How to use the optical flow positioning module



Overview

How to Set Up Optical Flow & Rangefinder Sensors in Learn how to set up a rangefinder optical flow sensor in iNav for enhanced FPV drone stability in Posit.

Key Takeaways

Adjusting an optical flow module involves calibrating the sensor, setting its position offsets, and tuning scale factors to ensure accurate velocity and position estimation.

Sensor Positioning and Mounting

Optical flow sensors require a downward-facing camera and a distance sensor (preferably LiDAR) to measure velocity and altitude accurately. The sensor can be mounted as a single integrated unit (e.g., ARK Flow, Holybro H-Flow) or as separate components. Ensure the sensor is aligned with the vehicle's body frame and securely mounted to minimize vibrations.

Configuring Sensor Offsets

If the optical flow sensor is not at the vehicle's center, you must set the X, Y, and Z offsets in the flight controller parameters. For PX4, these are: X position in body frame (default 0.0 m)Y position in body frame (default 0.0 m)Z position in body frame (default 0.0 m) These offsets ensure the estimator correctly interprets the sensor data relative to the vehicle's center.

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Calibration and Scale Factor Adjustment

Connect the sensor to the autopilot via MAVLink, I2C, or another supported bus. Ensure the optical flow camera publishes the OPTICAL_FLOW_RAD message and the distance sensor publishes DISTANCE_SENSOR. Check sensor readings in the flight controller interface (e.g., Mission Planner or PX4 QGC).

Non-zero values for flow axes indicate proper operation. For PX4, if pure rotations show discrepancies between integrated_xgyro and integrated_x (or integrated_ygyro and integrated_y), adjust the SENS_FLOW_SCALE parameter to correct the scale factor. For iNav, follow inflight calibration procedures or use log file analysis to verify flow measurements and correct any offsets.

Integration with EstimatorsOptical flow data is fused with other velocity sources in the estimator (EKF2 or LPE). Set EKF2_OF_CTRL to enable optical flow fusion. Ensure the estimator accounts for sensor offsets and scale factors to maintain accurate position hold and velocity estimation.

Testing

Perform a hover test in a safe, open area. Observe the vehicle's response in Position Hold or Loiter mode. Adjust offsets or scale factors iteratively until the drone maintains stable hover without drift.

By carefully calibrating the sensor, setting offsets, and tuning scale factors, the optical flow module can provide precise velocity and position data, improving stability and navigation in GNSS-denied environments.

Article Content

How to Set Up Optical Flow & Rangefinder Sensors in

Learn how to set up a rangefinder optical flow sensor in iNav for enhanced FPV drone stability in Position and Altitude Hold modes.

Interfacing PMW3901 Optical Flow Sensor With ESP32

Learn how the PMW3901 optical flow sensor tracks motion without GPS. Explore its features, specifications, and how to interface it with ESP32 for accurate position tracking.

This ESP32 Drone Flies Autonomously Without GPS! | Optical Flow

In this video, we demonstrate indoor drone position hold using an optical flow sensor and Time-of-Flight (ToF) height sensing without the use of GPS.

LiteWing PMW3901MB Optical Flow Sensor Guide

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Master PMW3901MB optical flow sensor on LiteWing drone. Learn velocity calculation from pixel deltas, position integration, and real-time trajectory visualization using Python.

PMW3901-Based Flow Sensors | PX4 Guide (main)

Flow modules are typically mounted near the centre of the vehicle. If mounted off-centre you will need to set offsets: Optical Flow > EKF2. The flow modules may be mounted with any yaw orientation

Optical Flow | PX4 Guide (main)

An Optical Flow setup requires a downward facing camera and a distance sensor (preferably a LiDAR). These can be connected via MAVLink, I2C or any other bus that supports the peripheral.

Optical Flow · PX4 Development Guide

In order to ensure good optical flow quality, it is important to focus the camera on the PX4Flow to the desired height of flight. To focus the camera, put an object with text on (e. g. a book) and plug in the

Optical Flow Sensor Testing and Setup — Copter documentation

An alternative method which avoids the need to land and change EKF3 parameters between calibration and testing is to setup GPS/Non-GPS transitions so the pilot can manually change between GPS

Optical Flow Sensors for Drones: Indoor Positioning Guide

How optical flow sensors let drones hold position without GPS. Covers PMW3901 setup with ArduPilot, ToF rangefinder pairing, and indoor positioning use cases.

Hovering with Optical Flow

Hovering with Optical Flow In order for the drone to be capable of autonomous flight it needs some reference or estimate of it''s position in the world. Outdoors we can use GPS. Indoors GPS doesn''t

ARK Flow Open Source Optical Flow and Distance Sensor

ARK Flow Open Source Optical Flow and Distance Sensor The ARK Flow Open Source Optical Flow and Distance Sensor is an open source optical flow sensor

DIY Indoor Optical Flow Drone | A Comprehensive Guide

An optical flow module is equipped with a downward facing camera. When paired with a precise rangefinder that tells the drone exactly how far above

LiteWing Drone Positioning Module

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Introduction The LiteWing Drone Positioning Module is a plug-and-play optical flow and ToF-based stabilization add-on designed for indoor and GPS-denied flight. Featuring the PMW3901

Here Flow

Here Flow is a finger size optical flow sensor. Compared with other optical flow sensors, it is even smaller. It can be installed easily at any position without taking much space. A LiDAR

An Autonomous UAV with an Optical Flow Sensor for Positioning and ...

For 2D positioning the principle of optical flow is used. Together with the output of height estimation, fusing ultrasonic, infrared and inertial and pressure sensor data, the 3D position of the

Optical Flow | PX4 Guide (main)

Optical Flow Optical Flow uses a downward facing camera and a downward facing distance sensor for velocity estimation. It can be used to determine speed when navigating without GNSS — in

Optical Flow Sensors for UAVs, Drones & Unmanned Systems

Find optical flow sensor suppliers for UAVs, drones, and unmanned systems. Compare high-precision modules for GPS-denied and autonomous navigation.

Estimating optical flow: A comprehensive review of the state of the art

Optical flow estimation is a crucial task in computer vision that provides low-level motion information. Despite recent advances, real-world applications still present significant challenges. This

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

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