Abstract:

The “Microcontroller Based Unmanned Aerial Vehicle” research project aims towards designing a flight stabilization unit for small remote controlled aircraft so that pilots can use their aircraft for other tasks, such as aerial surveying. In essence, the pilot will direct the aircraft in a desired direction and, with a flip of a switch, the airplane will continue flying on a straight course. For more advanced flying the pilot can plot way-points from a ground computer to direct the aircraft along a predetermined course allowing the pilot to control other devices such as an aircraft mounted camera.

To accomplish the task of designing a flight stabilization unit, a microcontroller (MCU) was employed to control the aircraft’s flight surfaces. An inertial measuring unit (IMU) was used to determine the aircrafts position with respect to gravity. To function properly, the IMU sends data to the MCU which then determines the appropriate output signals to the flight surfaces. This system is all that is required for level flight. For more advance flight patterns, the MCU requires additional information from the onboard Global Positioning System (GPS), an airspeed sensor, and data relayed from the ground computer.

In designing the flight stabilization unit, numerous challenges were overcome when first incorporating the IMU. It was initially discovered that the IMU was highly sensitive to voltage changes. Voltage loading caused by the motors for moving the flight surfaces resulted in reference voltage variations in the IMU which then caused faulty data to be sent to the MCU. Secondly, the IMU is very sensitive to vibrations caused by the electric motor propulsion system. To remove the relatively high frequency vibration components from the IMU output data, a low pass filter along with software averaging program was added.