High Speed Vision based Navigation of A Stabilize Quadcopter

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ABSTRACT
The real problem about war field is human victims in terrorist attack. So this problem solved by designing the quadcopter which involves wireless camera and a laser gun. This quadcopter are the used as fighters against terrorist in danger areas. This quadcopter is radio frequency operated and do the task i.e. FORWARD, BACKWARD, LEFT RIGHT,UP and DOWN.

A wireless camera has been placed on it, so people can see live video and stored on a laptop or pc that is located up to 100 meters to track the enemy wirelessly when required. A laser gun placed on it so that it can fire on terrorist when required.The movement of this robot is wirelessly controlled by RF transmitter to send command to the RF receiver placed on the moving quadcopter. RF 2.4GHz transceiver are used for the remote control.The kk2.1.5 board is used for flying and landing quadcopter in stable manner.

This quadcopter is used in star hotels, shopping malls, jewellary show rooms etc where there can be threat from intruders or terrorists.

Keywords
Kk2.1.5 Board,Laser Gun,Wireless Camera,Wireless Remote Control,Quadcopter

1. INTRODUCTION
A high speed vision based navigation of a stabilize quadcopter, which will save soldier's life in border area, when war is going on and to minimize human casualties in terrorist attack. Many time millitary soldiers need to enter into the hazardous area just to track enemy activities which is very risky for soldiers. Such dangerous job could be done using small quadcopter. This quadcopter must be capable of flying and landing in stable manner. The quadcopter must be capable to storing and logging data. This project created a platform to learn about unmanned aerial vehicles such as a quadcopter.This expands the scope of the electronic and telecommunication engineering education to include the control and the understanding of the electronic components.

The quadcopter has many applications that we are interested to develop like mapping and reconnaissance especially in a disaster and dangerous area. It also open up the possibilities to broaden the understanding and applications of control systems, stabilization and computer image processing as it applies to the quadcopter .A laser gun is placed on quadcopter so it can fire on terrorist wirelessly when required.

A wireless camera has been placed on it, so people can see live video and stored on a laptop or pc that is located up to 100 meters to track the enemy wirelessly.

Fig 1:Vision Based Quadcopter

2. SYSTEM OVERVIEW
2.1 Quadcopter
The aim of this project is to control the quadcopter with wireless technology. For this design two boards. One is transmitter and second is receiver which is placed on the quadcopter.

In the transmitter, after pressing the buttons accordingly some data will transferred from RF communication and the receiver will receive the data. According to the command, the quadcopter will perform task like FORWARD, BACKWARD, LEFT and RIGHT.And through the wireless camera, the receiver receive that information an that store on the hard disk of pc. KK2.1.5 acts as a flight control board for multi-rotor aircraft. Its aim is to stabilize the quadcopter during flight.KK2.1.5 is the atmega 644PA 8-bit AVR RISC-works on microcontroller having 64k of memory.The KK2.1.5 Multi-Rotor controlles the flight of multi-rotor quadcopter.Its aim is to stabilize the quadcopter during flight and for this , it takes signals from the 6050 MPU gyro/acc(roll, yaw and

pitch) and sends these signals to the Atmega 644PA IC,which processes that signals according the users selected firmware of Quadcopter and passes the signals to the ESC and that will make appropriate adjustments to the motors speeds which in-turn stabilizes the craft.The KK2.1.5 Multi-Rotor control board also uses signals that comes from radio receiver and passes these signals to the Atmega644PA IC via the aileron,elevator,throttle and rudder user demand inputs. After completion of processing, this information is pass to the ESCs which adjust the rotational speed of every motor to control quadcopter like up, down, backwards, forwards, right, left,

yaw. A 2.4Ghz wireless remote will be used to control the physical movements of the quadcopter.

Configuration software is provided to calibrate the boundary conditions. A Six pin ISP connecter is provided to load the user configuration to the KK2.1.5 board. A wireless camera interfaced will add a vigilance feature which is the main application of the proposed system.

3. SYSTEM CONTROL

3.1 Movement mechanism

Quadcopter consist of a small vehicle with four propellers attached to rotor located at the plus frame.This aim for fixed pitch rotors are use 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 control easily.

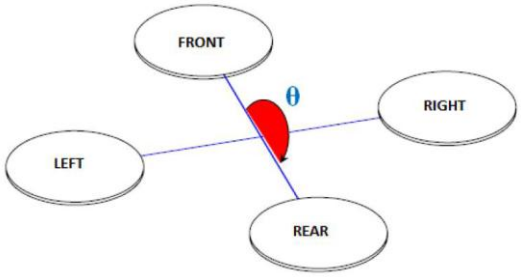

Fig 2: Pitch direction of Quadcopter

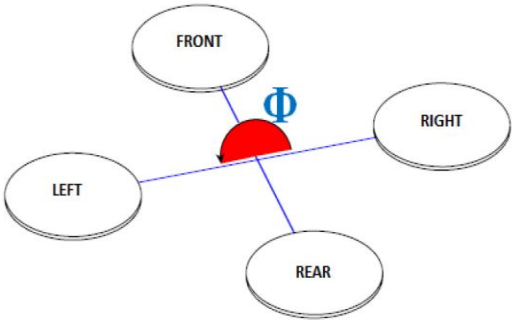

Fig 3: Roll direction of Quadcopter

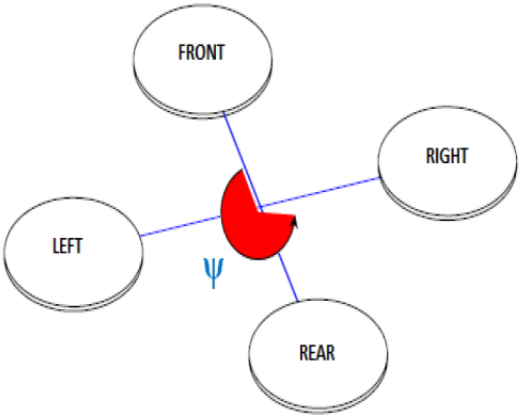

Fig 4: Yaw direction of Quadcopter

Quadcopter have four inputs first one is thrust that produced by the propeller.These thrust is control by the speed of each rotor.

3.1.1 Take-off and landing motion

Take-off and landing motion Take-off is movement that lift up from ground and landing position is lift down. Landing (take off) motion is control by decreasing (increasing) speed of four rotors simultaneously.

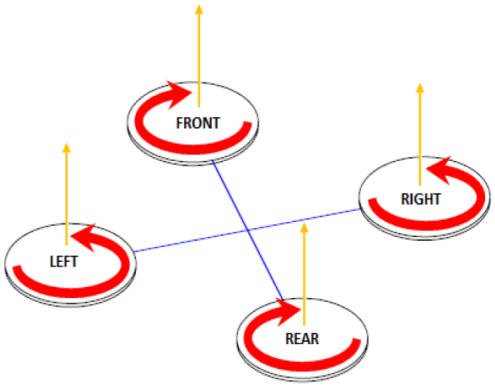

Fig 5: Take-off motion

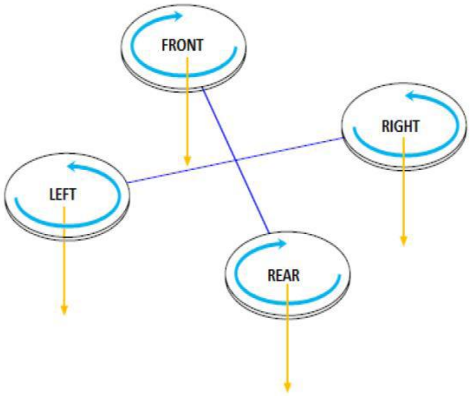

Fig 6: Landing motion

3.1.2 Forward and backward motion

Backward (forward) motion is control by decreasing (increasing) speed of front (rear) rotor. Decreasing (increasing) rear (front) rotor speed simultaneously will affect the pitch angle of the Quadcopter.

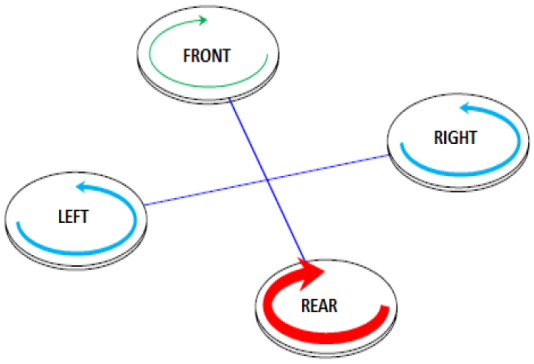

Fig 7: Forward motion

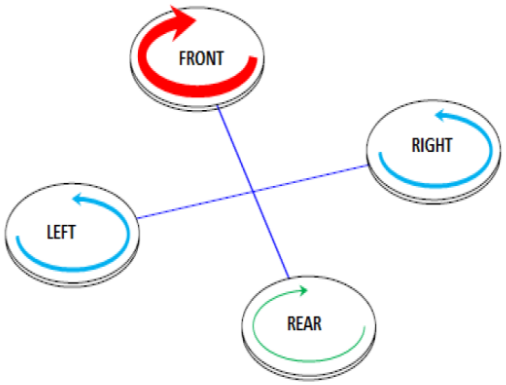

Fig 8: Backward motion

3.1.3 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.

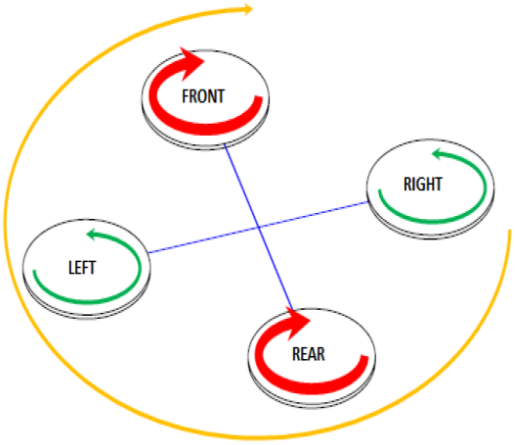

Fig 9: Right motion

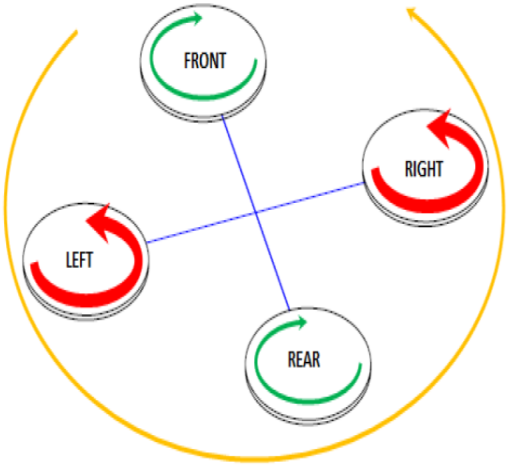

Fig 10: Left motion

4. SYSTEM DESIGN

4.1 kk2.1.5 multi-rotor controller

The actual KK gyro system is upgraded to the sensitive 6050 MPU system. Heart of the KK2.1.5 is the atmega 644PA 8-bit AVR RISC-based microcontroller with 64k of memory. The total of 8 motors to be controlled.

4.2 2.4Ghz transceiver remote

An RF Module is a usually small electronic circuit used as transceiver radio signals on one of a number of carrier frequencies.

4.3 Wireless camera with receiver

Wireless CCD camera, this type of cameras are commonly available in the market. The camera has a receiver, which is mounted on quadcopter. Its output signals are in the form of video.This camera captures the video signal and transmit those signals to the camera receiver that are connected to a computer.

4.4 High speed BLDC

Brushless DC motor known as electronically commutated motors are motors which are powered by a DC electric source which produces an AC electric signal to drive the motor.

4.5 Laser high directive 5V dc

A laser is a device that transmit light from a process of optical amplification based on the stimulated emission of electromagnetic radiation. Lasers allows to transmit light with a very narrow beam.

4.6 NiCd battery

The nickel cadmium battery is a type of rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes.Ni-Cd batteries are in a different capacities. This is reusable battery and it has a longer total lifetime.

4.7 Electronic speed controller

An ESC is an electrical circuit that controls the electric motor and the direction a motor rotates. A motor turns because of the magnetic forces created by the windings and the magnets within the motor.

4.8 Transmitter section

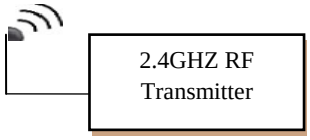

Fig 11:Control unit

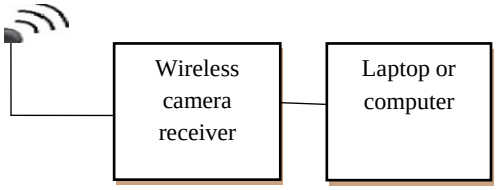

Fig 12:Monitoring unit

Controller Unit consists of the radio controller through which the operator can control the movement of the quadcopter from the distant place which is convenient to the operator. This radio controller cover distance up to 100m. To control the quad copter, we have used 6 channel radio controller system. This controller works on the frequency range of 2.4GHz & the

FM modulation technique is used. The programming prototype used is GFSK.

Monitoring system is mounted at the safe place from where the operator can easily monitor and analyze the data that has been received.The camera receiver module is connected at the monitoring system to receive the information. This is directly connected to the hyper terminal of the computer i.e. PC or the Laptop is interfaced for the display purpose.

4.9 Receiver section

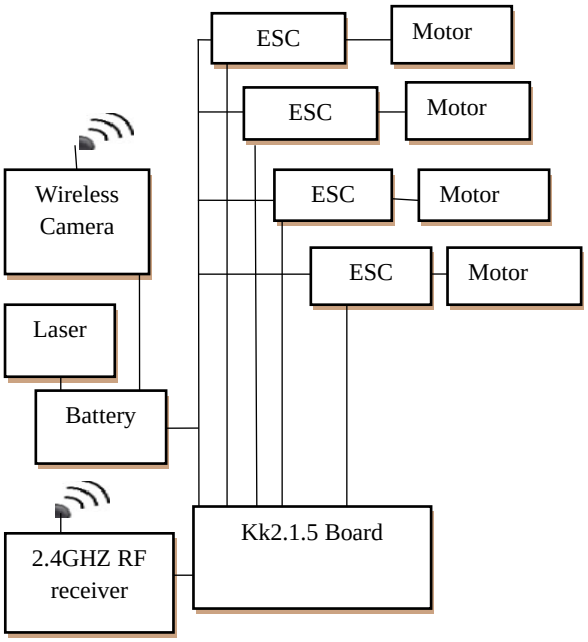

Fig 13: Quadcopter unit

The quadcopter built up of 4 BLDC motors, 4 propellers, 4 ESCs and the KK2.1.5 board used to control the overall operation of the quad copter. There is laser gun which is used for fire on enemy when required.This quad copter is controlled by the remote and can be sent to the remote locations from which we want to gather the information.

5. FLOW CHART

Whenever we start power supply of quadcopter camera will be ON.RF receiver will check that any instruction is came or not if yes,then it will do task as per instruction come from transmitter otherwise quadcopter will move in the same direction in which previously the quadcopter is moving.If command received for activation of laser then quadcopter activate the laser and fire on enemy.Then all the data capture by wireless camera will be send to pc wirelessly.

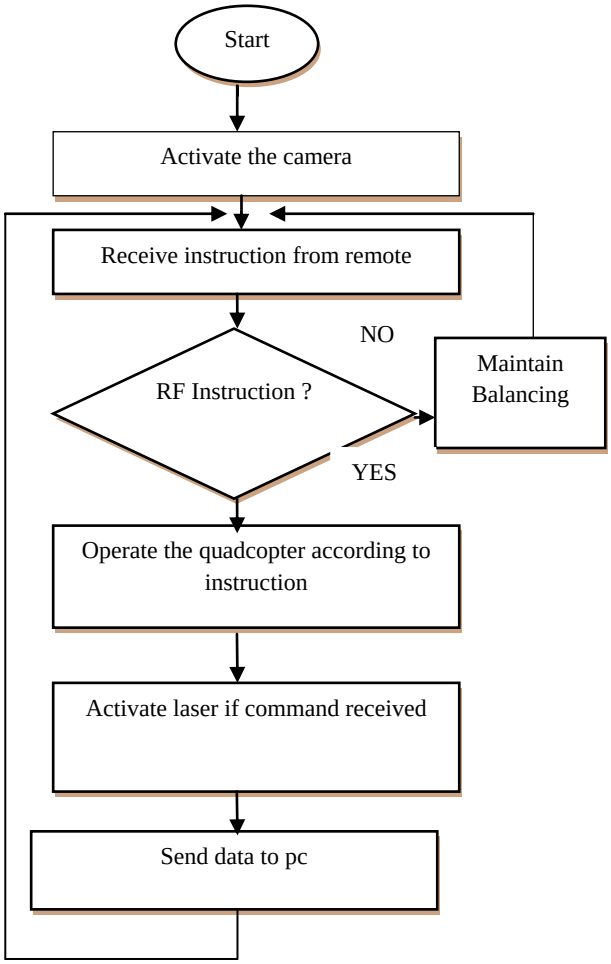

Fig 14:Flow chart

6. CONCLUSION

The primary need for this project would be accuracy.This project able to view the things accurately that are currently happening in the surrounding area. In this control units RF signal is used.The signal is encoded and send through transmitter. In the receiver end that received signals are decoded and given as input to rotate the motor.A video transmitter mounted on top of the quadcopter helps us to see the path of motion.Kk2.1.5 board make quadcopter stable, robust and reliable.

7. FUTURE SCOPE

- By using zig bee+ Wi-Fi,connect the system directly to the internet. Through the internet control the system via remote location.
- By using voice recognition system,control the project on commanding in voice.
- Easily operated by Cellphones by implementing DTMF system.
- By implementing GPS system, the detection of robot can be easily determined

8. ACKNOWLEDGMENTS

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