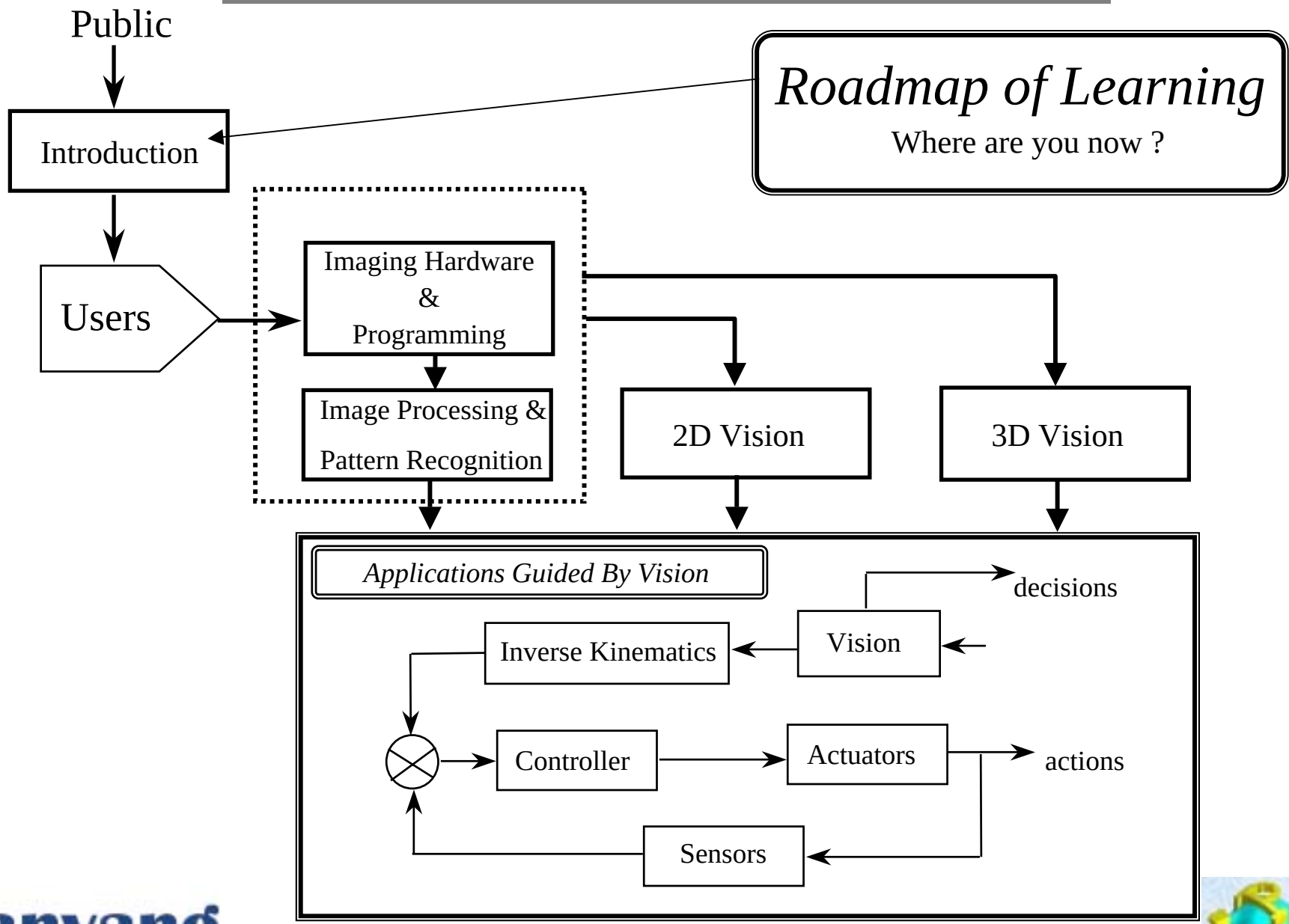

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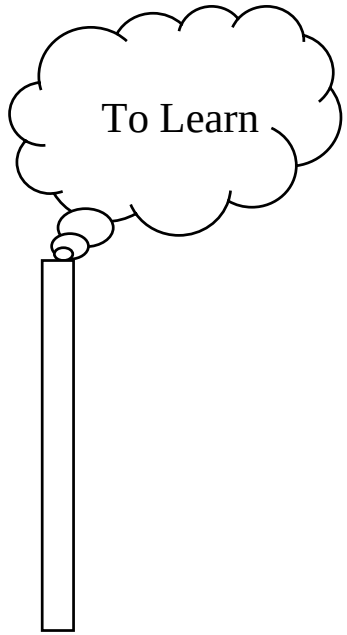
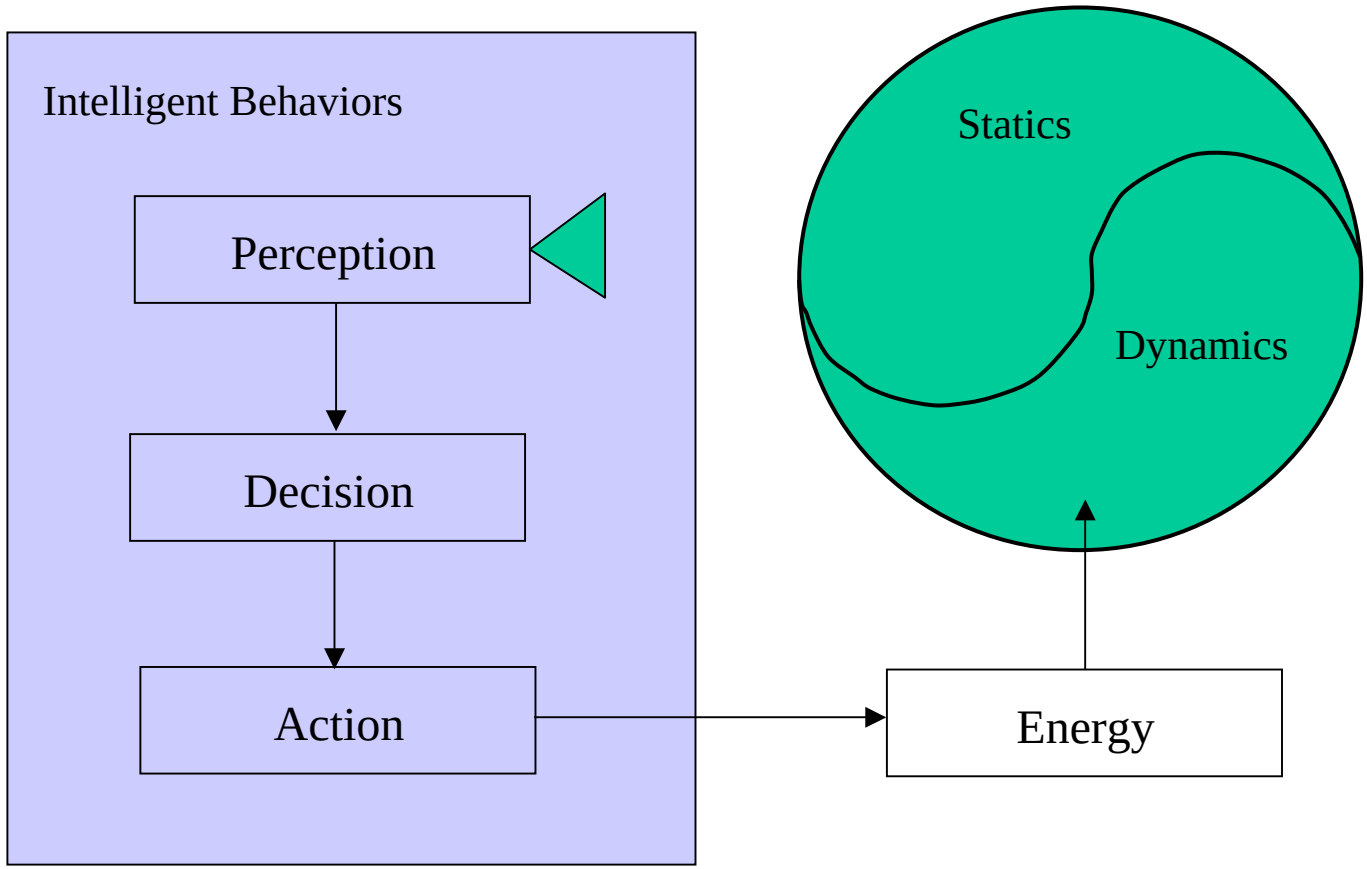
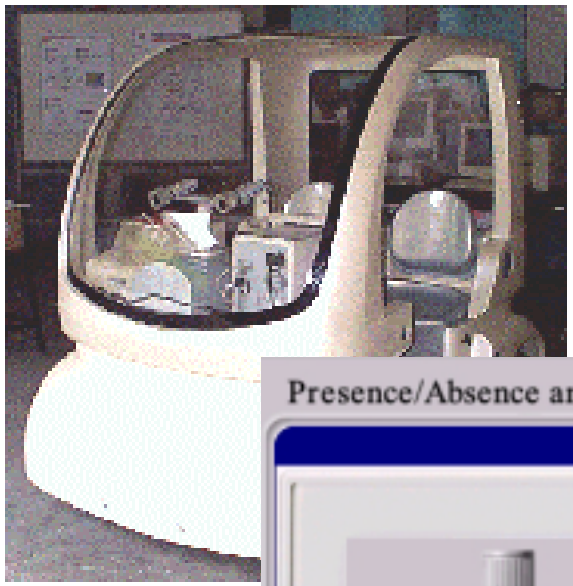
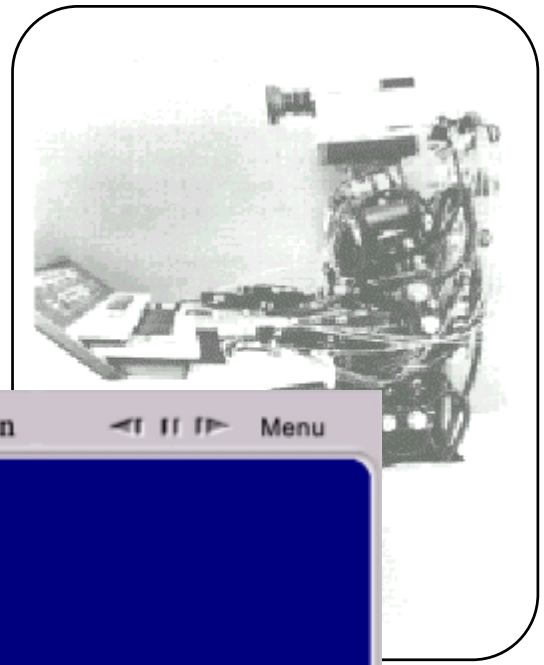


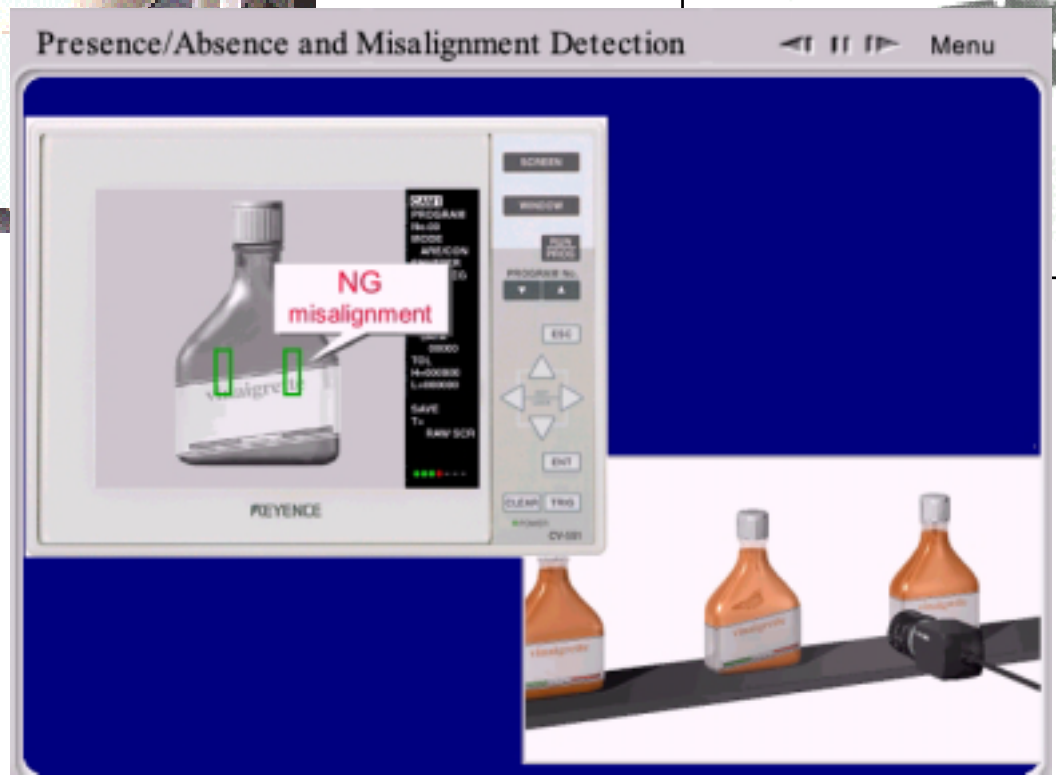
Why does a machine require vision ?

ANSWER:

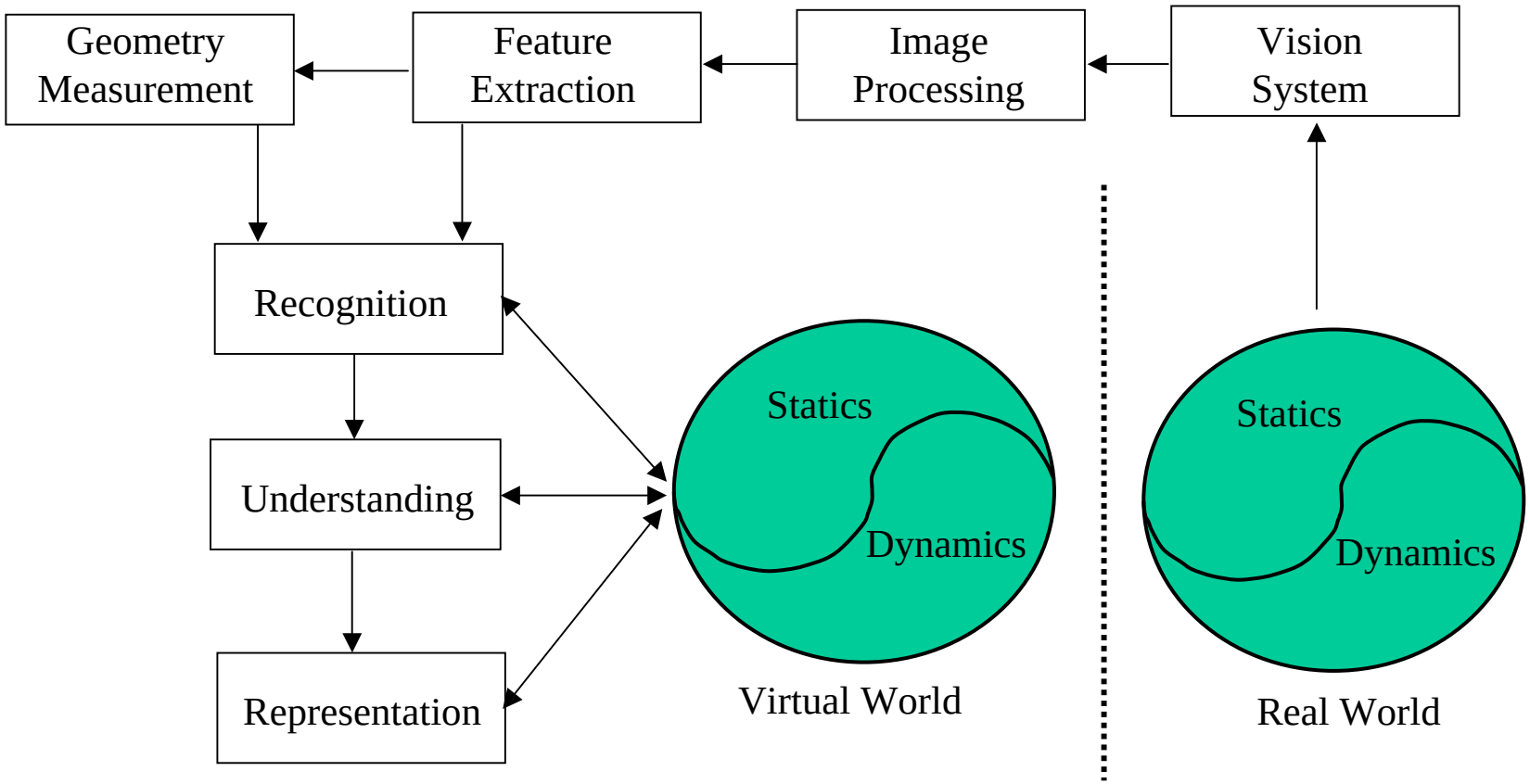








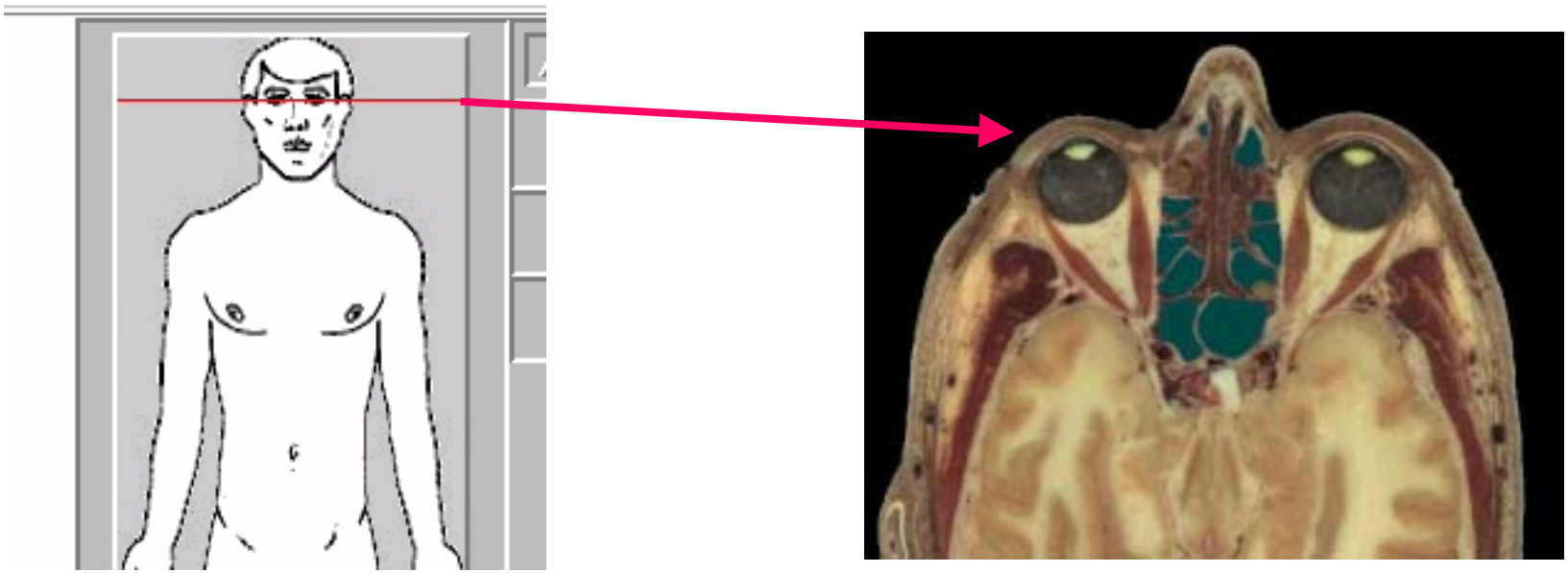
How to create a vision for machine ?

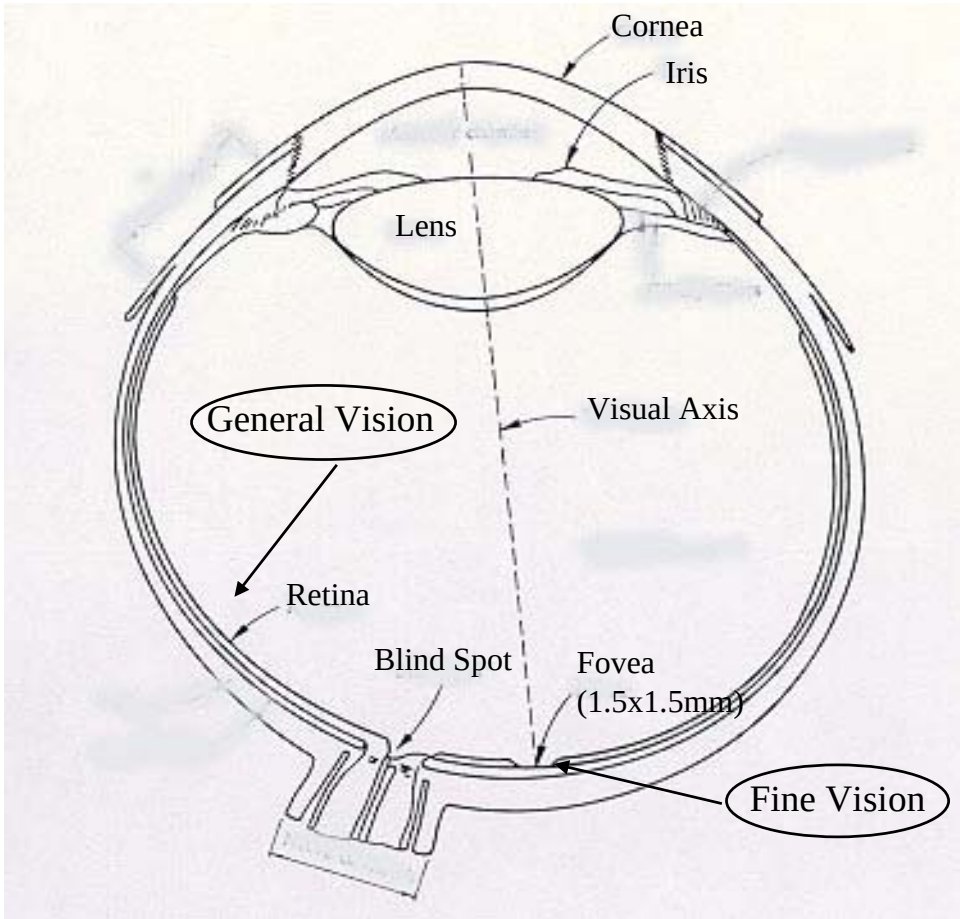


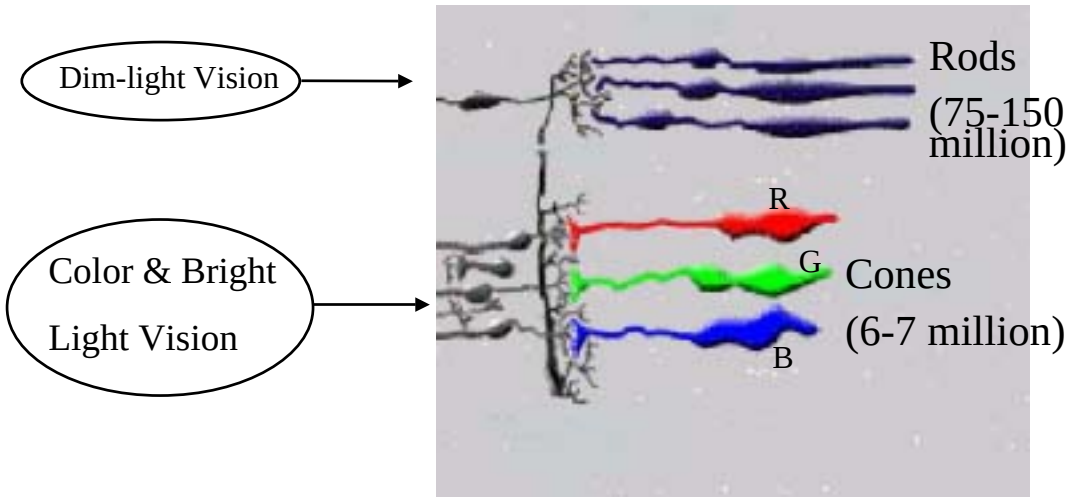
Are we able to create an artificial vision that is as powerful as human vision ?

How is human vision system composed of ?

ANSWER:

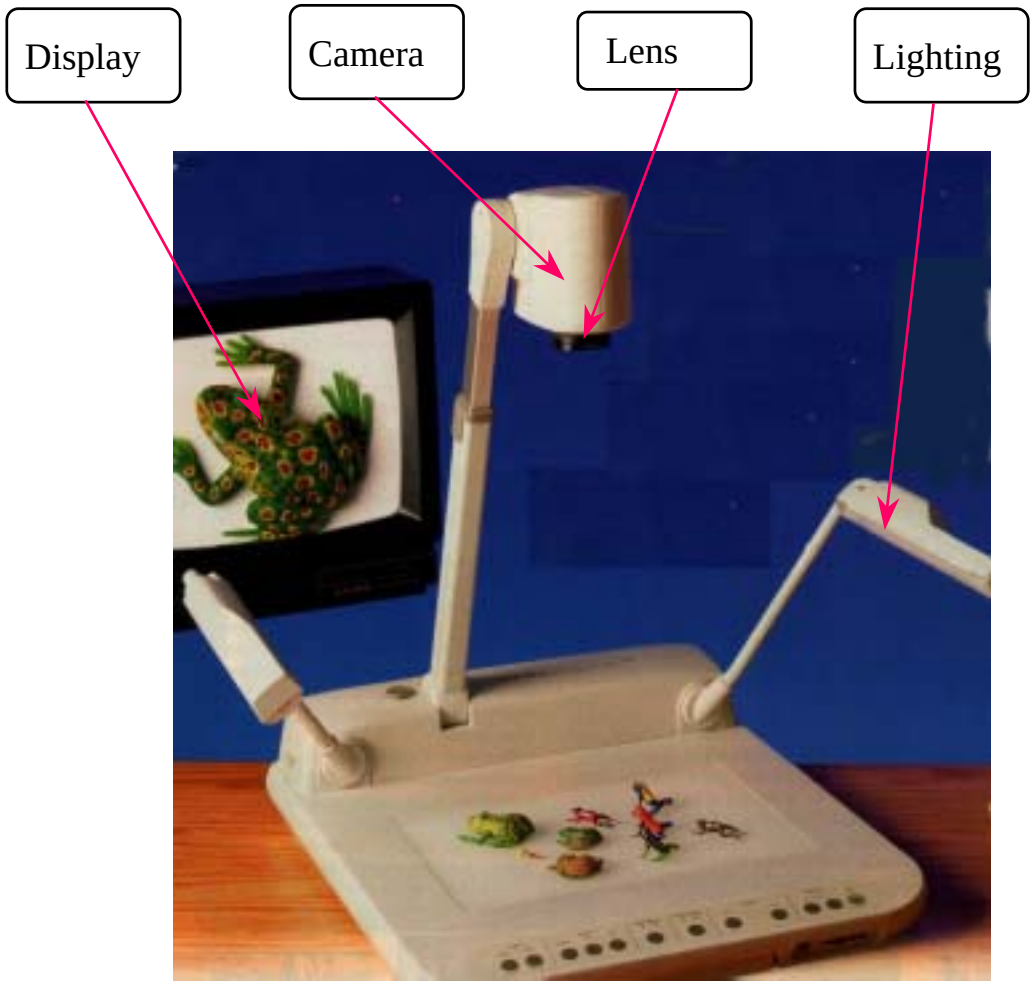




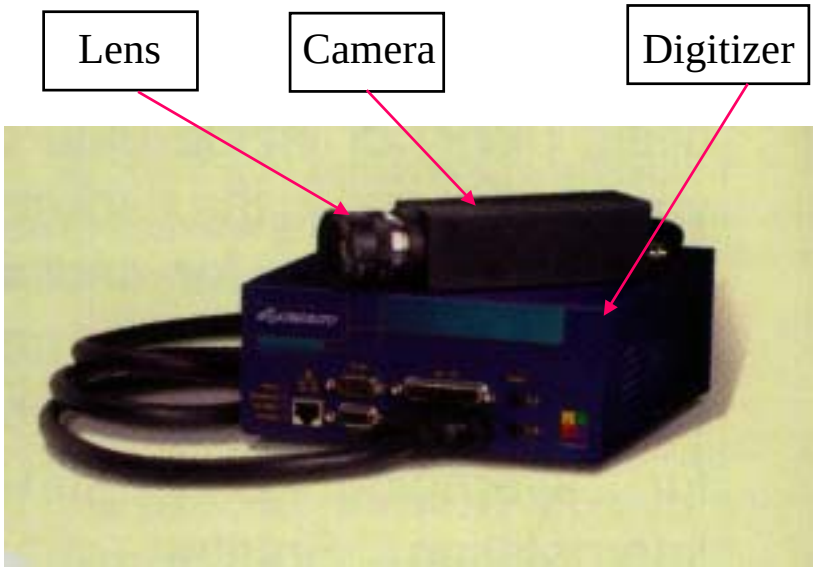


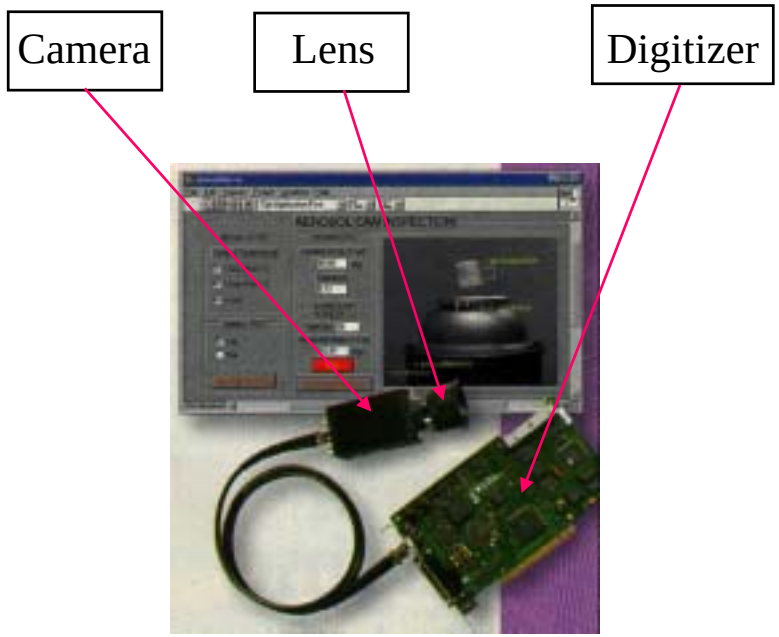
How is a machine vision system composed of ?

Is this a machine vision system ?



Are these machine vision systems ?





Is this a machine vision system ?

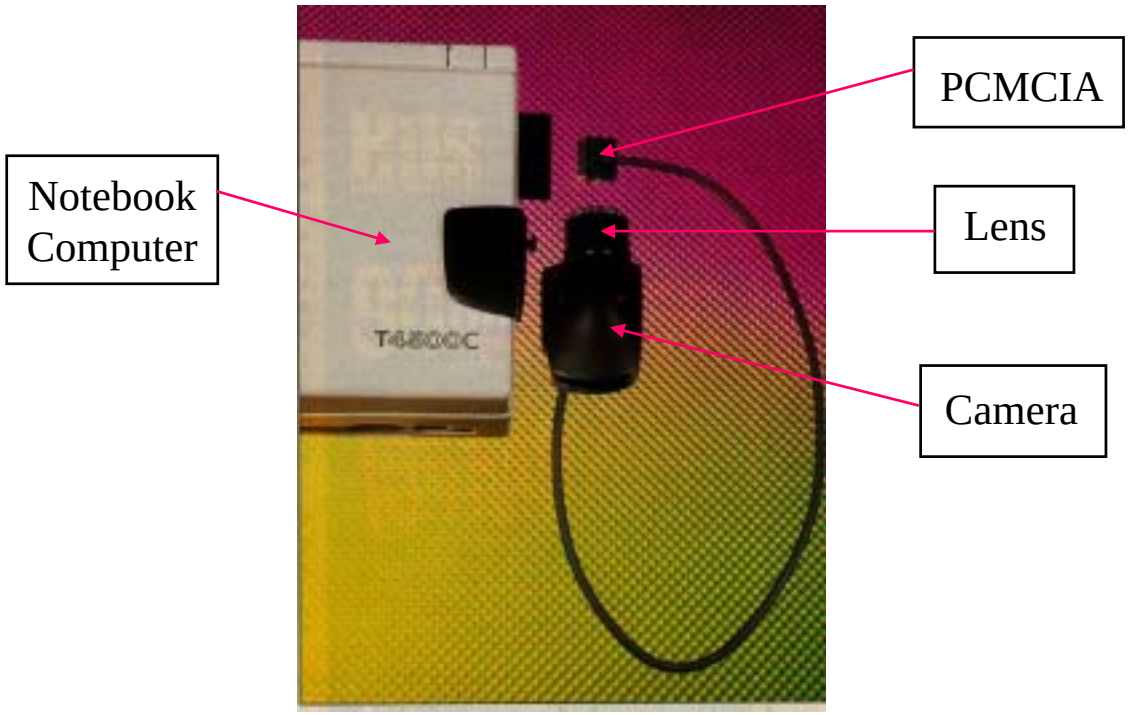
Computing Unit

Man Machine Interface

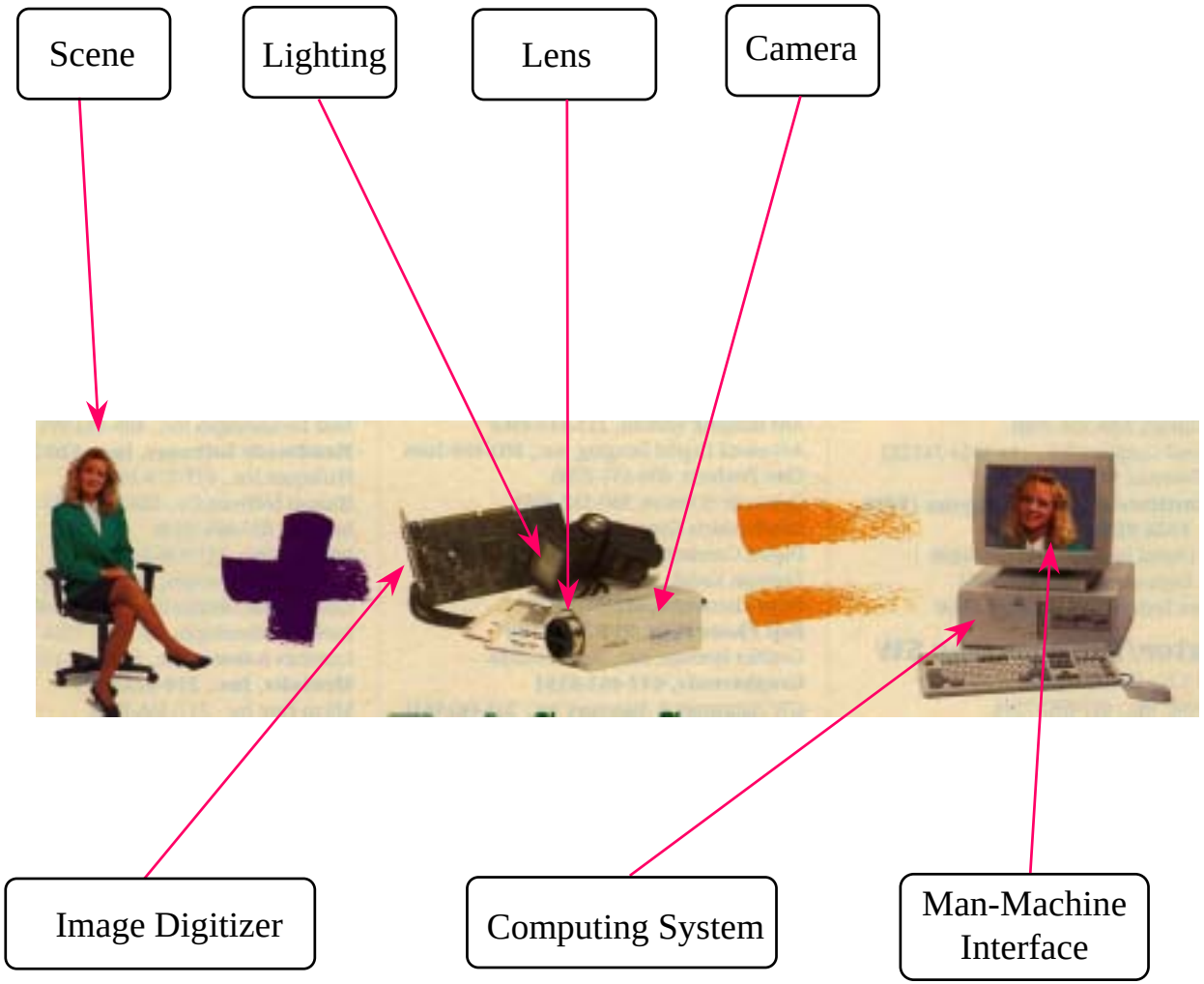
Camera

Lens

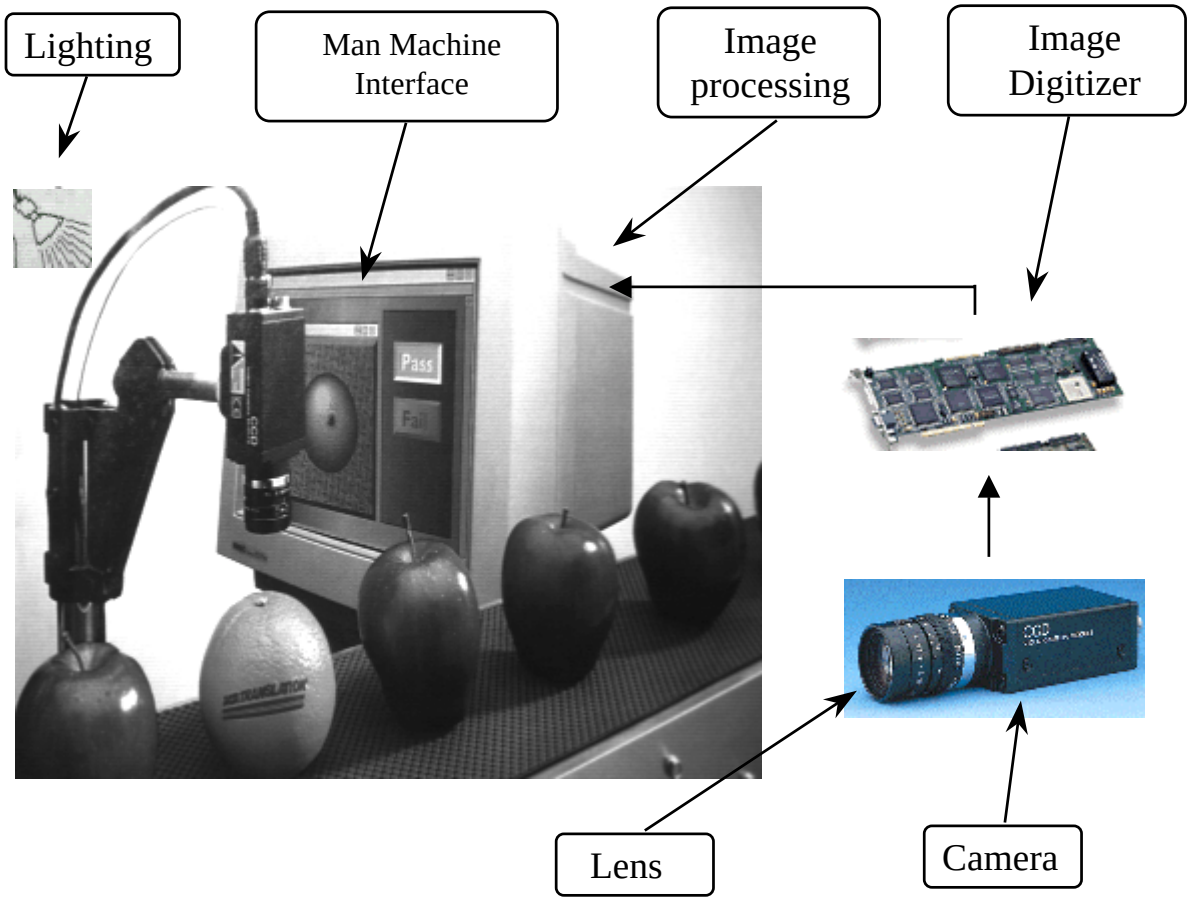
Is this a machine vision system ?



Is this a machine vision system ?



How is a machine vision system composed of ?



How is a machine vision system composed of ?

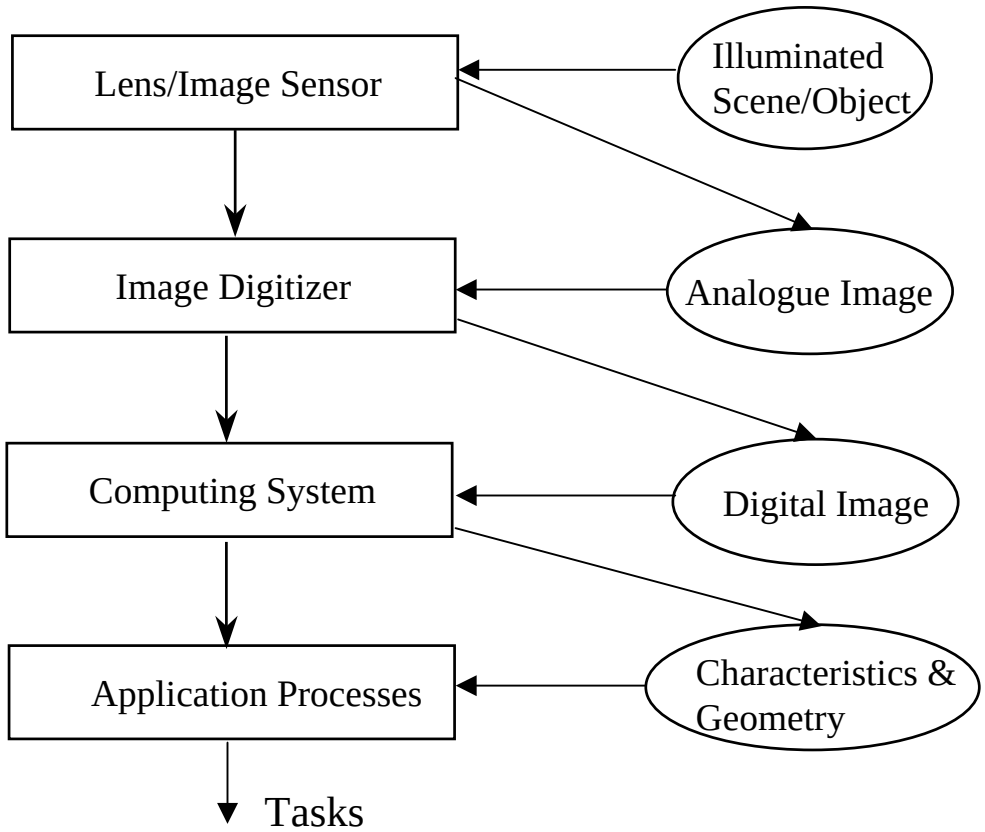
ANSWER:

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 <==> flow of components)



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

ANSWER:

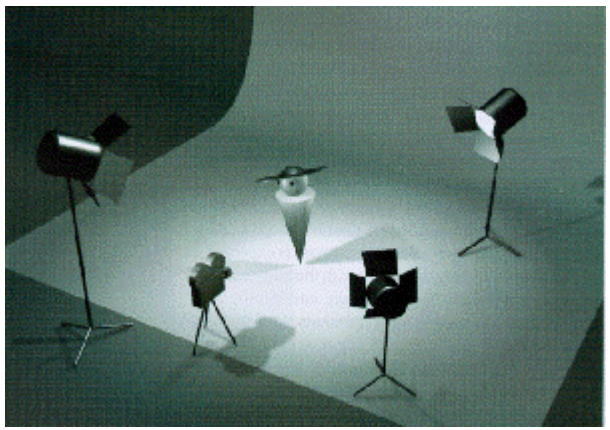
1. What is the application in mind ?
2. How to illuminate a scene or object ?
3. How to create analogue images of the scene or object ?
4. How to convert the video signal into digital images ?
5. How to describe the geometric relationship between an object and its image ?
6. What are possible computing 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”)

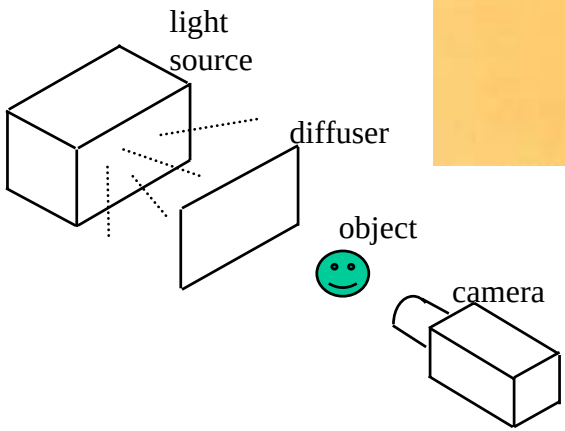
d) Flash light (“strobe light”)

How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

a) Back lighting

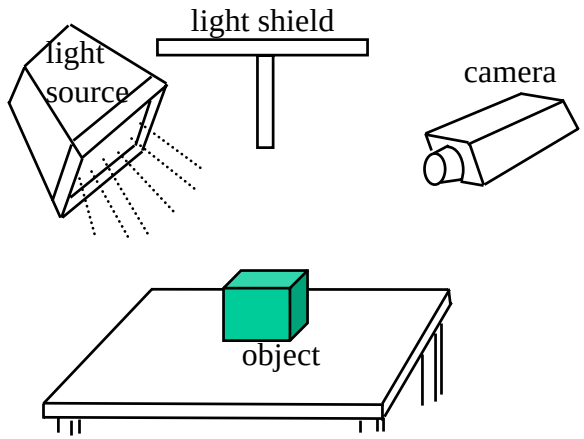


How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

b) Front lighting

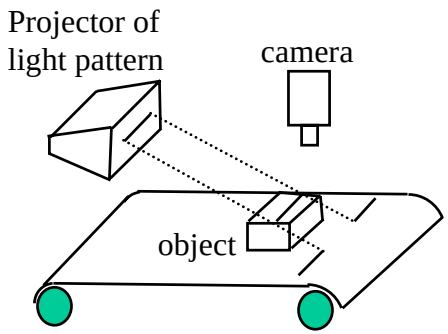


How to illuminate a scene or object ?

2. How to use lighting devices ?

ANSWER:

c) Structured lighting

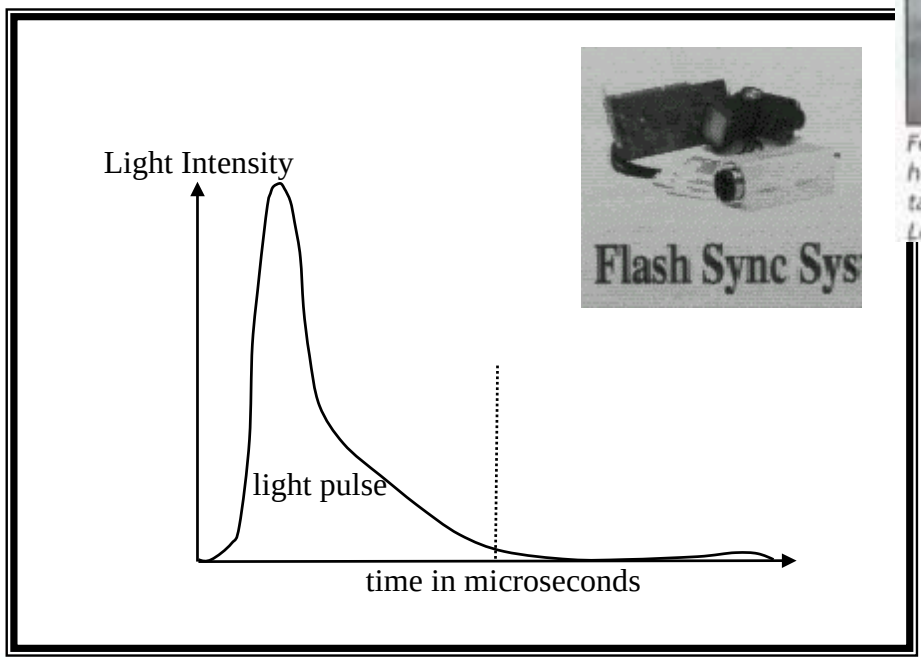


How to illuminate a scene or object ?

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.

CAUTION: lighting and A/D conversion must be synchronized.

SUMMARY

1. A vision system is usually composed of:

- lighting device
- lens system
- image sensor (camera)
- video A/D conversion (image digitizer)
- computing system
- 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
- Front lighting
- Structured lighting
- Strobe lighting