Computer Vision
Introduction

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Asia Data Science and Artificial Intelligence Master's Program

DS&AI

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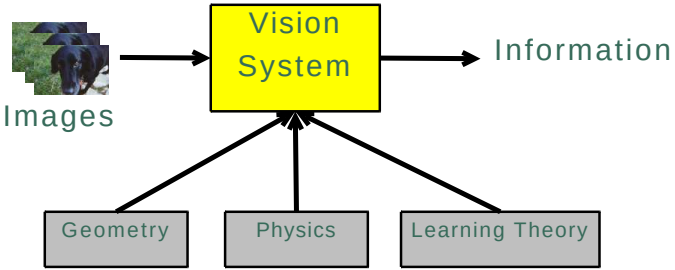
Readings

Readings for these lecture notes:

- Szeliski, R. *Computer Vision: Algorithms and Applications*, 2nd ed., `https://szeliski.org/Book`, 2021.

These notes contain material © Hartley and Zisserman (2004) and Szeliski (2021).

Outline



The kind of information we want is application specific:

- 3D models
- Object categories
- Object poses
- Camera poses

Important applications include:

- Mobile robot navigation
- Industrial inspection and control
- Military intelligence
- Security
- Human-computer interaction
- Image retrieval from digital libraries
- Medical image analysis
- 3D model capture for visualization and animation

The "vision system" includes:

- Image acquisition hardware
  - Analog camera plus digital frame grabber, -or-
  - Digital camera with a fast serial interface (Firewire, USB, etc.)
- Image processing support software
- Your computer vision algorithms

This semester we focus on algorithms for

- 3D reconstruction
- Learning (object detection and recognition)
- Sequential state estimation (e.g. tracking, SLAM)

To understand modern 3D reconstruction techniques we need to understand how cameras transduce the world into images.

This involves understanding projective geometry and camera models.

Then we can begin to figure out how to invert what the camera does, or reconstruct the 3D scene.