Stabilized IR Camera Gimbal for Drone

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hummingbIRd

life from a different perspective.

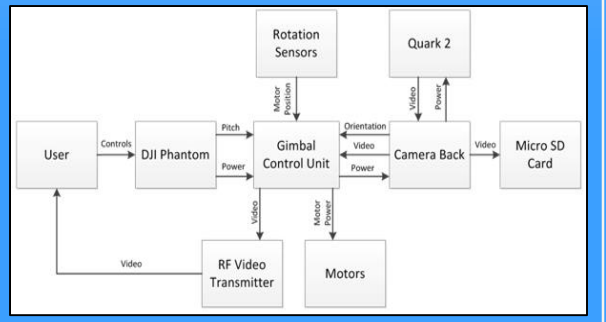
Abstract

The rise in popularity of drones has opened up a new market for stabilized gimbal systems; users are attracted to steady footage from aerial vantage points capable with the gimbals. Although there are already existing gimbals that attach GoPro cameras onto drones, there is one niche that remains relatively unexplored; stabilized gimbals for infrared cameras, and that is the niche that our product, the FLIR hummingbIRd satisfies.

Overview

The hummingbIRD is a 3-axis stabilized gimbal that is capable of wirelessly transmitting analog video to a remote user while simultaneously storing digital video onto an on-board SD card. The payload, a FLIR Quark II IR camera, is actively stabilized through 3 motors which control the pitch, yaw, and roll axes located on the camera back, base, and yaw arm, respectively. The board electronics consist of 5 PCBs: 2 on the Camera Back, and 3 on the Yaw Arm.

System Block Diagram



hummingbIRd

FLIR hummingbIRd mounted to DJI Phantom Drone

PCB/Features

Camera Back Unit

This unit interfaces with the Quark II IR camera to power it and access analog and digital video data. The MCU is in charge of the digital data storage, and the gyroscopic data relay and into the Yaw Arm Unit via a UART connection. Contains a STM32F411CE MCU, Molex µSD card slot, and an MPU6500 (gyroscope).

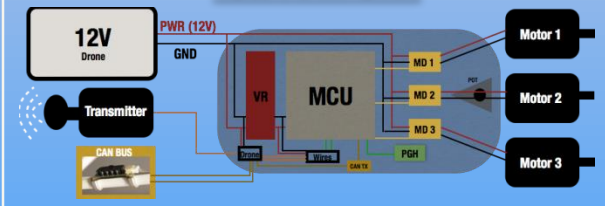
Yaw Arm Unit

The MCU on board analyzes the gyro data from the Camera Back, runs our stability algorithm, and controls the motors to keep our Quark camera stable. Analog video runs through this unit and into a DJI-AVL58 FM transmitter. The unit also supplies 3.3V for the entire system and has a can transceiver for tilt control.
Contains STM32F334C8 MCU, L6230QTR Motor Driver, SN65HVD232 CAN Transceiver, AOZ1280 Voltage Regulator.

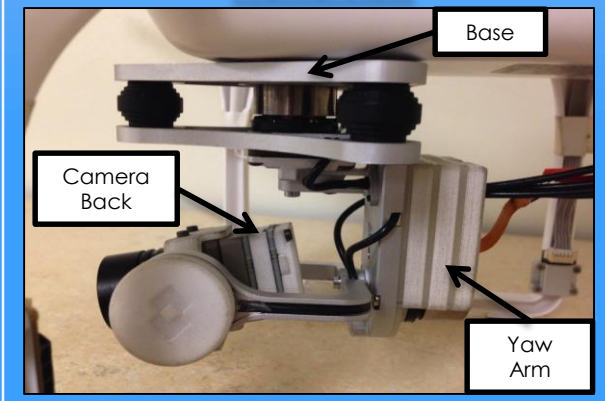
Gimbal System

The gimbal system is run using the electronics on the Yaw Arm Unit. The MCU (STM32F334C8) on this board takes in the gyro (MPU6500) and CAN(SN65HVD232DR) data for orientation data of the Quark Camera. Using our stabilization algorithm, it then calculates the movements it needs to stabilize the camera. These movements are sent to respective motor drivers (L6230QTR) which control each individual motor (Zenmuse H3-3D Brushless Motor).

Yaw Arm Unit



Profile View



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FLIR