IMPLEMENTATION OF UNMANNED AERIAL VEHICLE FOR SECURITY APPLICATIONS

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ABSTRACT

The main objective of the project is to design a Unmanned aerial vehicle for the surveillance purpose using high resolution video camera. This project is mainly focused on the UAV applications. The analysis of the existing Unmanned Aerial Vehicles is done for the purpose of implementing for the augmented reality purpose. The video camera is implemented in the Unmanned Aerial Vehicles to capture the video at which area need to focus on. The video captured by the camera is then transmitted to the PC with the use of the RF Transceiver system. The control of the UAV is done by interfacing the UAV with the Micro controller. Here the gyro sensor used for the interfacing purpose of the UAV with the remote control unit. The control signal for the controller is transmitted by the use of a RF Transceivers. So the required components are selected for the design of UAV with minimum weight and also camera in small size. By the thorough analysis this can be design, as the UAV with low cost and it is very useful while using at the reality top view.

Keywords– Unmanned Aerial Vehicle (UAV), RF transceiver, MEMS (microelectromechanical system.

I INTRODUCTION

The military use of unmanned aerial vehicles (UAVs) has grown because of their ability to operate in dangerous locations while keeping their human operators at a safe distance. The larger UAVs also provide a reliable long duration, cost effective, platform for reconnaissance as well as weapons.

The design of Unmanned Aerial Vehicles (UAVs) is currently hindered by the lack of a thorough understanding of the flow physics of very small aircraft flying at low speed. In many cases, the most effective design tool is trial and error which leads to lengthy and costly process. The development of functional Unmanned Aerial Vehicles (UAVs) within the last several years has been hindered by a limited understanding of the aerodynamics of small aircraft flying at low speeds. Unmanned aerial vehicles operate at significantly lower speeds and are small in size.

The use of Unmanned Aerial Vehicles (UAVs) to support such personnel has become commonplace in the military and with recent regulatory rulings will likely be increasing in the next few years in civilian sectors. Unmanned Aerial Vehicles (UAVs) that weigh only a few pounds have also been introduced in these settings.

Personnel in these situations have a primary mission other than operating the vehicle soldiers. Requiring such operators to have a specialized skill set for operating a UAV or MAV, requiring additional dedicated personnel to just operate the vehicles places additional demands on resources and could unnecessarily put more people at risk.

Moreover, in order for such systems to become viable in the commercial marketplace, the control devices will need to be easy to use with minimal training and low operational costs. One solution to these problems is to make the control of such systems sufficiently intuitive so that almost any computer-literate person can operate them with little to no training. Such a system could reduce hardware requirements, man power training time & cost can be signicantly reduce by this system if such a control system leveraged off-the-shelf components. The UAV has a variety of potential uses in military operations, including fire control, and detection of intruders. For border patrol hostage rescue, and traffic surveillance Law enforcement organizations could use UAVs. For most of these applications, a swarm of UAVs could provide wide-area coverage**.**

Fig.1 Unmanned Aerial Vehicle

The above Figure 1 shows one of the type of Unmanned Aerial Vehicle. We can use this device for the purpose of checking the underground pipeline leakage and also used in various companies for the security purpose. In the nuclear power plant if there is any gas leakage or any damage which causes the radiation can be find by this small device instead of risking the human.

This is used to obtain various images of certain affected area during natural disasters for recovery missions. If we use UAV instead of helicopters at the time of flood, we can reduce the cost and also to obtain a quick process. This Unmanned aerial vehicle can go through any place where the mankind can't because of the miniature size. With the remote control we can operate the Unmanned Aerial vehicle for a particular range which is based on the technology used. The camera image or video is transmitting lively to the PC or such a device which we can take to that particular area. The device is used as a spy that it fetches the details that are needed by us.

II OVERVIEW OF PROPOSED SYSTEM

In this project we are going to design a UAV for the purpose of military based applications. A small UAV is designed with the high resolution camera. The camera is used to capture the video or an image in the area where the human cannot enter safely.

By our idea we can reduce the harm of war and we can avoid the soldier's death. The awareness of the area and the persons help to prevent any bad situations that going to happened by the terrorists.

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Already we have several types of Unmanned Aerial Vehicles with various size and specifications. So in this paper we focus on two main things which are necessary for any kind of works. The important two factors are the size and the cost. Here we implement the Unmanned Aerial Vehicle with low cost, improvement of efficiency and life time.

III BLOCK DIAGRAM AND DESCRIPTION

Fig. 3.1 shows the block diagram of UAV. The transmitter part of UAV consists of PC (personal computer), signal processing unit, and the transceiver. The purpose of the transceiver is both to transmit and receive the signal. In the transmitter side the command from the PC is transmitted to the receiver with the help of transceiver. The reception of video from the camera can also be received by the transceiver.

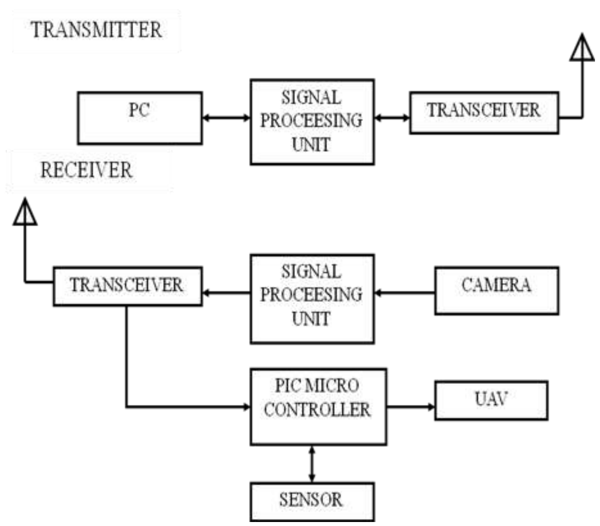

Fig.3.1 Block Diagram of UAV

The receiver block consist of UAV (Unmanned Aerial Vehicle), Micro controller, camera, signal processing unit and the transceiver. Camera is used to capture the video in the area of interest which is in analog form. The signal processing unit processes the analog signal from the camera and process the signal into the required form for the transmission.

Micro controller is used to control the unmanned aerial vehicle by the command which is transmitted from the PC. Turning the direction of UAV is done by microcontroller. The propellers on the UAV help the vehicle to take off, with the use of DC brushless motor.

IV PERFORMANCE ANALYSIS

The Quadcopter is considered an effective alternative to the high cost and complexity of standard rotorcraft. Employing four rotors to create differential thrust, the craft is able to hover and move without the complex system of linkages and blade elements present on standard single rotor vehicles. The Quadcopter is classified as an under actuated system. This is due to the fact that only four actuators (rotors) are used to control all six degrees of freedom

(DOF). The four actuators directly impact z-axis translation (altitude) and rotation about each of the three principal axes. The other two DOF are translation along the x- and y-axis. These two remaining DOF are coupled, meaning they depend directly on the overall orientation of the vehicle (the other four DOF). Additional Quadcopter benefits are swift maneuverability and increased payload. Drawbacks include an overall larger craft size and a higher energy consumption, which generally means lower flight time. From the fig 4.1 shows the without propeller of unmanned aerial vehicle and 4.2 shows the with propellers in unmanned aerial vehicle.

Fig.4.1 Note the propellers are removed.

Fig.4.2 Note the propellers are used.

4.1 Gyroscope

A gyroscope is a device for measuring or maintaining orientation, based on the principle of preserving angular momentum. Essentially, a gyroscope is a top, a self-balancing spinning toy, put to instrumental use. Tops were invented in many different civilizations. Mechanical gyroscopes typically comprise a spinning wheel or disc in which the axle is free to assume any orientation. Although the orientation of the spin axis changes in response to an external torque, the amount of change and the direction of the change is less and in a different direction than it would be if the disk were not spinning. When mounted in a gimbal (which minimizes external torque), the orientation of the spin axis remains nearly fixed, regardless of the mounting platform's motion. Gyroscopes based on other operating principles also exist, such as the electronic, microchip-packaged MEMS gyroscope devices found in consumer electronic devices, solid-state ring lasers, fibre optic gyroscopes, and the extremely sensitive quantum gyroscope.

4.2 Variations

- MEMS
- FOG
- HRG

4.2.1 Properties

A free gyroscope maintains its axis. Gyroscopes can be used to construct gyrocompasses, which complement or replace magnetic compasses (in ships, aircraft and spacecraft, vehicles in general), to assist in stability (Hubble Space Telescope, bicycles, motorcycles, and ships) or be used as part of an inertial guidance system. Gyroscopic effects are used in tops, boomerangs, yo-yos, and gyroscopic exercise tools. Many other rotating devices, such as flywheels, behave in the manner of a gyroscope, although the gyroscopic effect is not being used

4.2.2 MEMS

A MEMS gyroscope takes the idea of the Foucault pendulum and uses a vibrating element, known as a MEMS (microelectromechanical system). The MEMS-based gyro was initially made practical and producible by Systron Donner Inertial (SDI). Today, SDI is a large manufacturer of MEMS gyroscopes.

4.2.3 FOG

A fiber optic gyroscope (FOG) is a gyroscope that uses the interference of light to detect mechanical rotation. The sensor is a coil of as much as 5 km of optical fiber. The development of low-loss single-mode optical fiber in the early 1970s for the telecommunications industry enabled the development of Sagnac effect fiber optic gyros.

4.2.4 HRG

The hemispherical resonator gyroscope (HRG), also called wine-glass gyroscope or mushroom gyro, makes using a thin solid-state hemispherical shell, anchored by a thick stem. This shell is driven to a flexural resonance by electrostatic forces generated by electrodes which are deposited directly onto separate fused-quartz structures that surround the shell. Gyroscopic effect is obtained from the inertial property of the flexural standing waves.

4.3 Accelerometer

An Accelerometer is a device that measures proper acceleration ("g-force"). Proper acceleration is not the same as coordinate acceleration (rate of change of velocity). For example, an accelerometer at rest on the surface of the Earth will measure an acceleration $g = 9.81\ m/s^2$ straight upwards. By contrast, accelerometers in free fall orbiting and accelerating due to the gravity of Earth will measure zero. Accelerometers have multiple applications in industry and science. Highly sensitive accelerometers are components of inertial navigation systems for aircraft and missiles. Accelerometers are used to detect and monitor vibration in rotating machinery. Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. Accelerometers are used in drones for flight stabilisation. Pairs of accelerometers extended over a region of space can be used to detect differences (gradients) in the proper accelerations of frames of references associated with those points. These devices are called gravity gradiometers, as they measure gradients in the gravitational field. Such pairs of accelerometers in theory may also be able to detect gravitational waves.

V USES

- Remote Sensing
- Commercial Aerial Surveillance
- Disaster Relief and Medical Assistance
- Forest Fire Detection

5.1 Remote Sensing

UAV remote sensing functions include electromagnetic spectrum sensors, gamma ray sensors, biological sensors, and chemical sensors. A UAV's electromagnetic sensors typically include visual spectrum, infrared, or near infrared cameras as well as radar systems. Other electromagnetic wave detectors such as microwave and ultraviolet spectrum sensors may also be used but are uncommon.

5.2 Commercial Aerial Surveillance

Aerial surveillance of large areas is made possible with low cost UAV systems. Surveillance applications include livestock monitoring, wildfire mapping, pipeline security, home security, road patrol, and anti-piracy. The trend for the use of UAV technology in commercial aerial surveillance is expanding rapidly with increased development of automated object detection approaches.

5.3 Disaster Relief and Medical Assistance

Drones can help in disaster relief by gathering information from across an affected area to build a picture of the situation and give recommendations to direct resources. UAVs "Ambulance drones" rapidly deliver defibrillators in the crucial few minutes after cardiac arrests, and include live stream communication capability allowing paramedics to remotely observe and instruct on-scene individuals in how to use the defibrillators

5.4 Forest Fire Detection

Another application of UAVs is the prevention and early detection of forest fires. The possibility of constant flight, both day and night, makes the methods used until now (helicopters, watchtowers, etc.) become obsolete. Cameras and sensors that provide real-time emergency services, including information about the location of the outbreak of fire as well as many factors (wind speed, temperature, humidity, etc.) that are helpful for fire crews to conduct fire suppression.

VI DISCUSSION

The results of our study confirmed supported UAV navigation improves the position estimate and consequently the navigation of UAVs. The position estimate is more accurate. Compare to previous design with reduced cost and also camera small in size.

VII CONCLUSION

Several existing Unmanned Aerial Vehicle have been analyzed. The components have been selected in such a way to reduce the hardware complexity. Reduction of size and cost of the vehicle is mainly considered The proposed UAV with camera can be used for the military applications. The exact location of the damage in the underground pipelining can be observed due to its smaller size. In the nuclear power plant if there is any gas leakage or any damage which causes the radiation can be find by this small device instead of risking the human. It is used to obtain various images of certain affected area during natural disasters for recovery missions. If we use UAV instead of helicopters at the time of flood, we can reduce the cost and also to obtain a quick process.

VIII FUTURE ENHANCEMENT

The future enhancement of the project can be carried out by designing the hardware module in compact size with various applications and used for industrial and Surveillance of Forest to monitoring the functions.

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