Design and Implementation of Quadcopter for Surveillance Application

Dr. Nagesh K N [1], Professor and HOD
Department of Electronics & Communication Engineering
Nagarjuna College of Engineering & Technology
Bengaluru, India

M. Kiran mayee[2], Student
Department of Electronics & Communication Engineering
Nagarjuna College of Engineering & Technology
Bengaluru, India

Shaik Altaf [3], Student
Department of Electronics & Communication Engineering
Nagarjuna College of Engineering & Technology
Bengaluru, India

Siddaram jagadi [4], Student
Department of Electronics & Communication Engineering
Nagarjuna College of Engineering & Technology
Bengaluru, India

D Vaishnavi [5], Student
Department of Electronics & Communication Engineering
Nagarjuna College of Engineering & Technology
Bengaluru, India

Abstract:- The main purpose of the project is to design and implement a system that will be useful for surveillance applications. Surveillance is the process where a particular object or place or a thing is closely observed. Quad-copter, an unmanned aircraft system consisting of Camera, Brushless DC motors, Accelerometer, Gyroscope, Propellers, controller together form an Ariel vehicle, which is used for the surveillance work. This Quad-copter is also used in the military reconnaissance, Commercial usage, Civilian application and in many more industrial and rescue missions. In this project we are designing and developing a semi-autonomous quadcopter capable of self-sustained flight via wireless communication while using a micro-controller board and controlling the motions of the quadcopter remotely by observing the streaming video along with joystick. The project designed with low complexity, hence cost effect would be minimized.

Keywords:- KK Multicontroller Board, DC motors, ESC's, Propellers, Sensors.

I. INTRODUCTION

A quad-copter is an unmanned aerial vehicle capable of flying autonomously. These can be controlled remotely via a remote-control system (RC), though controlling aircraft autonomously or semi-autonomously is constantly monitored. This movement of the aircrafts without any interference of a person inside it can be done through the pre-programmed flight, which uses global positioning system, it also depends on it and it can be achieved by combination of ultrasonic sensor. Various UAV sizes and shapes can be chosen. Most benefited application is in Military, but these unmanned aircrafts are also implemented in various applications. A unique kind of UAV's which uses four-fixed rotors is Quad- copter, per axis two rotors are used (each axis is aligned orthogonally with the other), the lift is powered by four motors and propel the aircraft. By changing the speed of the motors, the scheme of controlling a Quad-copter is done with respective to each other, also the forces of the Quad-copter wants real time movement of the motors. To obtain a balanced flight, integration of the control system is needed and a kk controller board will give the control algorithm and will be able to receive and send commands. Till 1996 UAV Quad-copter was used only in military applications. When the improvement of advanced capable electronics, which ranged very powerful, very less weight microcontrollers to very small sensors with better required accuracy and precision, we can design a quad-copter with requires sizes and can be used for different applications. Several advantages are there for A Quad-copter when compared to the other unmanned aircrafts such as its quality of moving freely even in the stiff wind and its functionalities and the power in controlling the speed of the motors for the required one. Also, these aircrafts make less harm to the humans, as we added protective frames to cover the exposed propellers. By these aircrafts we can even eliminate many fire accidents, explosions and electrical based incidents. These aircrafts also used to avoid criminal activity and others.

II. RELATED WORK

M. Alwateer, S. W. Loke and N. Fernando [1], As drones are way more useful in civilian applications these are mostly networked, enabling their remote programming setup and in the control of humans. However, drones are limited to their capable carriage weight and battery power is limited too. With use of nearby devices (i.e. with additional smart resources other than drones' abilities) and controlling multiple drones is more convenient method to overcome these limitations in advance. With the study programmable crowd-powered drones, involving two key concepts for combining drones and smartphones or a smart device as a crowd-powered resource cloud is detailed. In particular, this study focuses on crowd-sourcing for drone computations which are complex, and multi-drone data

processing management using an advanced scripting language for coordinated flight paths of multiple drone's technology.

J. Engel, J. Sturm and D. Cremers [2], Low cost quadcopter builds and which can be controlled through the smart devices from the ground is studied in this paper, which features autonomous navigation in unknown GPS environments. They have used three major components in the system, to navigate using simultaneous localization and mapping all the components are calibrated and set for detecting accurate data. Kalman Filter for data processing and error correction, for data fusion and for state estimation. For generation of commands proportional–integral–derivative controller. A PID controller is used for which it calculates an error value e(t) continuously. Mapping all the data we can obtain a scale of generated visual map with all the altitude measurements. We studied the system which is able to navigate in unknown environments with proper scale and it is obtained without the use of external sensors. Its robustness in communication, use of SLAM tech, accurate navigation is studied.

N. Yamamoto and N. Uchida [3], High performance drone technology is studied. Which are having high vision cameras and all the flight control sensors like gyroscope, IR sensors, Global positioning system and a video processing unit. Stable Flight is obtained by manual operations by human control. As the human sight is not so accurate and range is low detailed study of automated drone control is useful. Study of multiple drone data processing and sensor calibration is obtained for secured flight control. The study of performance evolution is done. This drone has the ability to recognize the patterns using its built-in camera and by processing the captured image. A study on frame rate of 100 msec per frame is done.

J. R. Cauchard *et al* [4], Studied all the various tasks offered to the people using drone technology such as photography, surveillance and increase the social context. Studied about the interface design that is used by the user with ease and without any complexity in a natural manner. This was the first drone which has general graphical user interface which is used by normal person. Studied the design process of drone inputs and outputs. The full-fledged functional prototype in guiding scenario is studied. The simple user training technique is also studied in this paper. The way of human robot interaction is clearly studied in this paper.

I. Bae [5], The study of replacement of person with a machine is done. The mobility factors are referred in detailed. The telepresence platform that resembles the social humans of drone piolet design is studied. The extensions for the drome capabilities are detailed. Portability and compatibility are mainly focused. Easily manurable drone designs are studied in in this. Adding head and arms to the quadcopter design is explained clearly in this paper
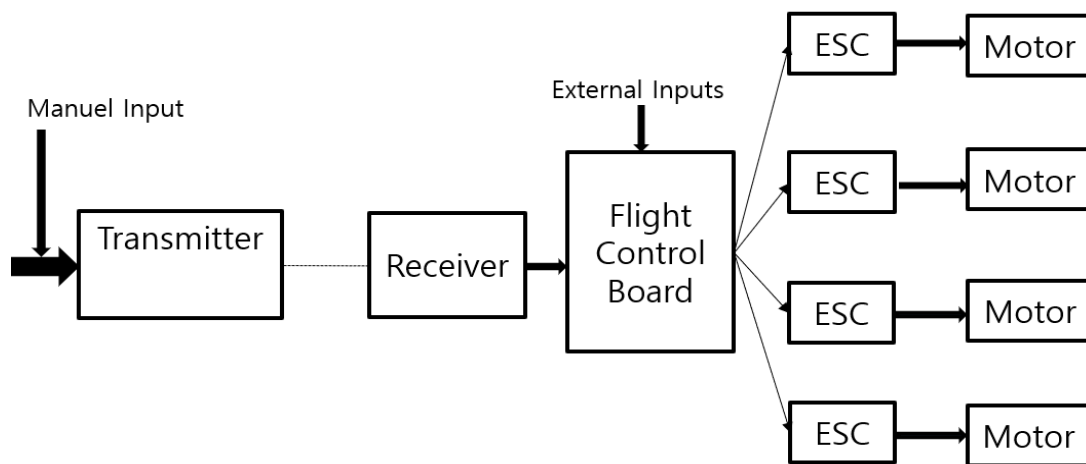
III. METHODOLOGY

Fig 1:- Layout of Surveillance quadcopter

The layout of the surveillance quadcopter in fig 1 shows the algorithm in which overall working of the quadcopter is shown. As of first when the user inputs or directions are given, they are received by flight control board through transmitter. All the information will be transmitted to the ESC's (Used to run the motors in the required speed), and from there to the DC motors. The rotation of motors and the propellers make the quadcopter to hover. The sensors present in the KK board, Accelerometer and the gyroscope (used to know the tilt of the drone).
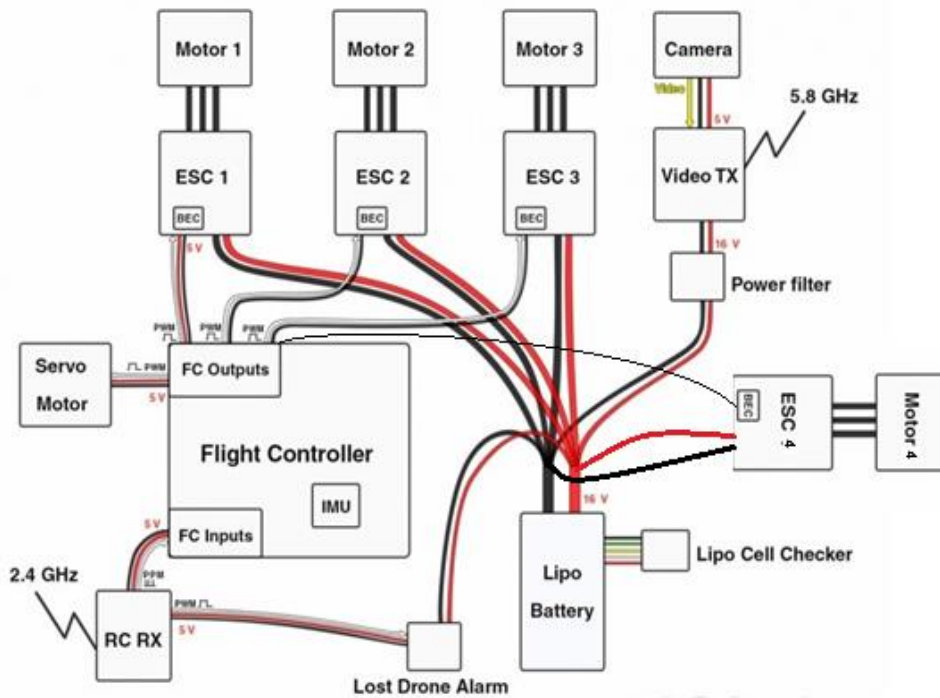
Fig 2:- System Architecture

The KK multi-controller, connected by the receiver and transmitter through the wireless remote controller. All the four electronic speed controllers are connected to the KK board, which are used for controlling the speed of the DC motors ,which are connected to the ESC's, When we want the drone to fly for surveillance work, first we have to send information to the KK board, through the transmitter and then controller sends the information to propellers, esc's and the motors through the sensors used like gyroscope and the accelerator. The user, who is using the remote can send the directions, in which drone have to move and all the operations will be performed manually by wireless remote.
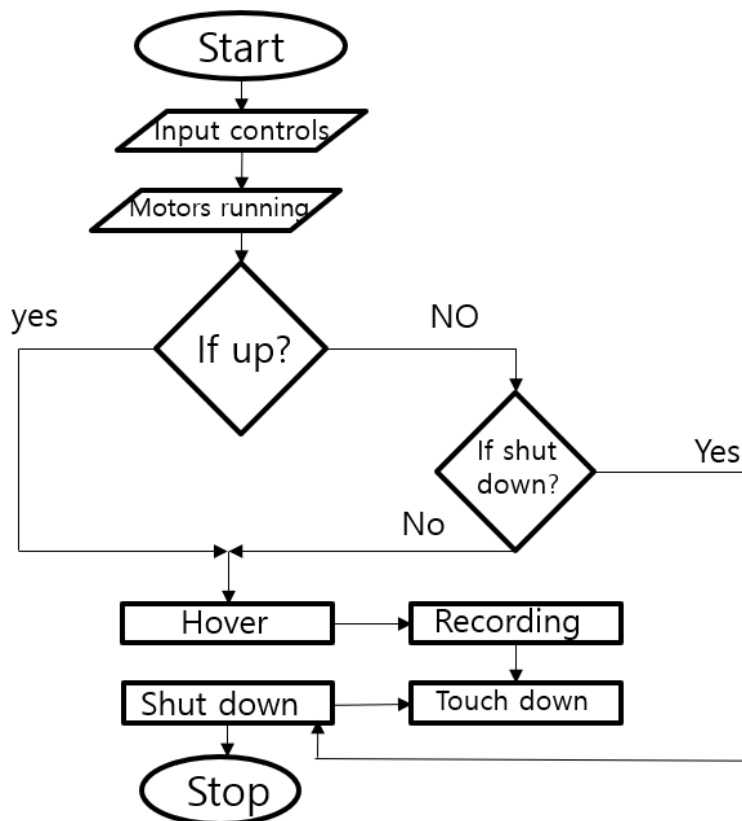

Fig 3:- Data flow diagram

IV. WORKING

The combination Electronics, Mechanical will make the Quadcopter work and mainly depends on the principle of Aviation. As stated, its main intention is to take care of a plane on the wing, these four forces operate the plane on the wing are arranged. The motion of the air is compared to the generated plane two types of these forces. lift is the first one. The force which is produced will be directed towards up and can act at right angles to the movement of the plane. The plane is maintained within the air. is the Drag being the second one. It is applied in the opposite direction to the movement of the traditional plane. This is because of opposing breaking action of the air on the horizontal and is against the advance of the plane. As this maintenance of the horizontal is by the action of the air due to the displacement of the aircraft, the lift and also the drag are referred to as aerodynamic forces. This force is due to gravity, the load of the plane, is meant to the lift. The balance of the lift and also the load results in constant altitude within the plane. To confirm that the plane continues to maneuver forward, it is necessary to produce a opposite force that compensates for the force called drag. This force is termed as the thrust. System of propulsion of the planes will generate thrust, the engines. Within the case of the flight is at cruising speed, the role of the engine is thus to make amends for the force of drag, but not to make the plane mount. On the opposite side, at the time of take-off, the altitude of flight is obtained by the employment of engine power.

V. CONCLUSION

The "Surveillance Quad-copter" is a highly helping system with the help of the wireless remote controller And we can the live video over the areas which ever we want to observe. It can also able to take the pictures by the camera, whenever user gives the commands. This also helps to keep a record of details of the incidents that happened at the wanted areas. It will give us the live video and audio transmission from the areas where we cannot go and access the information. Overall specifications tell that all approaches will be trying to provide better result in terms of quality of the video and picture detection.

REFERENCES

[1]. M. Alwateer, S. W. Loke and N. Fernando, "Enabling Drone Services: Drone Crowdsourcing and Drone Scripting," in IEEE Access, vol. 7, pp. 110035-110049, 2019.

[2]. J.Engel, J.Sturm and D. Cremers, "Camera-based navigation of a low-cost quadrocopter," 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems, Vilamoura, 2012, pp. 2815-2821.

[3]. N. Yamamoto and N. Uchida, "Improvement of Image Processing for a Collaborative Security Flight Control System with Multiple Drones," 2018 32nd International Conference on Advanced Information Networking and Applications Workshops *(WAINA)*, Krakow, 2018, pp. 199-202.

[4]. J.R. Cauchard *et al*, "Drone.io: A Gestural and Visual Interface for Human-Drone Interaction,"2019 14th ACM/IEEE International Conference on Human-Robot Interaction *(HRI)*, Daegu, Korea (South), 2019, pp.153-162.

[5]. I. Bae, "Avatar drone: Drone as telepresence platform with 3D mobility," 2016 13th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), Xi'an, 2016, pp. 452-453.