ISSN No:-2456-2165

Drone (Unmanned Aerial Vehicle) for Surveillance

Taraprasad Shadangi[1]
MIT ADT UNIVERSITY
Loni, Pune, Maharashtra

Anand Kumar[2]
MIT ADT UNIVERSITY
Loni, Pune, Maharashtra

Umang Verma[3]
MIT ADT UNIVERSITY
Loni, Pune, Maharashtra

Mahesh Kamthe[4]
Prof., MIT ADT UNIVERSITY
Loni, Pune, Maharashtra

Dr. Upasani Dhananjay[5]
MIT ADT UNIVERSITY
Loni, Pune, Maharashtra

Abstract:- This paper is on a project related to unmanned aerial vehicles in which we have added a feature to a quadcopter drone by attaching a wireless A/V camera to the frame of a drone. This project will be really helpful for disaster management and on using upgraded components this can also be used for military purposes. In this project we have combined different electronic devices for getting different output results. It has many advantages, one of them is the price of this drone is cheap as compared to its features and quality. This project will open doors for many solutions for the modern problems in society like the government will get to know about traffic related situations and it can also be used in examination centres to get an overview of actual surroundings to avoid malpractices. The paper includes the details about the components used and about the working of the drone. The paper contains the future scope and benefits of such vehicles which will lead the nation towards development.

Keywords:- *KK2.1.5 Flight Controller, FS CT6B, Motors, Wireless A/V CAMERA.*

I. INTRODUCTION

Quadcopter- As the name suggests that it has 4 wings or motors, the frame of this aerial vehicle is designed like a “plus” or “X” sign. The weight of this is carried with the help of four motors and propellers attached to each motor.

In a quadcopter one pair of motors rotate in clockwise manner and the other one rotate in counterclockwise. The diagonal motors will rotate in the same direction and its adjacent motors will run in opposite directions and this design is needed for counter balance so that the drone will get stability. Each rotor generates the required amount of thrust needed as an output to lift the quadcopter.

A drone has many capabilities, it can perform those tasks which humans can’t do or we can say a drone can enter those areas where humans can’t. For example : In extreme climatic conditions, high altitude, can be used for surveillance purposes in high alert areas, for rescue operations. The main parts of the drone includes a flight controller which controls the RPM of the motors with respect to the input provided, then comes four motors, propellers and electronic speed controller.

The remaining paper is ordered as: section II is about system overview of the proposed system. Section III is about basic details of different modules and components used for the system. Section 4 gives working of the system using KK 2.1.5 flight controllers. Section V is about the future scope of the system. Section VI is the result, precaution and conclusion.

II. SYSTEM OVERVIEW

The system consists of a Flight controller KK2.1.5, transmitter, receiver, Lipo battery, camera, electronic speed controllers, motors and frame.

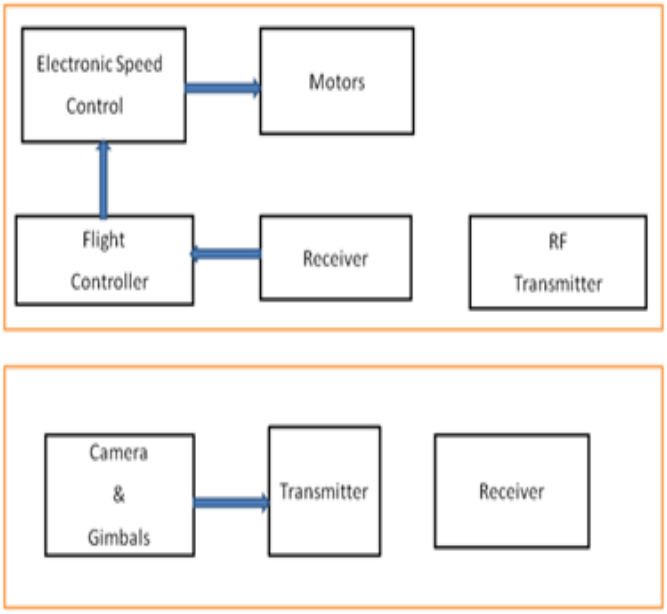

Fig 1

III. COMPONENTS

A. *Flight controller KK2.1.5*

The flight controller which we have used is the KK 2.1.5 GPS flight controller. It has features like inner damping, barometer, 6 axis accelerometer and many more. We have used F4 processor. The program for this is written in ATMEGA 16 chip microcontroller. The specifications of this microcontroller are as follows:

- It has 40 pins
- 131 powerful instructions
- 16 kb programmable flash memory
- Static RAM of 1 kb
- EEPROM of 512 bytes

KK2.1.5 flight controller has an LCD display, 8 motor outputs, voltage sensor, 5 control inputs, it requires an input voltage between 4.8V to 6V. The flight controller works with the help of radio signals. The pilot transmits radio signals with the help of a remote controller, the drone has a receiver and with the help of that receiver it receives the radio signals and follows the given instructions and directs the speed of the motors.

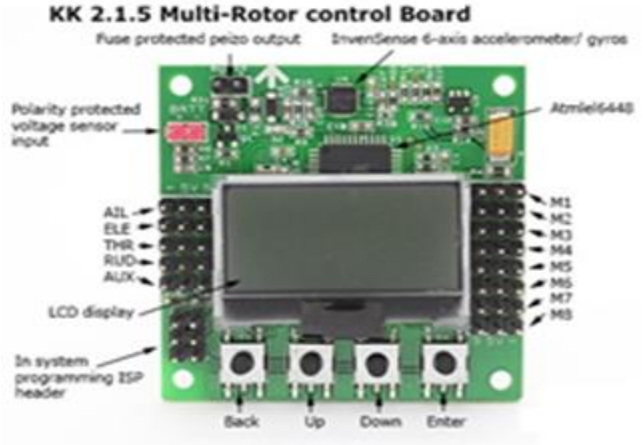

Fig. 2:- Flight Controller

Microcontroller	Atmega 664PA
Operating voltage	1.8-5.5V
Input voltage	4.8-6.0V
Gyro./Acc.	MPU 6050
Memory	64KBytes
Signal from Receiver	1520us(5channels)
Signal to ESC	1520us
Pin count	44
Software required	Pre-installed
Size	50.5mm X 50.5mm X 12mm

Table 1:- Specifications of KK2.1.5

B. *ELECTRONIC SPEED CONTROLLER*

Fig 3:- Internal Circuit of Electronic Speed controller

Every motor is connected with an electronic speed controller. It provides required current to the motors and also controls the speed and rotation of motors. An electronic speed controller is made up of voltage regulator which distributes power to motors as well as flight controller without this the motor will take all the power from the battery, field effect transistors for switching purpose and processor which translates the instructions provided by the transmitter to the receiver for regulating the power of the motors.

Fig 4:- Electronic Speed Controller

Output	25 A
Input	35 A
Weight	24 Gms
Input voltage	2-4 cell lipo battery
Max speed	2 pole - 210k rpm

Table 2:- Specifications of Electronic Speed Controller

C. *BRUSHLESS (BLDC) MOTOR*

These are lightweight and compact. These motors consist of neodymium magnets. One advantage of these motors are they can provide maximum air thrust and have low weight.

ISSN No:-2456-2165

Fig. 5:- Brushless motor

These motors can provide a large amount of torque efficiently and can work very smoothly. It consists of magnets attached to an armature which spins and inside which it has electromagnets which helps in generating magnetic fields when the switch is on and helps to rotate the armature. It has two main parts one is the rotor which has rotor magnets and the other one is the stator consisting of stator winding. Advantages of BLDC motors are they produce less noise during operation, low maintenance, more reliable, no sparking, high performance.

Specification of the motors used for this project are as follows:

- RPM/V - 1200KV
- Weight - 124.75g
- Power Source - DC
- Current - 7 to 16 A
- Efficiency - 82%
- Dimension - 22*10mm

D. PROPELLERS

Propellers are also named as wings of the drone. In this project we have used propellers made up of plastic. There are two sets of propellers used while making Quadcopter Drone one is for clockwise and the other one is for counterclockwise.

The main role of the propellers is to lift the weight of the drone and to give direction to the drone during flight.

Fig. 6:- Propellers

Specification of the propellers used for this project are as follows:

- Length - 8inch 200mm
- Weight - 20.4g
- Diameter-0.9 inch
- Price - 1.45$

E. BATTERY

The battery used in drones is made up of lithium polymer. According to a survey a 5000mAh battery has a flight time of 18 minutes. The battery used in this project is rechargeable and consists of 3 cells. These types of batteries have good temperature control and also have minimum weight.

Fig 7:- Lipo battery

Parameters	Specification
No. of cells	3
mAh	2200 mAh
Output Voltage	11.1V
weight	153 gms
Price	21.19$

Table 3:- Specifications of Lipo Battery

F. RADIO TRANSMITTER & RECEIVER

We have used 2.4 Ghz transmitter and receiver in our project. The transmitter which we have used is of FlySky CT6B and the receiver used is FS-R6B. The receiver has 6 channels. The transmitter requires 12V power supply to operate and it has space to insert 8*AA size battery. Advantages of using this product are it has high quality and is more stable, it can be programmed by PC with the help of T6config software, it covers the entire bandwidth, very low power consumption, has high receiving sensitivity. Some features of this product are it has an USB socket,8 model memory, digital control.

ISSN No:-2456-2165

Fig. 8:- Transmitter & Receiver

Transmitter	**FS CT6B**
Antenna length	25mm
Bandwidth	500Khz
Transmitter Weight	509 gms
Receiver weight	49gms
Voltage required	12V DC
Price	35.76$

Table 4: Specifications of Transmitter and Receiver

G. FRAME

A frame provides support to all the other electronic components. The frame is made up of glass fibre which makes it tough and durable. The product which we have used in this project is Q450 frame. The arms of the frame have proper thickness which provides the motors a hard platform. These arms are made up of polyamide nylon. The Q450 frame also consists of a printed circuit board where we have shouldered our electronic speed controller and battery. The advantages of using Q450 are it is easy to assemble or disassemble, it has proper space for mounting the camera also, the frame is flexible, durable and has good strength.

Fig. 9:- Drone PCB Frame

Product Name	**Q450**
Shape	X
Frame made up of	Glass Fibre
Width	450mm
Height	51mm
Weight Of Q450	327 gms
Arm Size(L*W)	222*40
Price	13.9$

Table 5:- Specifications of Drone Frame

H. Wireless A/V CAMERA

A Camera is used for live streaming & capturing images during a flight of drones. There are many types of cameras for the purpose_like professional, racing HD cameras.

Fig 10:- Camera for Surveillance

Transmitter range	**200ft**
Pixel	PAL:628*582
Frequency Control	0.9G/1.2G
camera sensitivity	18dB
Source For camera	9V DC
Power Consumption	<=400mW
Price	25.82$

Table 6: Specifications of Camera

ISSN No:-2456-2165

IV. WORKING

Quadcopter is a device which has a combined principle and mixture of electronics and mechanical. quadcopter. Quadcopter has four motors, the diagonal motors rotate clockwise and the adjacent ones rotate counter clockwise. The propellers and motors push the air downward.

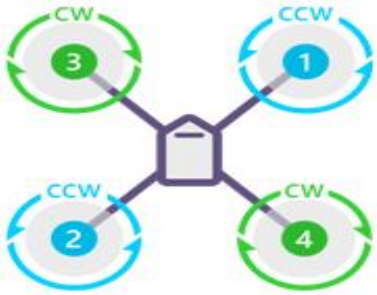

Fig 11

The above figure shows the layout of motors placed in a quadcopter. The reason behind we turn the motors in different directions is because when a motor spins it creates an angular momentum in the opposite direction of its spinning. This is according to Newton's third law that every action has an equal and opposite reaction. For example motor 4 rotates clockwise and motor 1 spins counter clockwise then the direction of both angular momentum will be opposite and they will cancel out and this will result in balance or stable state. And this is also a reason that quadcopter do not spin about their axis.

The direction in which the flight is moving depends on the speed of the motor. The direction in which you want to make the drone fly keep that side motor's speed maximum and the opposite side motor's speed should be minimum.For example: If I want to move my drone forward then motor 1 and motor 3 should have maximum speed and the rest two motors minimum.

V. FUTURE SCOPE

Drones are nowadays used in many fields such as in agriculture, medical fields, for surveillance purposes in industries or in prisons, to rescue people during disasters and in future drones will open doors for many solutions and can be used to make work easier. One of the major fields where drones can be used is for disaster management. Engineers are developing many more features like ability to protect the drone from fire, chemicals etc. and this is going to create many opportunities in drone technology. Drones can also be introduced for irrigation purposes, In India Andhra Pradesh Government is using drone technology for keeping an eye on Polavaram Irrigation Project. Similarly, the US is using drones for military purposes and these drones can also carry war related weapons. These drones can fly over a range of 24,140km and can fly at a maximum altitude of 30000 ft. There is a demerit in these drones that they have a fear of cyber attack, so in future such problems can be solved. Drones are also useful for delivery purposes, few companies which are using drones for this purposes are United Parcel Service, Amazon, DHL, etc. These services use drones to fly autonomously and deliver goods within 30 minutes of order. Recently we all are in a pandemic for corona disease, everybody is locked down and during this time drones can be very useful for delivering essential goods without physical contacts.

VI. OUTCOME/RESULT

We have completed the whole project in a week and the total cost of our project is 225.16$. We have tested our project and the results are as follows:

- The weight of the total project is around 1.75Kg.
- Without a camera the drone reached at a height of 50 ft.
- The maximum speed calculated is 80.07 mph
- The battery has a flight time of around 10 minutes.

Fig 12:- Quadcopter Drone

The above figure is the actual view of our Quadcopter. With the help of this project we can get live video as well as audio of the surroundings.

VII. PRECAUTIONS

- Before switching ON the KK2.1.5 make sure the Transmitter is in ON condition.
- Do the receiver test that is making sure the Aileron, Elevator, Rudder, throttle, Aux pins are all equal to zero.
- At last, check if all the motors are rotating with equal speed or not if you are increasing the Throttle value.
- Make sure that the Lipo battery is fully charged up to 11.1V
- Lipo batteries are highly dangerous, there is a chance for it to explode if they are overcharged. So be careful while charging them.
- Don't leave it unattended while charging.

VIII. CONCLUSION

In many places humans are not allowed to enter as they can have their life in risk in that condition this drone can be sent for surveillance purposes or can be used for aerial photography. This drone can withstand extreme temperature and can go to high altitude. This project can be used in military and defense for surveillance at the border as a part of border security force and this will reduce the deaths of our soldiers in borders.

REFERENCES

[1]. R. Banga “Building a Quadcopter using KK 2.1.5 Flight Controller” in Instructables published on June 27th, 2015.
[2]. International Journal of Scientific and Research Publications, Volume 4, Issue 9, September 2014 1 ISSN 2250-3153
[3]. School of Science Mat-2.4108 Independent research project in applied mathematics Espoo, August 22, 2011
[4]. Korey "How to Build a Quad copter" in My First Drone.published on February 22nd,2014.
[5]. Clym Montgomery "Multi-Rotor, First-Person view, And The Hardware You Need"in tom shard ware published on June 3
[6]. D Damle & S Roy. (March 23, 2018) India's Proposed No-Fly Zones for Drones Will Do More Harm than Good, the wire, retrieved from: https://www.thewire.in/government/indias-proposed-no-fly-zones-for-drones-will-do-more-harm-than-good