Computer Vision

Eng. Mai Magdy
Eng. Yossr Mansour
Section (1)
2020-2021

Agenda

1. What is Computer vision
2. Computer vision based system
3. Computer vision applications
4. Image types
5. image processing techniques
   1. High level processing
   2. Low level processing
6. Image file

What is Computer vision

Computer vision : science that deals with how computers can be made to gain high-level understanding from digital images or videos to simulate human vision system .

Computer vision based system
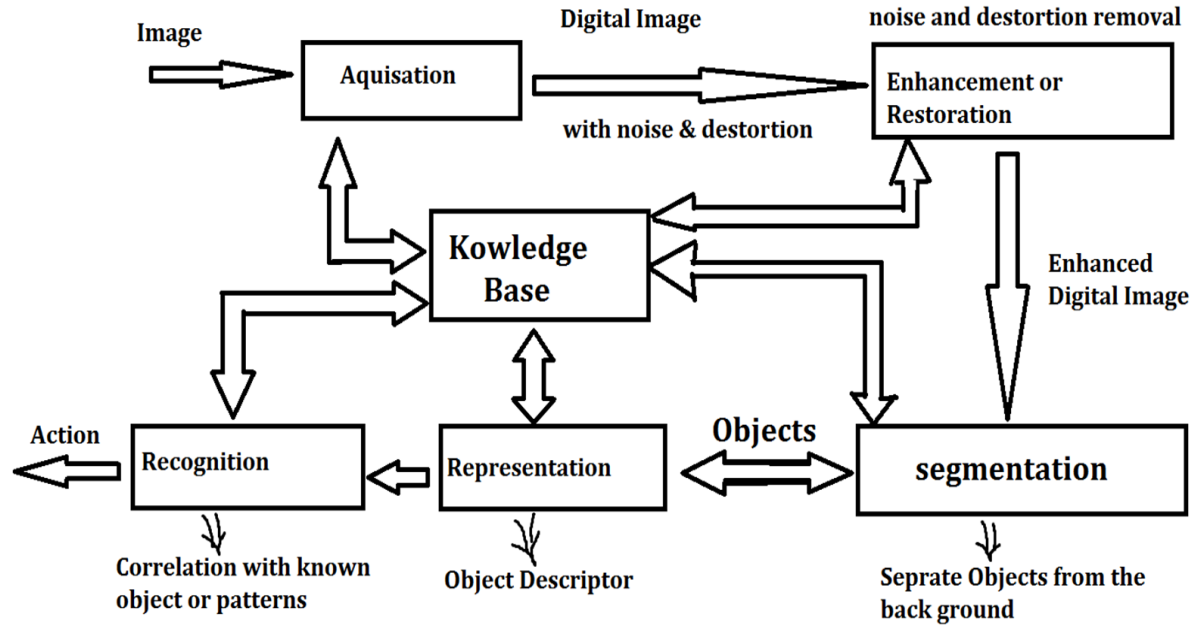
fig(1.1) Image Processing Based Systems

Computer vision applications

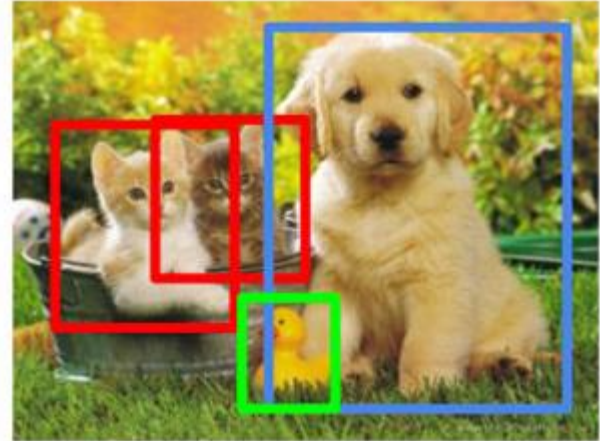## ➤ Image enhancement

Computer vision applications

➢ **Image Classification**
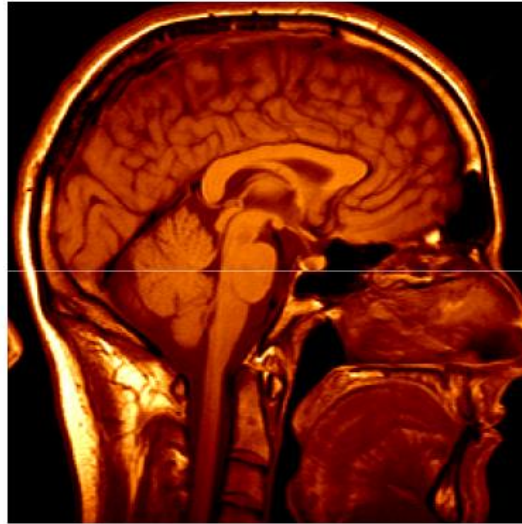

CAT

Computer vision applications

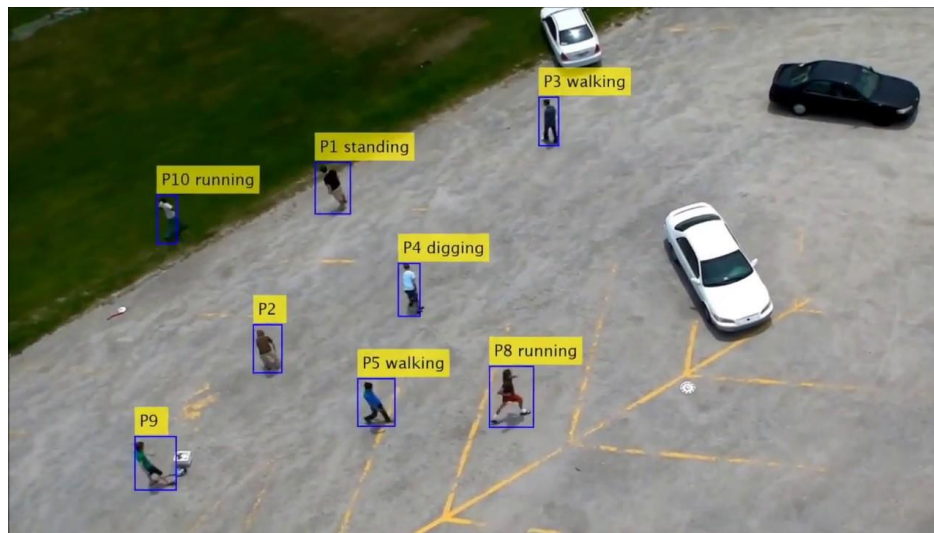➢ **Object Detection**

CAT, DOG, DUCK

Computer vision applications
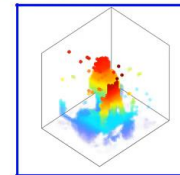
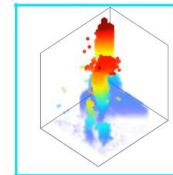➢ **Medical imaging**

3D imaging
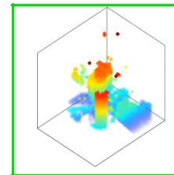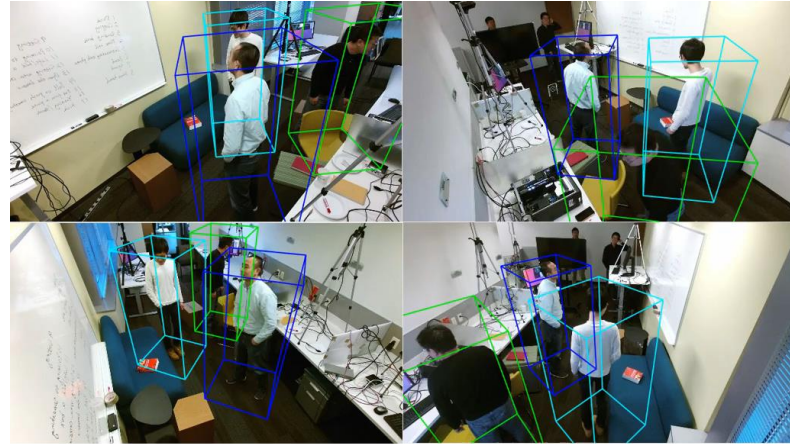

Image guided surgery

Computer vision applications

➢ **Human Pose Estimation**

Computer vision applications

➢ **Object Tracking**

Computer vision applications

➢ **Self Driving Car**

FOOTAGE 3X SPEED
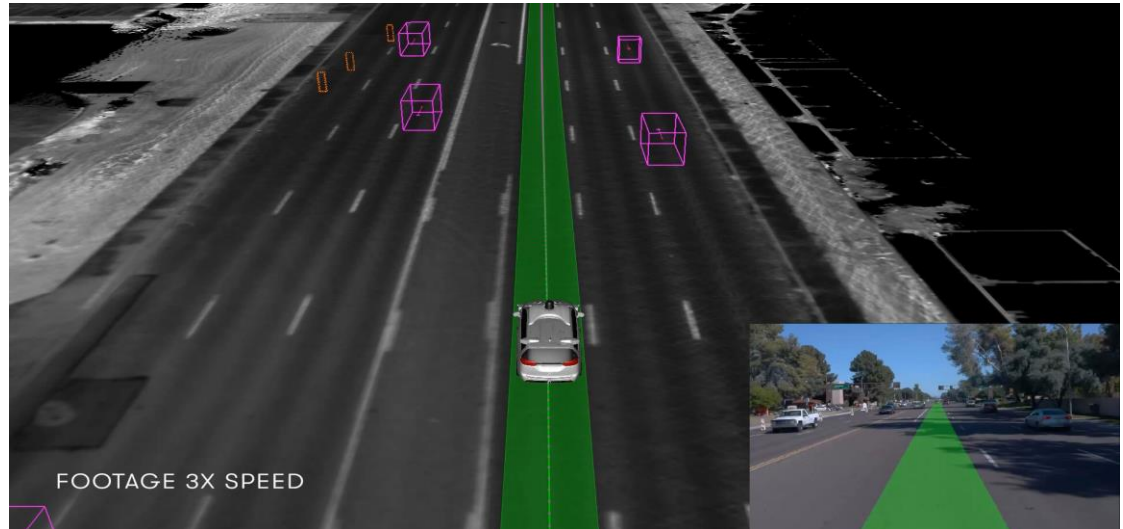
How computer sees image

What we see

What a computer sees

Image types

➢ **RGB image**

Represent as : 3D matrix
(height x width x 3 channels)

Image types

➢ **Gray image**

Represent as : 2D matrix (height x width)
Each pixel represents intensity
information in **range** 0 (for black) up to
255 (for white)

Image types

➢ **Binary Image**

Black for Background

White for Foreground

○ Binary Image: has only 2 values for black and white (e.g. 0 and 255)
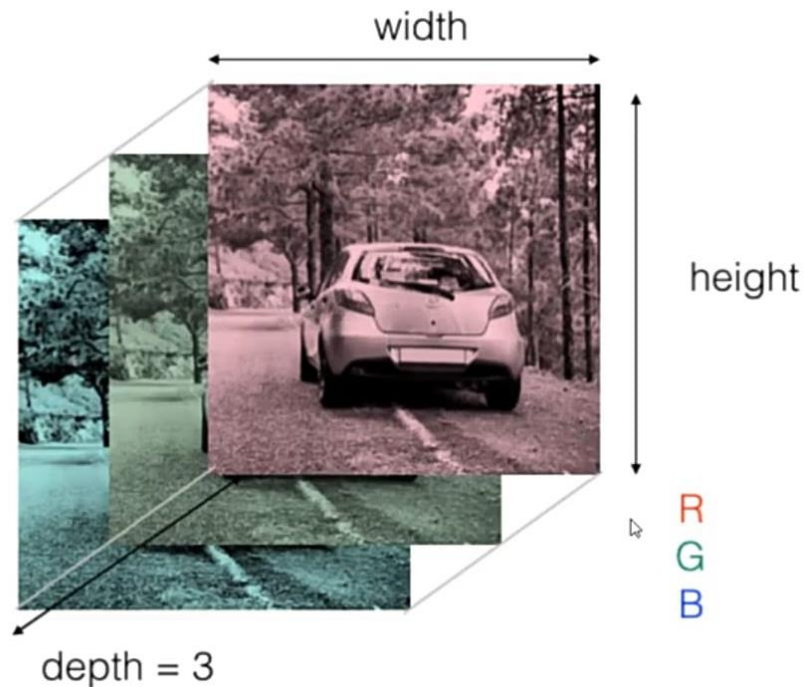
image processing techniques

High level	Low level

Use built-In functions or import libraries
Example:
 	
cv2.imshow('image',img)
	Implement functions from scratch to use
	Example:
	
	filelist = dir('Training data');
	for i=1 : length(filelist)
	for i=1 : length(filelist)
	filename = filelist(i);
	if ~strcmp(filename.name , '.') &&
	~strcmp(filename.name , '..')
	filename.name
	end
	end

Languages for image

Python: A high-level programming supports functional, procedural and object-oriented styles of programming while having a simple syntax and being portable.
Its compatibility with a range of libraries for computer vision, deep learning and machine learning applications.

Matlab: A high-level programming platform with an array of built-in tools and functions
Since image recognition and matrix calculation are interconnected, MATLAB turns out to be an excellent environment for computer vision, deep learning and machine learning applications.

c/c++ : A low-level language is used widely for the creation of artificial intelligence programs and it's native libraries and specifications such as OpenCV have built-in intelligent features for processing pictures

Image file

Image file formats:

- standardized means of organizing and storing digital images.
- An image file format may store data in an uncompressed format, a compressed format (which may be lossless: reduce file size while preserving a perfect copy of the original uncompressed image or lossy: preserve a representation of the original uncompressed image that may appear to be a perfect copy but it is not a perfect copy), or a vector format.
- Image files are composed of digital data in one of these formats so that the data can be rasterized for use on a computer display or printer.
- Rasterization converts the image data into a grid of pixels