GauchoHawk is a fully-featured flight controller with custom hardware and software that greatly improves the Pixhawk's capabilities.

Pixhawk is an open-source project that provides high-end autopilot hardware and flight control software. But, Pixhawk does have some room for improvement:

- No high quality IMU
- No magnetometer
- No ethernet port
- No RTK capable GPS
- No precise timestamp

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Circuit Board Design

Features a custom PCB shield that mounts onto the Nucleo microcontroller, adding new sensors:

- PX4FMU
  - A very small chip featuring a 9 axis accelerometer. It uses 1 MHz SPI for dynamic and precise motion tracking.

Features an open-source, customizable flight control software called Betaflight, responsible for interfacing with GauchoHawk's high-precision peripherals. Betaflight captures sensor output to control and fly any compatible drone.

- MPU-9250 IMU
- XBEE 900HP Radio
- NEO-M8P RTK GPS
- LPS22HB Barometer
- MS4515DO Pressure Sensor
- QMC5883L Magnetometer
- ADIS16477 IMU

Software

Features an extremely responsive 160 Hz max output rate while providing precise compass headings within 1° of accuracy.

Components

Motivation

We extended Betaflight's driver suite to support GauchoHawk's on-board sensors. Betaflight's portability makes it ideal for prototyping and testing our shield design for commercial viability.

Our development of the flight controller software demonstrates the versatility of our PCB and its potential market applications.

Betaflight Overview

Includes a triaxial accelerometer and a gyroscope to provide precise delta angle and delta velocity measurements for extremely accurate stabilization and navigation.