer system with GUI. A significant challenge in developing Fighter quadcopter is to extract and fuse the useful information in a robust manner and to provide stable flight and an accurate navigation. 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, 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. Following are the module in the proposed system:

A. Admin : In this module, Admin control the all the system and monitor all the things in mission including beginning to end.

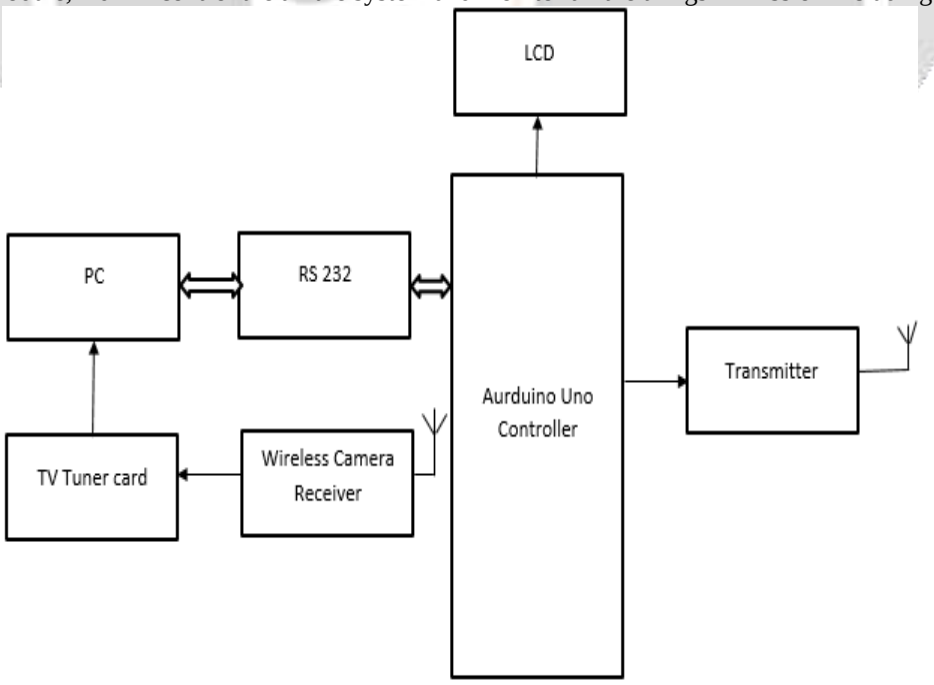

Fig (a). Computer Side

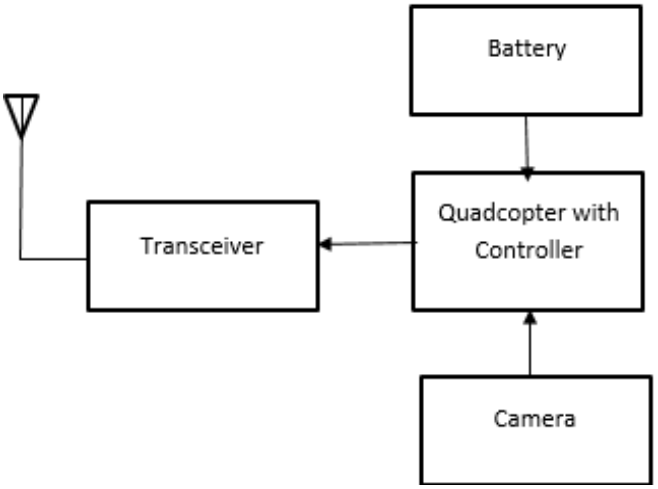

Fig (b).Quadcopter Side

Fig. Flow diagram of the proposed system

IV Algorithm

1. Start
2. Assembly all parts on Quadcopter Body
3. Test GUI communication with controller board
4. Test runs brushless motor by GUI
5. Test each motion of Quadcopter (left, right, reverse and forward)
6. If quadcopter can perform design motion then, go to step 7
7. Apply some disturbance during Quadcopter hovering
8. Else, ESC and Brushless motor programming in first stage
9. Go to step 6
10. If quadcopter maintain it balancing then, go to step 12
11. Else, F3 and 6-DOF Programming
12. End

V Mathematical Model

Where,

U1 = sum of the thrust of each motor

Th1= thrust generated by front motor

Th2= thrust generated by rear motor

Th3= thrust generated by right motor

Th4= thrust generated by left motor

m = mass of Quadcopter

g = the acceleration of gravity

l = the half length of the Quadcopter

x, y, z = three position

θ, ϕ, ψ = three Euler angles representing pitch, roll, and yaw

The dynamics formulation of Quadcopter moving from landing position to a fixed point in the space is given as:

$$Rxyz = \begin{bmatrix} C\phi C\theta & C\phi S\theta S\psi - S\theta C\psi & C\phi S\theta S\psi + S\theta S\psi \\ C\phi S\theta & S\phi S\theta S\psi - C\phi C\psi & S\phi S\phi C\psi - C\phi S\phi \\ -S\theta & C\phi C\psi & C\phi C\psi \end{bmatrix}$$

Where,

R = matrix transformation

$S\theta$ = Sin (θ), Sϕ= Sin (ϕ), SΨ= Sin (ψ)

$C\theta$= Cos (θ), Cϕ= Cos (ϕ), CΨ= Cos (ψ)

By applying the force and moment balance laws, the motion equation are

given in Equation (3.2) till (3.4) and Pythagoras theorem is computed as Figure 3.12.

$\ddot{X}$= u1 (CosϕSinθCosψ + SinϕSin) – K1ẋ/m (3.2)

$\ddot{Y}$ = u1 (SinϕSinθCosψ + CosϕSin) – K2ẏ/m (3.3)

Z= u1 (CosϕCosψ) -g – K3__/m (3.4)

Where,

Ki = drag coefficient (Assume zero since drag is negligible at low speed)

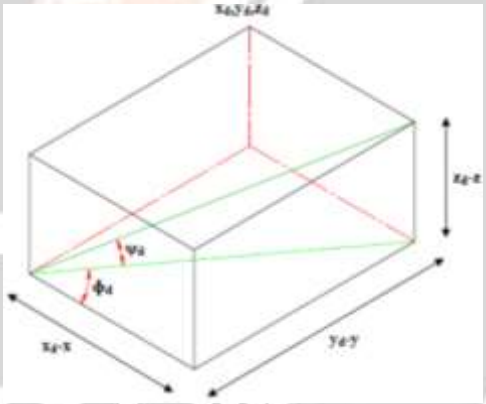

Fig. Angle movement of Quadcopter

Quadcopter have four controller input forces U1, U2, U3, and U4 that will affects certain side of Quadcopter. U1 affect the attitude of the Quadcopter, U2 affects the rotation in roll angle, U3 affects the pitch angle and U4 control the yaw angle. To control the Quadcopter movement is done by controlling each input variable. The equations of them are as below:

$$U \begin{cases} U1 = (Th1 + Th2 + Th3 + Th4) / m \\ U2 = l(-Th1 - Th2 + Th3 + Th4) / I1 \\ U3 = l(-Th1 + Th2 + Th3 - Th4) / I2 \end{cases}$$

Where,

Thi = thrust generated by four motor

C = the force to moment scaling factor

Ii = the moment of inertia with respect to the axes

Then the second derivatives of each angle are:

$\ddot{\Theta} = U_2 - lK_4\Theta/I1$

$\ddot{\Psi} = U_3 - lK_5\Psi/I2$

$\ddot{\phi} = U_1 - lK_6\phi/I3$

VI Conclusion

This project, mainly developed for the military application, this project minimize the loss of man power and also protect human life in multiple dangerous environments. This project mainly developed for safety and security purpose. This project totally control by computer system.

VII Future Scope

In Future we are trying to provide more security to army by implementing our device along with wide rage and maximize battery power. Also it should be used in navy and air force. Also with reducing size it can be send to place where human ever gone.

VIII Acknowledgment

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