Characteristics of the Optical Flow Module



Overview

Lecture Notes: Optical Flow In the next few lectures, we will learn about optical flow, which refers to the apparent motion of brightness patterns in image.

Key Takeaways

An optical flow module measures motion by analyzing changes in images over time, enabling velocity estimation and navigation in GPS-denied environments.

Function and Purpose

An optical flow module uses a downward-facing camera, often combined with a distance sensor like LiDAR, to detect motion relative to the ground or surrounding environment. By tracking the displacement of visual features between consecutive frames, it calculates the direction and speed of movement, which is crucial for drones, robots, and other autonomous systems operating indoors, underground, or in areas without GPS.

How It Works

The module captures a sequence of images and computes the optical flow, which represents the apparent motion of objects in the camera's field of view. This involves: Detecting patterns, textures, or features in the image. Comparing their positions across frames to determine movement vectors.

Integrating these vectors to estimate velocity and displacement of the device. When paired with a distance sensor, the module can also account for altitude changes, improving accuracy in position estimation.

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Applications

Drones and UAVs: Maintain stable hover, navigate indoors, or fly in GPS-denied areas. Robotics: Assist in obstacle avoidance, path planning, and motion tracking. Computer Vision: Analyze motion in video streams for surveillance, gesture recognition, or autonomous navigation.

Integration

Optical flow modules typically communicate with the main control system via interfaces like MAVLink or I2C, publishing data such as angular motion and distance measurements. This data is then used by the flight controller or navigation system to adjust movement and maintain stability. In summary, the optical flow module is a key sensor for motion detection and navigation, providing real-time velocity and positional information when GPS signals are unavailable, enhancing the autonomy and safety of robotic and aerial systems.

Article Content

Lecture Notes: Optical Flow

In the next few lectures, we will learn about optical flow, which refers to the apparent motion of brightness patterns in images. Motion is an important cue for recognition—and sometimes the only

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

48 Optical Flow Estimation – Foundations of Computer Vision

Before we discuss how to estimate motion, let''s introduce a new concept: optical flow. Optical flow is an approximation to the 2D motion field computed by measuring displacement of image brightness

Optical flow

The concept of optic flow has roots as far back as Euclid ''s Optics, but its modern formulation arose from Second World War research into pilot vision during landing.

Optical Flow Algorithms | opencv/opencv_contrib | DeepWiki

The optflow module extends OpenCV''s core optical flow capabilities with advanced algorithms that offer different trade-offs between accuracy, speed, and handling of special cases like

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lecture13_optical_flow_cs231a

Optical flow Definition: optical flow is the apparent motion of brightness patterns in the image Note: apparent motion can be caused by lighting changes without any actual motion Think of a uniform

Optical Flow: Predicting movement with the RAFT model ¶

Optical flow models take two images as input, and predict a flow: the flow indicates the displacement of every single pixel in the first image, and maps it to its corresponding pixel in the second image.

Optical and Scene Flow

Given a video, optical flow is defined as a 2D vector field describing the ap-parent movement of each pixel due to relative motion between the camera (ob-server) and the scene (objects, surfaces, edges).

lecture13_flow.key

Optical Flow Idea first introduced by psychologist JJ Gibson in ~1940s to describe how to perceive opportunities for motion

Understanding and Implementing Optical Flow with PyTorch

In this blog, we will explore the fundamental concepts of optical flow in the context of PyTorch, learn how to use it, go through common practices, and discover some best practices.

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

Notably, the state-of-the-art performance achieved by VideoFLows (Shi et al., 2023) is attributed to its utilization of a TRi-frame Optical Flow module (TROF), a technique that jointly

ITPro Today, Network Computing, IoT World Today combine

ITPro Today, Network Computing and IoT World Today have combined with TechTarget . The page you are looking for may no longer exist.

Home Page: Gastrointestinal Endoscopy

Gastrointestinal Endoscopy publishes original, peer-reviewed articles on endoscopic procedures used in the study, diagnosis, and treatment of digestive diseases. Articles report on

Optical Flow Sensors

Exploring the capabilities of optical flow sensors by transforming a old optical mouse into a handheld motion tracking device.

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Microsoft Word

Abstract This paper presents the development and characterisation of a low-cost optical sensor module, to be used for localisation. The modules contain CMOS sensors found in optical mice with modified

Optical Flow: Revolutionizing Motion Detection

Explore optical flow, a key computer vision field for motion detection and scene dynamics. Learn about classic and deep learning techniques today!

“What Is Optical Flow for?”: Workshop Results and Summary

However, in optical flow it is only within the last year that the top performing methods [8, 19] are end-to-end trainable networks. This opens a new research question of how should we integrate these

Optical Flow in a Smart Sensor Based on Hybrid Analog-Digital ...

The purpose of this study is to develop a motion sensor (delivering optical flow estimations) using a platform that includes the sensor itself, focal plane processing resources, and co

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