Cheat Sheet
Computer Vision

Basics

01 **Features**
Relevant or noticeable parts in an image, like edges, lines, texture, or even motion.

02 **Scene Understanding**
The ability of a machine to interpret or comprehend visual information.

03 **Machine Vision**
Application of CV systems for processes automated based on visual information.

03 **Depth perception**
Visual ability to perceive distance of an object, also enables 3D vision.

04 **Convolution**
Core mathematical process in image processing filters e.g. feature extraction.

Terms

abbr.

- Computer Vision (CV)
- Convolutional Neural Network (CNN)
- Red-Green-Blue (RGB)
- Simultaneous localization and mapping (SLAM)

Technologies

01 **Image Processing**
Enhancement of images & extraction of basic features. 1st step of CV systems.

02 **CNN**
Deep learning method that can combine multiple techniques for complex CV applications.

Tip **CNNs in CV**
Learn about CNNs for Visual recognition from Stanford University

Learn More

SDKs & Toolkits

01 **OpenCV**
Free Open Source library of image processing and CV algorithms:

Learn More

02 **PCL**
Library containing algorithms for point cloud systems (e.g. registration and feature estimation):

Learn More

03 **Eigen**
C++ library for linear algebra used extensively in for example 3D reconstruction:

Learn More

04 **VLFeat**
Open source CV library specialized in image understanding and feature extraction & matching:

Learn More

05 **ROS**
Robot Operating System, used when creating vision-based robotics solutions:

Learn More

Tip **Tutorials**
Learn OpenCV with Python:

Learn More

Technical Set-Up

01 **RGB-D**
Combines an RGB (color channel) camera for color imaging and an infrared sensor and a camera for depth perception.

Cameras

02 **Monocular**
Single camera. Requires the use of 2D characteristics to enable 3D understanding.

03 **Stereo**
Multi camera-system. Depth perception based on disparity like the human visual system.

04 **Time-of-flight**
Recognize distance like an ultrasound system based on laser pulses or LED.

Technical application

01 **SLAM**
Determines the location and orientation of a sensor and maps the environment simultaneously.

02 **Video tracking**
Continuously locating a moving object over time (over a sequence of images).

03 **Registration**
Combines data from e.g. multiple cameras into a single coordinate system for information comparison and integration.

04 **Segmentation**
Separating an image into more meaningful segments, like separating bones and organs in a medical scan.

05 **3D Reconstruction**
Reconstructing the geometrical structure of a real-world object or scene from 2D information.

Application

05 **Production & Manufacturing**
Automated defect detection & maintenance tasks.

03 **Augmented/ Mixed Reality**
Capturing and mapping the environment & projecting digital information into the visual field.

04 **Medical**
Tumor detection, organ segmentation, robotic surgery 3D reconstruction of ultrasound images.

Use-Cases

02 **Robotics**
Industrial robots navigating autonomously based on visual sensor data.

01 **Autonomous Driving**
Realtime analysis of unknown and changing environments.

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