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A Wireless Control Quadcopter With Web Camera And Self Balancing System

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Abstract

The research is intended to develop a remotely operated quadcopter system. This quadcopter is controlled by graphical user interface (GUI). By using wireless communication system the communicatin between Quadcopter and GUI can be done . The balancing condition of quadcopter is sensed by AVR controller and IMU 5DOF sensor. Quadcopter is equipped with ultrasonic sensor for self balancing. All signals from the sensors are processed by AVR controller board. Output from AVR controller board used to control Quadcopter propellers. Express as interface between control base and Quadcopter. The balancing and stability of quadcopter can be hover by this experiment. The load disturbance up to 250g during it hover condition can be operated by quadcopter. The operating time of quadcopter can be increased by using largest battery capacity. Using 2200mAh Lipo battery the maximum operated time of quadcopter is 6 minutes.

Keywords:*Ultrasonicsensor,quadcopter,AVR controller,GUI.*

1.Introduction

The technology development and control method used in Quadcopter is included in the review. The visual tracking using web camera is used to do research on control of quadcopter. The visual feedback and measurement of inertial sensor is used to control motion of quadcopter. In this research, visibility under various perspectives is improved by design of active markers. Everything needed to build and control the flying platform in which the camera will be mounted is consisted in quadcopter chassis and controller system.This includes a DC motors,frames, power supply, flight control circuit board, flight control software, rotors and an AVR controller. The raw video data is taken by digital video analysis system and converted into digital if necessary, and loaded it into a program. A quadcopter is designed and implemented to autonomously fly and demon- strate on-board image processing capabilities. The control of quadcopter by virtue of two control systems; the local control, and the global control is aimed in this project.

The stabilisation of the quadcopter is intented by local control, so that it is able to fly manually through the RC receiver and the global control is intended to make the quadcopter to fly autonomously with the aid of visual control through the camera. The two control loops are implemented on dedicated processors with appropriate capabilities. The use of Unmanned Aerial Vehicles (UAV) has increased due to the development and improvement of control systems in the last decades. The quadcopters are being widely used for different purposes.These are commercial, educational or entertainment within UAV hardware. The justification can be made by the fact that this model presents a very low moment of inertia and six degrees of freedom. This results in great stability of the quadcopter. The motivation of this work is to develop and compare control mechanisms for a quadcopter model by tuning them with three different approaches by this consideration. The exciting and emerging field is aerodynamics. A quadcopter is popular platform for small unmanned aerial vehicles (UAVs) . A quadcopter is a device which consists of four propellers which are arranged in a cross configuration. The quadcopter is lifted into the air while avoiding any net angular momentum with two propellers which spin clockwise and two counterclockwise. The

quadcopter is tilted in x and y direction so that the thrust has a horizontal component. Modifying the thrust of different propellers can allow the quadcopter to move. The quadcopter platform is same as that of a helicopter in its mobility and it is simpler to construct and operate because the propeller blades are fixed-pitch.The control problem is still difficult as it requires much manual tuning of controller parameters.This project aims to explore the control of quadcopter which evolved neural networks, so that the element of human design is reduced as much as possible.

2.Block diagram

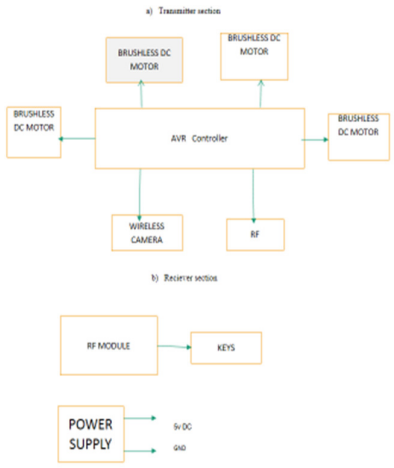

Fig 1) Block Diagram

2.1 AVR Controller:

AVR is an 8 bit single chip RISC microcontroller. The **AVR** is modified Harvard architecture 8-bit RISC single-chip microcontroller . The use of on-chip flash memory for program storage as opposed to EPROM,ROM or EEPROM which was used by other microcontrollers at the time was done by AVR for the first time. MegaAVR chips became popular when they were designed into the 8-bit Arduino platform.

2.2 DC motor :

Dc motor is an electric motor which runs on direct current (DC) electricity. The operation is based on simple electromagnetism in any electric motor. A magnetic field is generated by current-carrying conductor; this is then placed in an external magnetic field. The force proportional to the current in the conductor will be experienced by it and to the strength of the external magnetic field. We are well familiar of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel each other. The internal configuration of a DC motors is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.The controlling motion of robotic and industrial automation systems is controlled by the dc motor. The controller presented here uses the pulse-width modulation(PWM) technique .

2.3 Lithium Polymer Battery :

The lithium-ion polymer batteries, polymer lithium ion or lithium polymer batteries are rechargeable batteries (secondary cell batteries). Normally batteries are composed o to discharge current capability. The several identical secondary cells in p. Lithium-ion batteries has technologically evolved in this type. The primary difference is that the lithium-salt electrolyte is not held in an organic solvent but in a solid polymer composite such as polyethylene oxide. The potentially lower cost of manufacture, adaptability to a wide variety of packaging shapes, and ruggedness are the advantages of Li-ion polymer over the lithium ion. The appearance of lithium-ion polymer batteries s in consumer electronics was around 1996.

2.4 Camera :

Camera which we used is WS-309AS 1.2G Wireless Mini Camera**.**

Features:

- 1/3 or 1/4 image sensor
- System: CCIR,PAL, NTSC, EIA
- Horizontal resolution: 380 TV lines

2.5 Power supply:

The first and the most important part of our project is the power supply. We require +5V regulated power supply with maximum current rating 500mA for our project. To generate regulated

power supply following basic building blocks are required. Radio frequency (RF) is a rate of oscillation in the range of around 3 kHz to 300 GHz and it corresponds to the frequency of radio waves and the alternating currents carrying radio signals. Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects.

1 Radio-frequency identification
2 Short for *radio frequency*, RF is any frequency within the electromagnetic spectrum associated with radio wave propagation. An electromagnetic field is created when an RF current is supplied toan antenna then it is able to propagate via the space. RF field propagation forms the base of many wireless technologies.
3 These frequencies make up part of the electromagnetic.

3.Working of quadcopter

3.1Take-off motion of quadcopter:

It is movement that lifts the quadcopter up from ground to hover position .The landing position is vice versa of take-off position. The take-off (landing) motion of quad copter is controlled by increasing (decreasing) speed of four rotors simultaneously which meant to change the vertical motion.

3.2 Forward and backward motion of quad copter:

Increasing (decreasing) speed of rear (front) rotor controlles the forward (backward) motion of quad copter. Decreasing (increasing) rear (front) rotor speed will affect the pitch angle of the quad copter simultaneously.

3.3 Left and right motion of quad copter:

The left and right motion of quadcopter can be controlled by changing the yaw angle of quadcopter. By increasing (decreasing) counter-clockwise rotors speed while decreasing (increasing) clockwise rotor speed yaw angle can be controlled.

3.4 Hovering or static position of quadcopter:

The two pairs of rotors rotating in clockwise and counter-clockwise respectively with same speed causes the hovering or ststic position of quadcopter. By two rotors rotating in clockwise and counter-clockwise position, total sum of reaction torque is zero. This allows the quadcopter in hovering position.

3.5 Yaw angle of quadcopter

The yaw angle is the angle between an aircraft's longitudinal axis and its line of travel. Pitch angle: The pitch angle is angle between an object's rotational axis and a line perpendicular to its orbital plane. Roll angle: The roll angle is the angle of rotation of a vehicle about its longitudinal axis. The two of the motors i.e. motor 1 and 3 are rotating in a clockwise direction whereas other two motors i.e. motor 2 and 4 are rotating in anti-clockwise direction. This ensures the perfect balance at the centre of the quad-copter. The quad copter obtains the expected speed by its fix pitch rotors whose speed is variable similar to other helicopters that have variable pitch angle. By adjustments of the speeds of all four rotors at the same time the vertical movement of quad copter can be realized. The movement along the X direction depends on the inclination on Y. The angle could be adjusted by slowing down the speeds of rotors 1 and 2, speeding up rotors 3and 4.The acceleration along X direction generates the inclination.

4. Features

4.1 Maintainability: In case of redesigning and easy review, system will be developed for redesigning and easy review.

4.2 Availability: The system will be available as per the demand and thus modifications can be made as per requirement.

4.3 Reliability: System will provide services to the user according to needs.It will reliable with maximum period.

5. Conclusion

The self stabilization of quadcopter takes place using the array of sensors integrated on it as per the design specifications. It attains appropriate lift and thus provides surveillance of the terrain through the camera mounted on it. The user specified commands given via a remote controller intends to work it appropriately. Its purpose is to provide real time audio or video transmission from areas which are physically inaccessible by humans. Thus, its functionality is monitored under human supervision. Henceforth being beneficial towards the military applications. It is very easy to maneurver ,thus providing flexibility in its movement .The infrared camera can be used to provide survelliance at night. The system can further be enhanced for future prospects and development.

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