Unmanned Aerial Surveillance and Mapping System

Hitesh Sagar[1], Kartik Kaul[2], Vishal Srivastava[3], Mohd. Mohsin Khan[4] and Navneet Sharma[5]

([1-4]Student, [5]Sr. Assistant Professor, Electronics & Communication Engineering, ABES Engineering College)

ABSTRACT: In the fifth industrial revolution, unmanned aerial systems (UAS) are gaining much more attention in research organizations and private sectors. UAS can participate in the search for unusual objects and can be used to map, deliver, monitor, and much more. Unmanned Aerial Systems (UAS) are controlled by the Ground Controlled Station (GCS), be it the mobile application or the desktop/laptop computer. Today, unmanned aerial systems (UAVs) are used in many industries such as emergency rescue, coast guard, cartography, together with real-time monitoring, offering real-time wi-fi coverage, faraway sensing, and supply of goods, safety and surveillance, precision agriculture and civil infrastructure inspection, etc. The project reveals how we can use a UAV to monitor the target various activities sent through the UAV's integrated wireless camera. Captured clips are displayed simultaneously on the connected computer. The instructions given to the UAV handset is a human command as a substitute of the machine command. The UAV handset receives the instructions, and the microcontroller interprets, and moves the UAV based on the commands.

***Keywords*—UAVs, Quadcopter, UAS, Micro-controller, Wireless Camera, Radio Transmission, Radio Reception, GCS, VTOL.**

I. INTRODUCTION

A UAV is a flying robot that works in coordination with the data provided via GPS and other sensors such as a magnetometer, barometer, Lidar, etc.

The quadcopter is an exclusive type of unmanned aerial system. It has the ability to take off and land vertically (known as VTOL). The quadcopter has a mobility benefit attributable to its fundamental energetic nature[1]. The quadcopter has benefits over the standard heli-copter because the mechanical idea of the quadcopter is uncomplicated. In addition, Quadcopter adjusts its course by exerting the rate of the only rotor propeller and requires no collective and cyclical keep watch over of the pitch. The quadcopter will likely be managed by altering the rate of the 4 rotors suitably and the absense of mechanical connections [2].

II. PROJECT OVERVIEW

The last word purpose of the project is to craft a live aerial video circulation that might be dispatched to the pc for surveillance purposes, which is able to pave the best way for future expansions reminiscent of UAV sensitivity, goal tracking, and video compression. There are a lot of formula of this mission and we have to choose which areas we can expand ourselves and which areas will likely be applied with various different products.

III. FLIGHT PLATFORM

There are a few sorts of quadcopter stages to structure the system. The point of the undertaking is to decrease the expense of existing techniques and make the quadcopter agreeable and simple to utilize [1] [2]. The frames or arms of the quadcopter are made of low-density plastic composite material to cut back the load of the drone. Thus, the UAV plan is in accordance with the built-in technique platform. The built-in technique platform, includes microcontrollers that keep an eye on the overall habits of the UAV, equivalent to the flight mechanism and the are living transmission of videos. later the microcontroller, there's an digital velocity controller (ESC) which might be used to keep watch over the propeller velocity according to the sign from the computer. The energy to the drone is provided by the lithium polymer battery[2]. Since the application is meant for surveillance, it feels necessity for an enduring battery in a position to supplying vitality for longer time, greater than 15 minutes. The lithium polymer battery meets our requirements. This requirement ensures that the UAV maintains a secure flight when transferring or hovering [2].

IV. FLYING MECHANISM

The quadcopter shall be defined as a tiny aerial robot with 4 propellers connected to the rotor located in the chassis. The goal is to use fixed-pitch rotors to regulate UAV movement. The speeds of those 4 rotors are self reliant and have an independent attitude, tilt, roll, and yaw of the robot, which can be controlled easily. There are six predominant operations or actions that should be controlled. They are the forward, backward, take-off, landing, right, and left actions [6].

A) Take-Off and Landing Motion

Takeoff can be described as the movement of the UAS that lifts it from the ground to the forward position and the landing function is the contrary of the takeoff function. The take-off movement is managed by rising the velocity of 4 rotors simultaneously, that altering the vertical movement. While the landing process is managed by slowing down four rotors simultaneously. The quadcopter's take-off and landing movements are shown below [6].

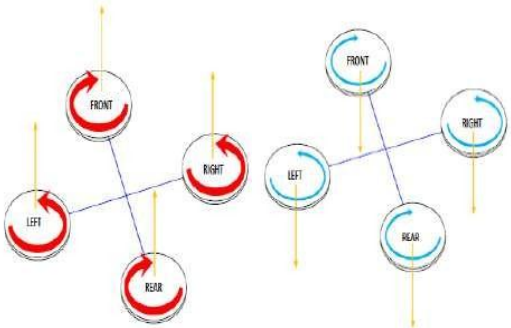

Fig.1. Takeoff and Landing motion

B) Forward and Backward Motion

Forward movement can be controlled by increasing the speed of the rear rotor, while backward movement can be controlled by decreasing the speed of the front-rear rotor. Increasing or decreasing the speed of the front-rear rotor simultaneously affects the tilt angle of the UAV.

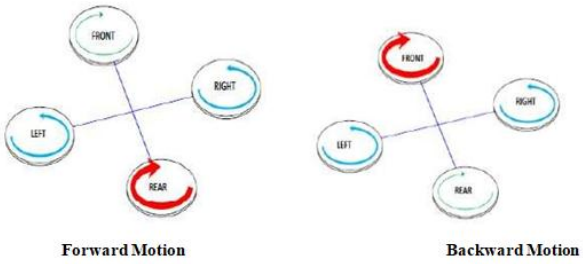

Fig2. Forward and Backward Motion

C) Left and Right Motion

Left and right actions will be managed by altering the Quadcopter yaw angle. The yaw attitude may possibly in addition to and be managed by rising (decreasing) the rotor velocity counterclockwise during lowering (increasing) the rotor pace clockwise. The image below exhibits the left and right actions of drone.[6]

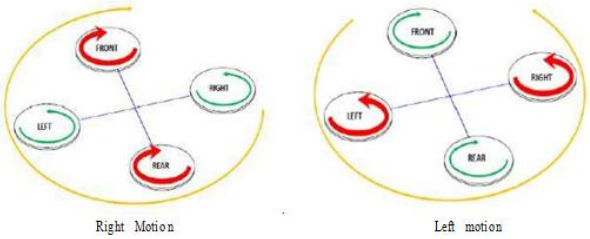

Fig3. Right and Left Motion

D) BLOCK DIAGRAM

The bottom regulate station contains a pc, a microcontroller, and the Internet. Initially, the video feed is taken from esp32 and decoded using the RTMP protocol and sent to GCS over the Internet. On the transmitter side, the manual transmitter is used to control the quadcopter [3].

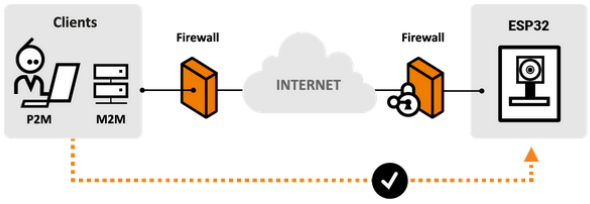

Fig 4.Computer Side

The UAV side contains various electronic modules, which have a speed controller, a flight controller, a wi-fi camera, and an influence supply, for example, a battery. The ESC is used to keep an eye on the rate of the rotors and the battery meets the facility required for the entire manner [3]. The wi-fi digicam captures the video streams and broadcast it to the pc as a radio signal.

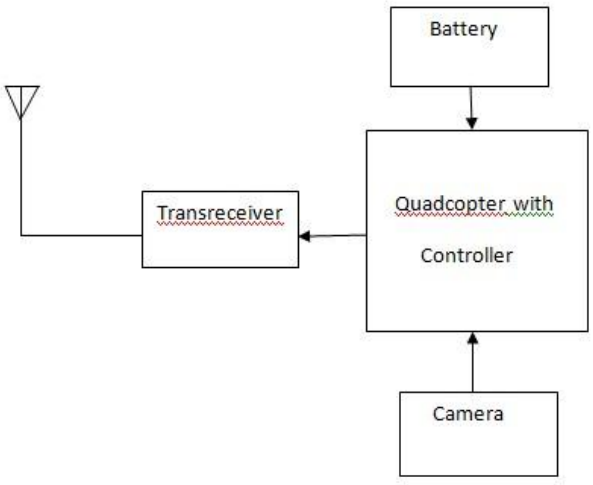

Fig5. Drone Side

V. VIDEO CAPTURING AND TRANSMISSION

Choosing the video system is one of the most important choices for the task. The Digi-cam have to be mild sufficient to permit the UAV to fly constantly and small enough to be easily adapted to the quadcopter. The video transmission system should on top of have the option to transmit proper distance with open area the absence of any interference or lack of the radio signal. For this project, we consider 100 meters as an adequate range [5].

VI. Conclusion

The challenge will play a very important function in each developed and constructing countries. In all developed countries, the surveillance of land areas may be very important. The central aim of the venture is to check the entire UAV initiative course, from an engineering viewpoint, enhance its steadyness, and balance system. The quadcopter can carry out surveillance by broadcasting live video and offers safety for chosen areas, also storing GPS coordinates to map. Our job is to put into effect the wi-fi digicam on that quadcopter to broadcast the captured video stream to the bottom regulate station. Impending job is to mature this prototype that controls the quadcopter utilizing the pc as a replacement of the faraway regulate to scale back the complexity of flight control.

REFERENCES

[1] S. Hayat, E. Yanmaz, and R. Muzaffar, ``Survey on unmanned aerial vehicle networks for civil applications: A communications viewpoint,'' IEEE Commun. Surveys Tuts., vol. 18, no. 4, pp. 2624_2661, 4th Quart., 2016.

[2]. A comparison of convolutional object detectors for real-time drone tracking using a PTZ camera, 2017 17th International Conference on Control, Automation and Systems (ICCAS)

[3]. M. Zuckerberg, ``Connecting the world from the sky,'' Facebook, Cambridge, MA, USA, Tech. Rep. 249, 2014.

[4]. NASA Armstrong Fact Sheet. (2014). Beamed Laser Power for UAVs. [Online].Available:

[5]. J. Sun, B. Li, Y. Jiang, and C.-Y. Wen, ``A camera-based target detection and positioning UAV system for search and rescue (SAR) purposes," Sensors, vol. 16, no. 11, p. 1778, 2016.

[6]. R. Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment, vol. 54. Hoboken, NJ, USA: Wiley, 2011.

[7]. PwC. Clarity From Above, PwC Global Report on the Commercial Applications of Drone Technology. Accessed: Feb.2018.[Online].

[8]. M.-R. Ra, B. Liu, T. F. La Porta and R. Govindan, "Medusa: A programming framework for crowd-sensing applications", Proc. 10th Int. Conf. Mobile Syst. Appl. Services (MobiSys), pp. 337-350, 2012.

[9] Jessica R. Cauchard ; Alex Tamkin ; Cheng Yao Wang ; Luke Vink ; Michelle Park ; Tommy Fang ; James A. Landay, "]. Drone.io: A Gestural and Visual Interface for Human-Drone Interaction". 2019 14th ACM/IEEE International Conference on Human-Robot Interaction (HRI)

[10]. R. Sun and D. W. Matolak, ``Air_ground channel characterization for unmanned aircraft systems part II: Hilly and mountainous settings,'' IEEE trans. Veh. Technol., vol. 66, no. 3, pp. 1913_1925, Mar. 2017.

[11]. S. Hayat, E. Yanmaz, and R. Muzaffar, ``Survey on unmanned aerial vehicle networks for civil applications: A communications viewpoint,'' IEEE Commun. Surveys Tuts., vol. 18, no. 4, pp. 2624_2661, 4th Quart., 2016.

[12]. M. Mozaffari, W. Saad, M. Bennis, Y.-H. Nam, and M. Debbah. (2018).``A tutorial on UAVs for wireless networks: Applications, challenges, and open problems.'' [Online]. Available:https://arxiv.org/abs/1803.00680

[13]DroneOmega, "How GPS Drone Navigation Works," 2017.

[14] R. C. Will, "Drones," 2015. [Online].

[15] R. L. Weiger, "MILITARY UNMANNED AIRCRAFT SYSTEMS IN SUPPORT OF HOMELAND," U.S. Army War College, Pennsylvania, 2007.

[16] L. a. G. Pawel Smyczynski, "Autonomous Drones Control," 22nd International Conference on Methods, 2017.