

CONTENT

Chapter 1: Introduction to Machine Vision

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1.3 Specific Problems with Machine Vision

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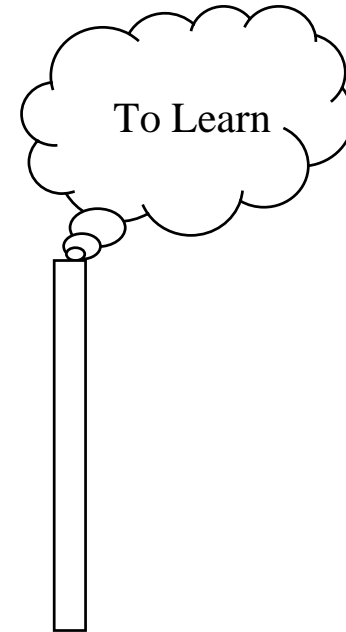
1.5 Examples of Vision Application

1.5.1 Visual Guidance

1.5.2 Visual Inspection

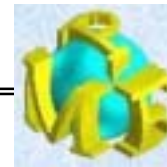
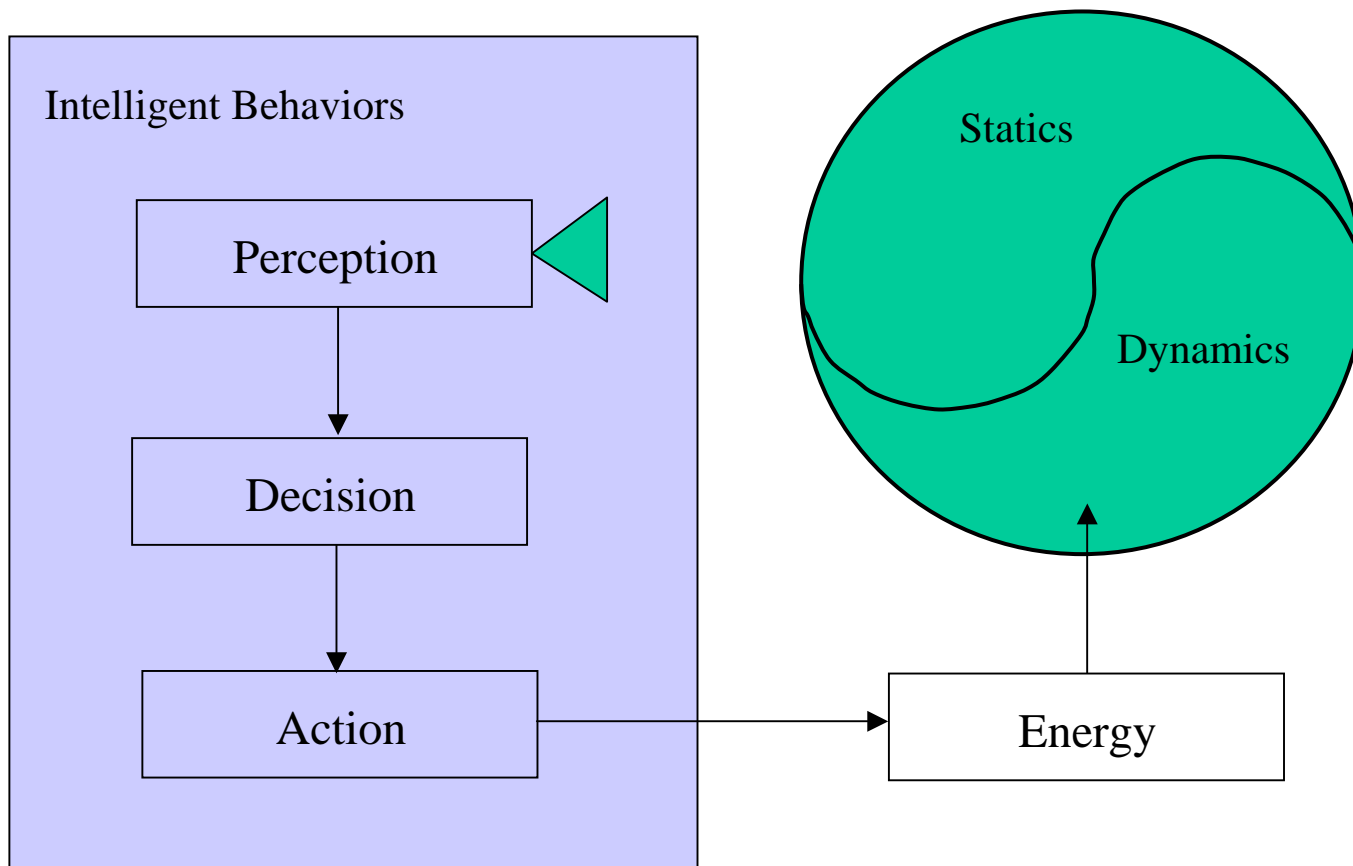
1.5.3 Visual Measurement

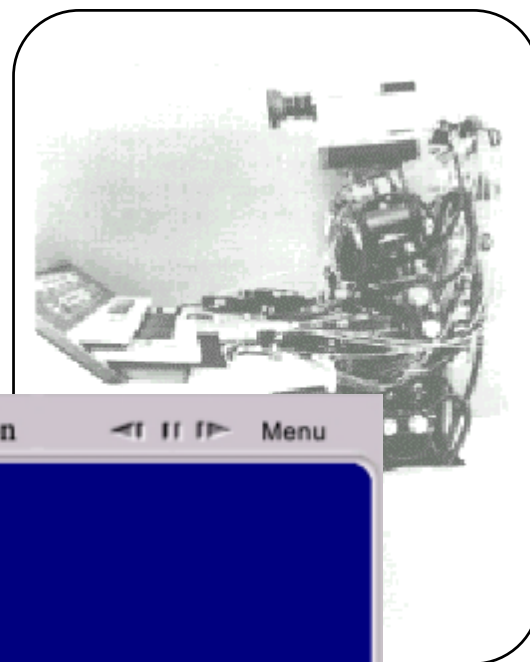
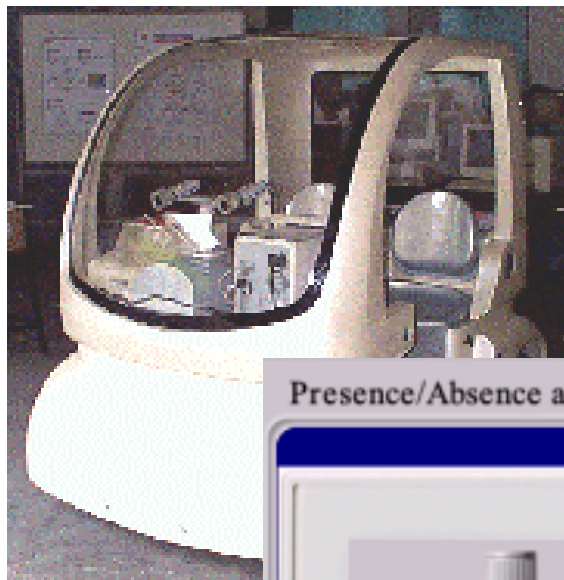
1.5.4 Visual Identification



Why does a machine require vision ?

ANSWER:





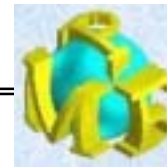
Presence/Absence and Misalignment Detection

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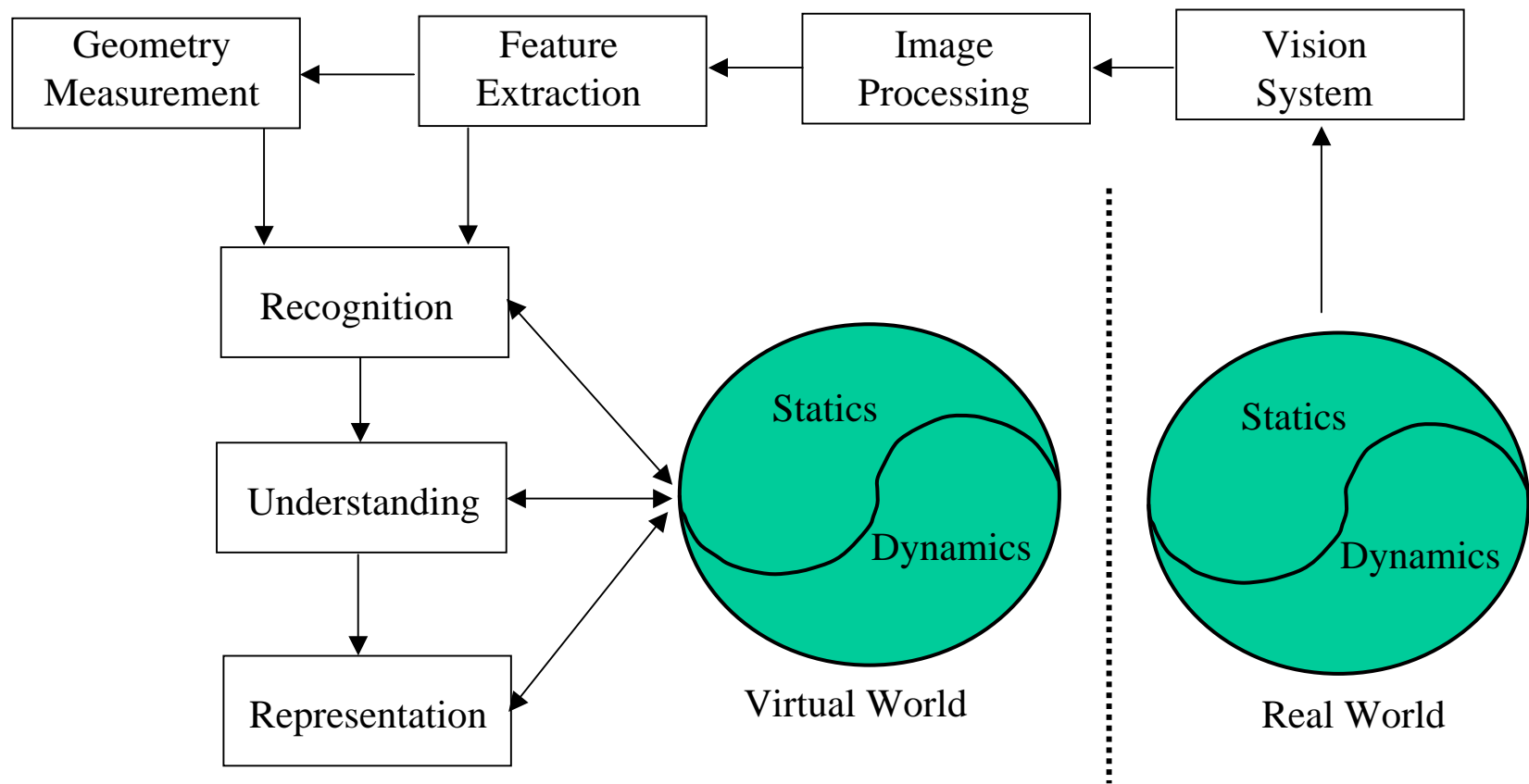
SCREEN
WINDOW
FULL VIEW
PROGRAM NO.
END
ENT
CLEAR FIND
CV-501

NG
misalignment

PREYENCE



How to create a vision for machine ?

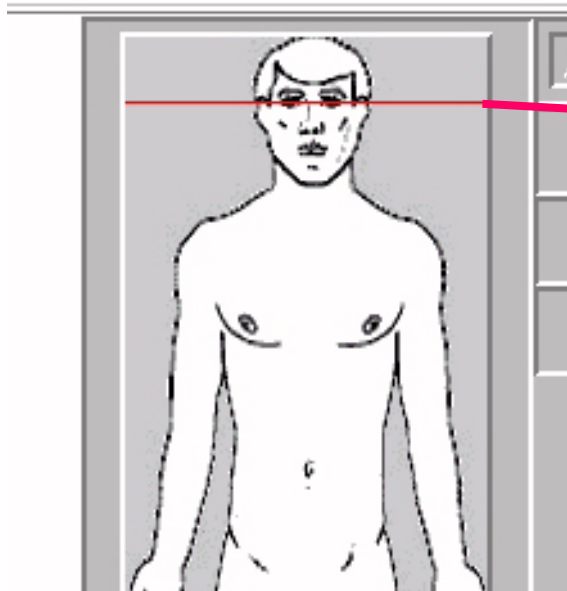


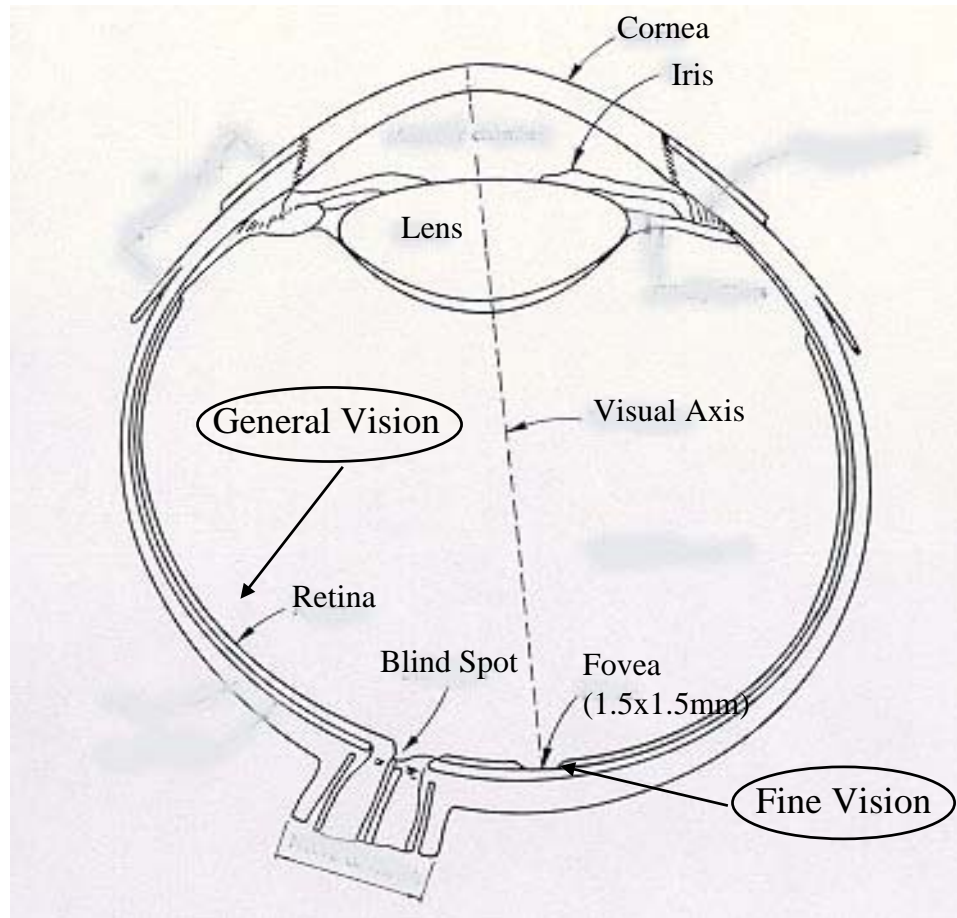
Are we able to create an artificial vision that is as powerful as human vision ?

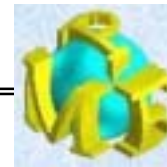
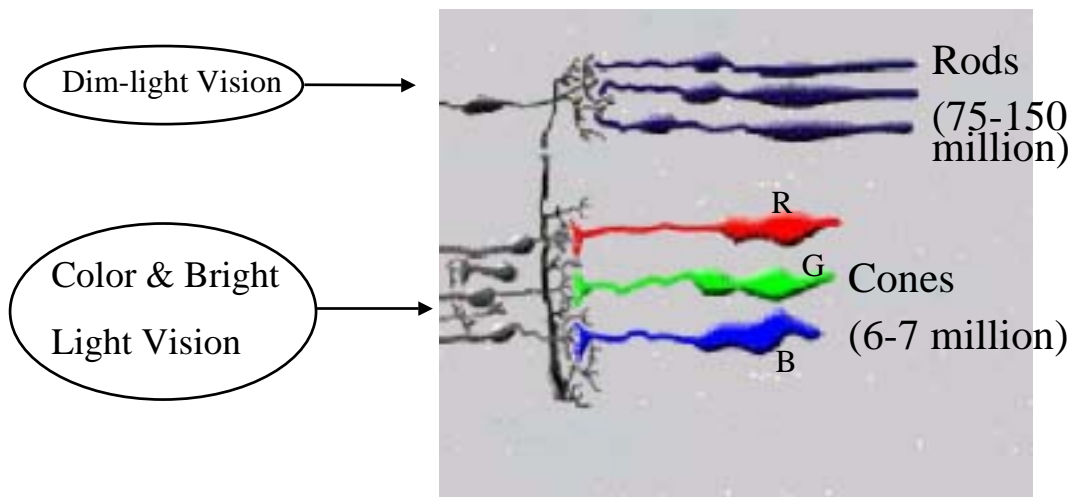


How is human vision system composed of ?

ANSWER:

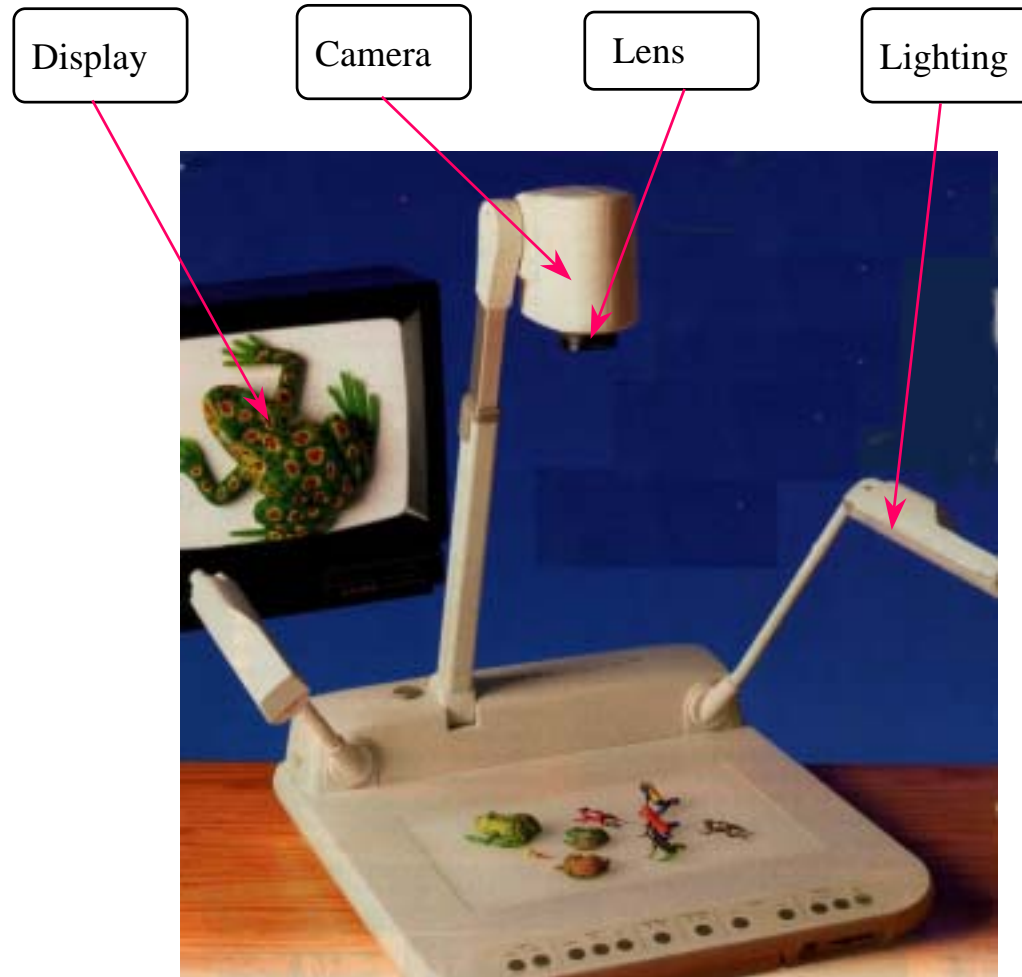






How is a machine vision system composed of ?

Is this a machine vision system ?



Are these machine vision systems ?

Lens

Camera

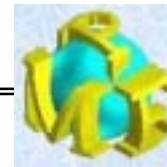
Digitizer



Camera

Lens

Digitizer



Is this a machine vision system ?

Compact Machine Vision System
(PC not required!)

Use the Sharp IV-S20 to detect the presence, absence, position, orientation, size or number of objects. Locate positioning marks and deviation from a reference position. Measure angular deviation. And more.

Operate the IV-S20 like a visual sensor - set-up from a key-pad or PC.

Capture images from 1 or 2 self-(or externally-) triggered cameras. Process in gray scale. Output to PC or PLC. Use built-in PLC-like functions for I/O controls.

Computing Unit

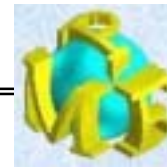
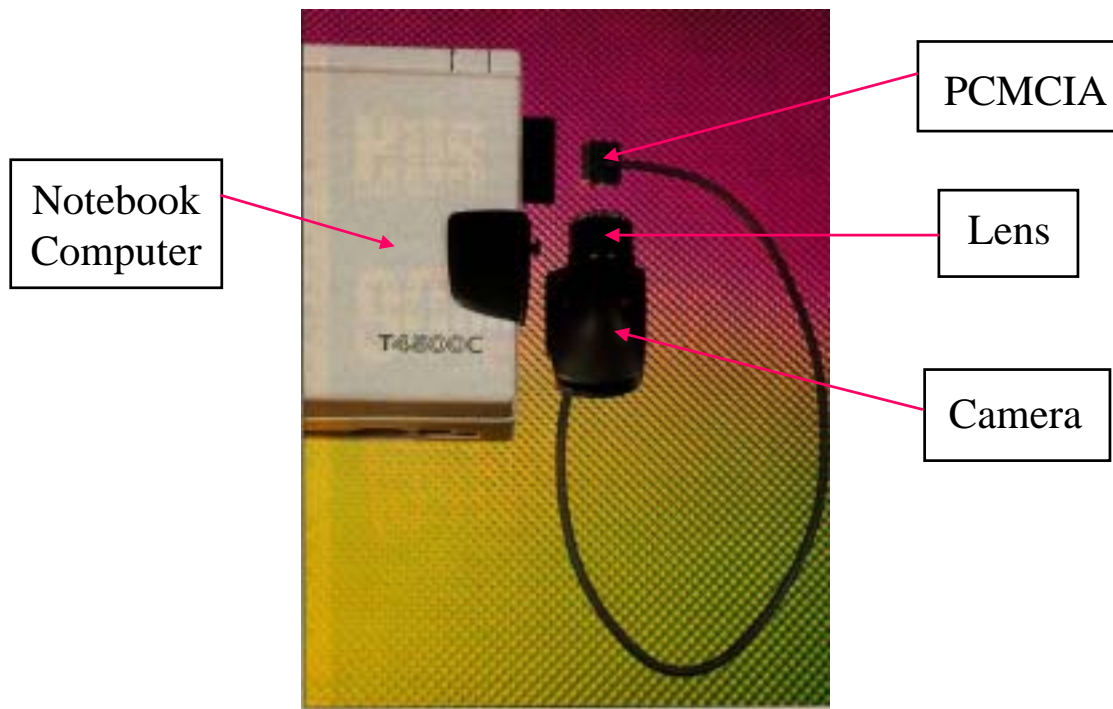
Man Machine Interface

Camera

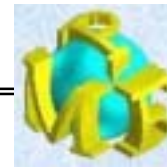
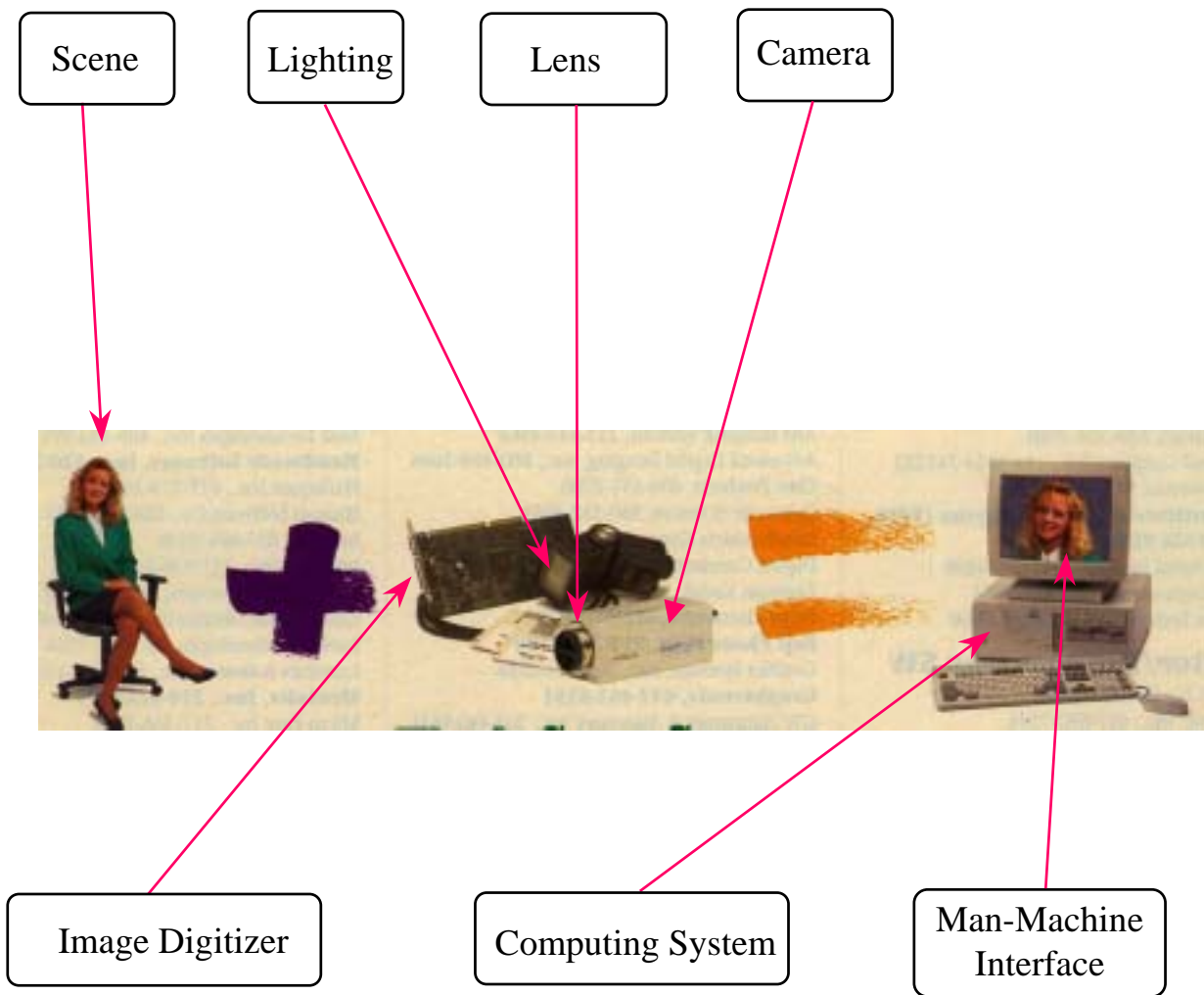
Lens



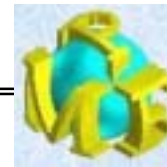
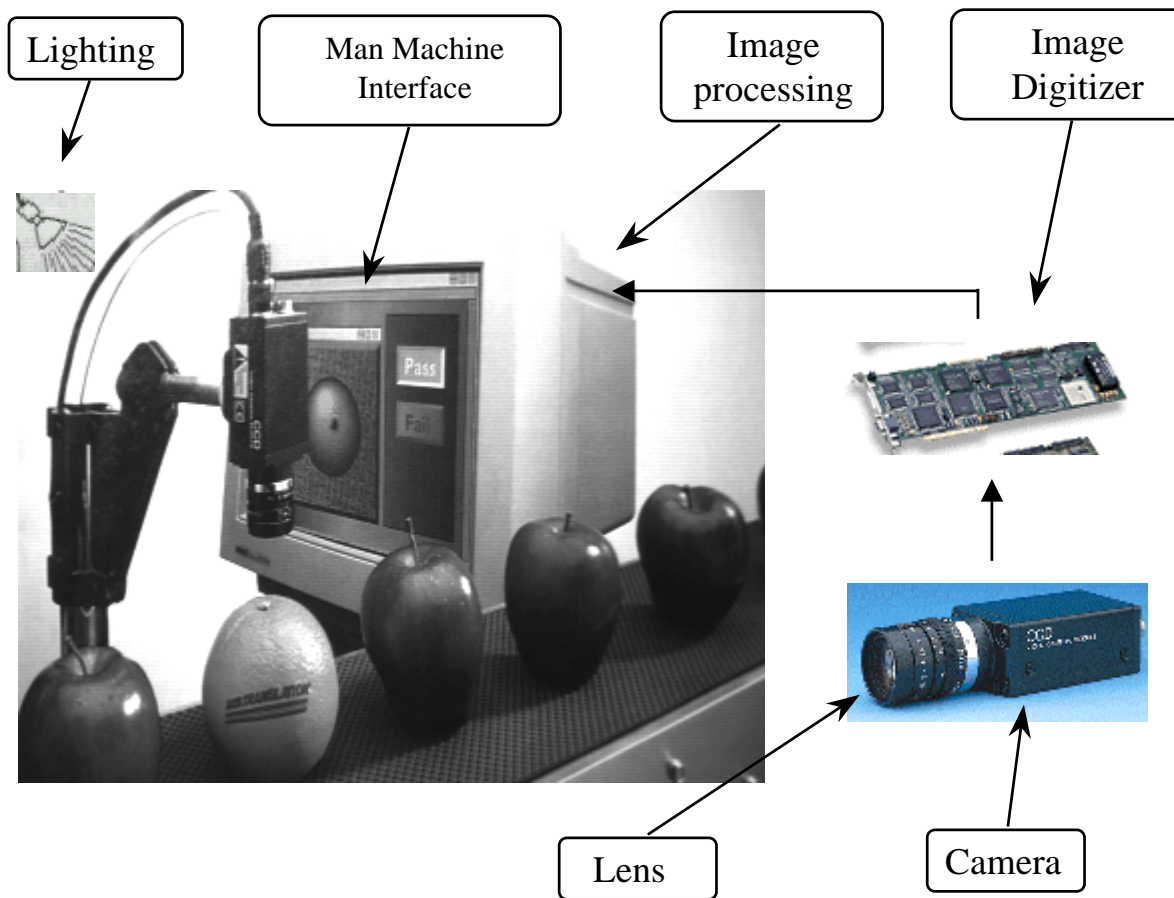
Is this a machine vision system ?



Is this a machine vision system ?



How is a machine vision system composed of ?



How is a machine vision system composed of ?

ANSWER:

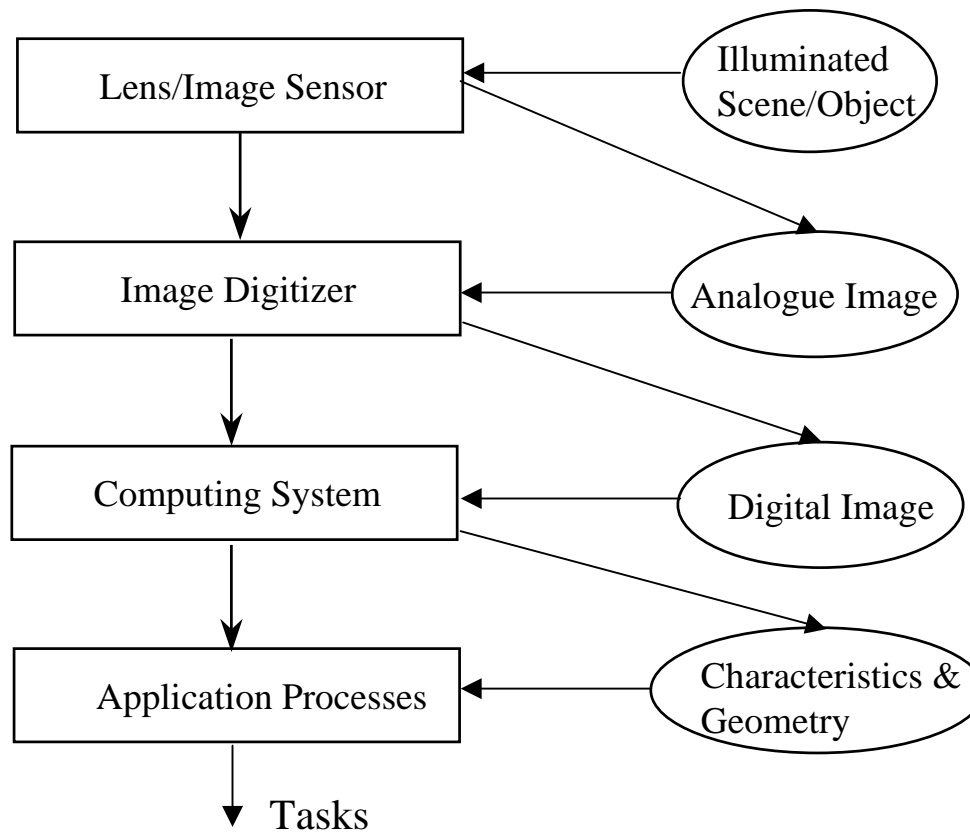
In general, a machine vision system is composed of:

- Lighting Device.
- Lens System.
- Camera (image sensor).
- Image Digitizer.
- Image Processing System.
- Interface to Process Control System or Human



What is a machine vision system ?

ANSWER: (flow of data \leftrightarrow flow of components)



What are the specific problems related to the design and use of a machine vision system ?

ANSWER:

1. What is the application in mind ?
2. How to illuminate a scene or object ?
3. How to create analogue images of the scene or object ?
4. How to convert the video signal into digital images ?
5. How to describe the geometric relationship between an object and its image ?
6. What are possible computing platforms for image processing ?
7. How to program “image processing” algorithms with C language ?
8. What are the basic techniques for image processing & feature extraction ?
9. How to describe and recognize objects in image (2D space) ?
10. How to recover geometric information (location and motion) of an object in a 2D space of a scene ?
11. How to recover geometric information (location and motion) of an object in a 3D space of a scene ?
12. What are the most important applications using machine vision ?

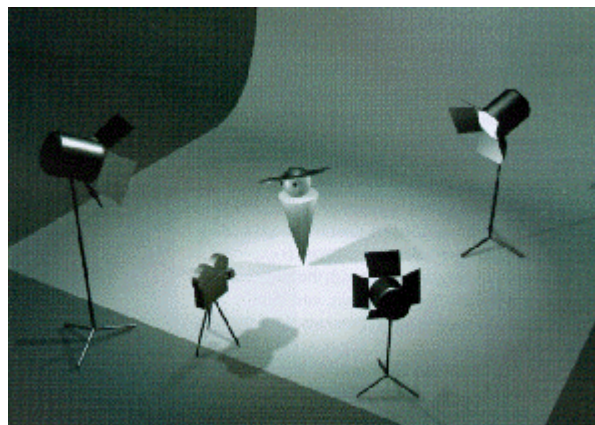


How to illuminate a scene or object ?

1. What to use ?

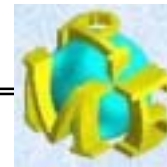
ANSWER:

Lighting Devices (light source)



Examples:

- a) SUN light (“parallel light”)
- b) Projector or Street Lamps or Car headlight (“spot light”)
- c) Light bulb or fire-fly (“point light”)
- d) Flash light (“strobe light”)

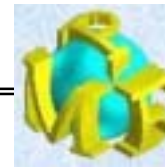
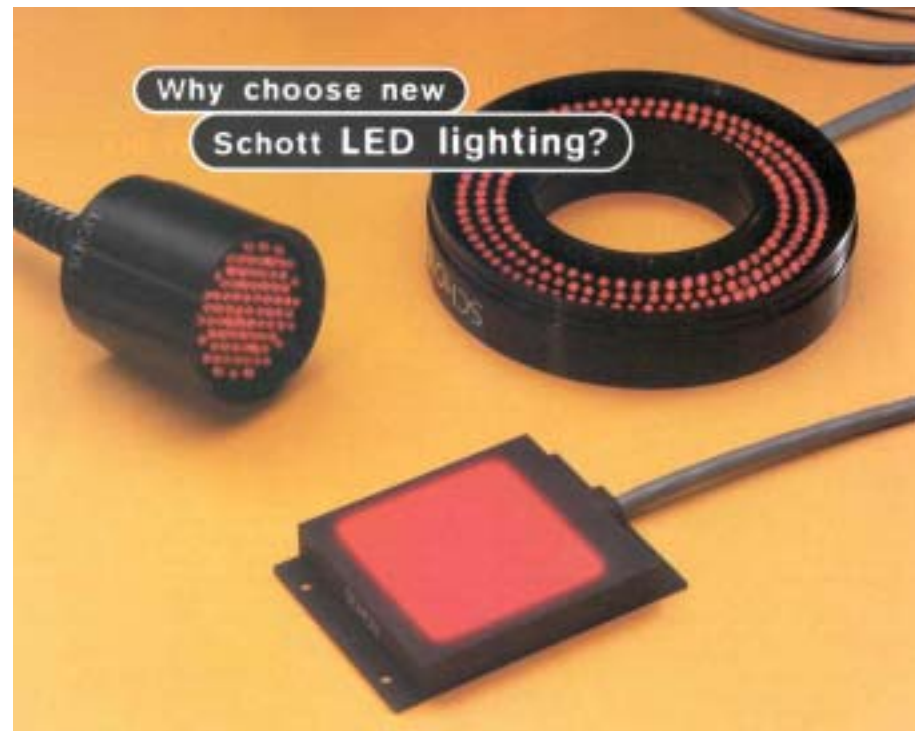
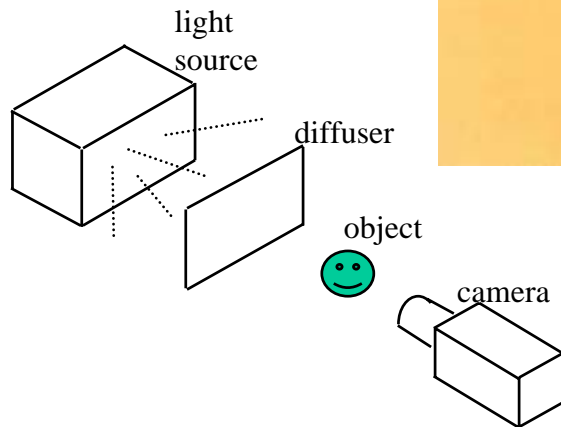


How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

a) Back lighting

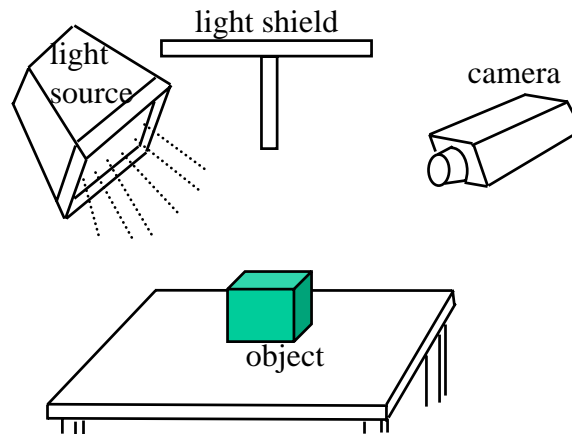


How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

b) Front lighting

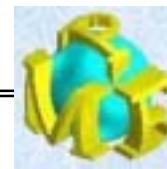
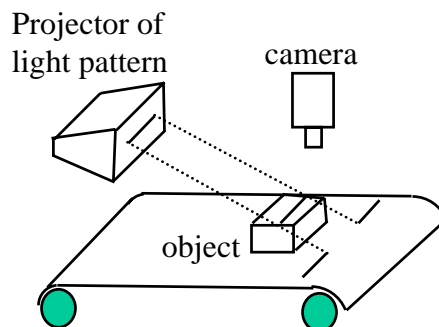


How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

c) Structured lighting

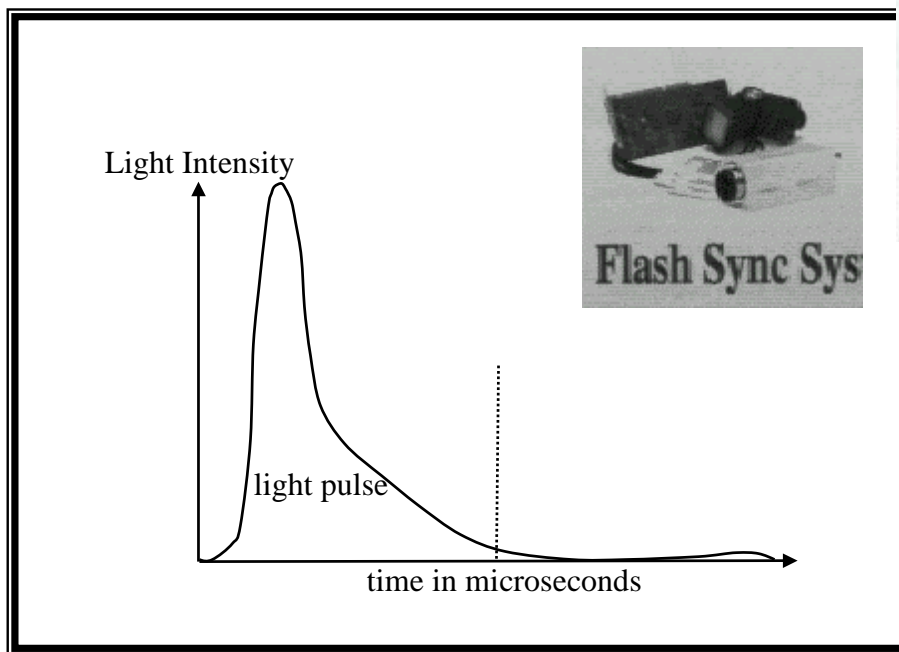


How to illuminate a scene or object ?

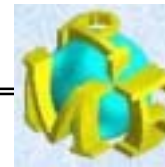
2. How to use lighting devices ?

ANSWER:

d) Strobe lighting



Forward-looking infrared radar, or FLIR, enables helicopter pilots to navigate at night and to target vehicles, people and buildings. Courtesy of Lockheed Martin.



SUMMARY

1. A vision system is usually composed of:

- lighting device
- image sensor (camera)
- computing system
- lens system
- video A/D conversion (image digitizer)
- interface to process control system or human.

2. There are at least 12 specific problems related to the design and use of machine vision.

3. There are four types of light sources: a) parallel light, b) spot light, c) point light, and d) strobe light.

4. There are four techniques of using lighting devices:

- Back lighting
- Structured lighting
- Front lighting
- Strobe lighting

