

Lecture 1 notes and knowledge - IP

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1 Pre-lecture

- Read: Chapter 1, 2, 10(browse)

2 Lecture

2.1 Pre-face: Introduction

Deep learning & AI

2.2 Image processing

Rotation, scaling, blurring & remove part of image.

Combine graphics with real images.

Combine part of one image with another.

How to find and follow objects in an image.

Basic image processing: ImageJ.

Prerequisite for exam:

- Exercises solving
- Participating in explaining the solved exercises to the rest of the class
- Micro and Mini-projects, including their presentations

Sensors create electric charge when exposed to light, later converted it to a digital image

Motion blur can be a result of the speed of the shutter. The speed of the shutter can also lead to over or under-exposure.

Digital images are seen as a discrete function(x,y) $f(x,y)$, whereas an image seen as a continuous function would be an analog one(film).

ROI(Region of Interest) vs background. The ROI can be found with object tracking or any tracking.

2.3 Camera

Optical system(lens) acts as a barrier, allowing only specific rays to reach the sensor(s). It also focuses bundles of rays into single points. Focal point(F) and Focal length(f), Optical center(O), both F and O span the optical axis.

Distance from object to lens(g), Distance from lens to where the rays intersect(b).

$$\frac{1}{g} + \frac{1}{b} = \frac{1}{f}$$

$$\frac{b}{B} = \frac{g}{G}$$

Aperture can close on a lens, making the rays of light come in at a steeper angle, giving more focus but could potentially increase blur. (Glasses sometimes help the aperture in the eye, if a user is straining their eyes focusing)

F.O.V (v), depends on sensor and focal length, the smaller the focal length, the larger the F.O.V.

2.3.1 Zoom

Optical zoom, algorithms and focal length + aperture = distance from camera.

2.3.2 Light

Having correct lighting conditions can be crucial to computer vision related topics.

3 Knowledge

- How is an image formed?
Sensors and electric charge reflected onto a 2d-array
- How is a pixel represented?
bits and bytes, with different channels.(256 values, greyscale)
- Pros and cons of back-lighting?
Makes the object stand out, since the light stems from behind an object, making the object a black silhouette. Con is light-dependent? Pros, very clear object tracking i guess.
- Explain the following terms:
 1. Focus
 2. Depth-of-field
 3. Zoom
 4. F.O.V
 5. Focal length
 6. Shutter
 7. Aperture

4 Important notes

4.1 Micro-project

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