

## **Module 7 : Robot vision I**

### **Lecture 25 : Robot vision, image processing, image acquisition camera**

#### **Objectives**

In this course you will learn the following

- Robot Vision
- Image Processing
- Image Acquisition
- Charge-coupled Device
- Image
- **Lighting**
- The Eye

#### **Robot Vision**

- Internal and External State Sensors
- Machine Vision
- Image – 2D representation of 3D world. Extraction of 'useful information' of real world
- **Image Processing**
- Image Acquisition (sensing)
- Preprocessing (Reduction in noise enhancement)
- Segmentation (separating regions)
- Description (characteristic features)
- Recognition (identify regions)
- Interpretation ( Assign meaning)

## Image Acquisition

- Traditionally Vidicon Cameras
- Photosensitive layer behaves as Capacitor
- Scanning Pattern 525 lines out of which 480 contain image 30 times in a second
- 262.5 lines , 60 fps
- 559 lines Interlaced 512 belong to image

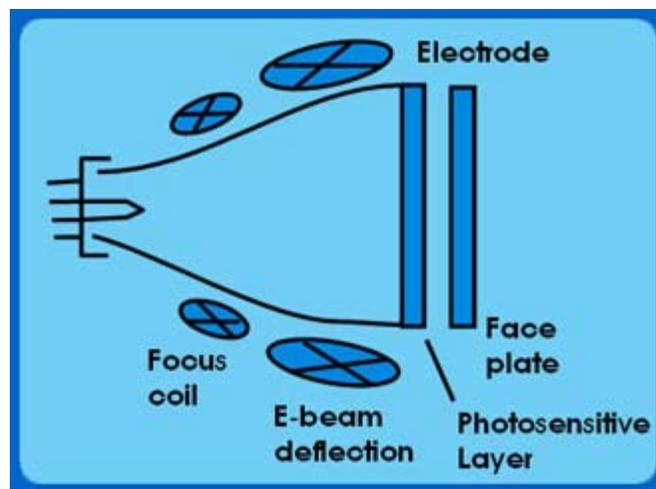


Figure 25.1 Image Acquisition

## Charge-coupled Device

- Gate is more positive than substrate
- Potential well – electrons accumulate
- Line scan and Area scan cameras

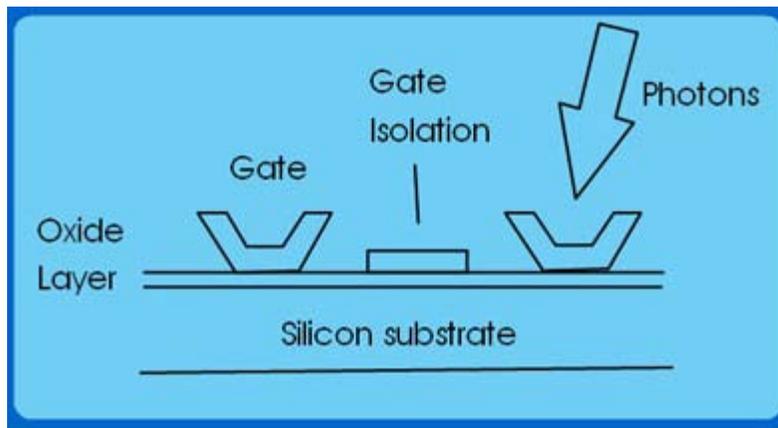


Figure 25.2 Principle of CCD

Analog Signal Frame grabber

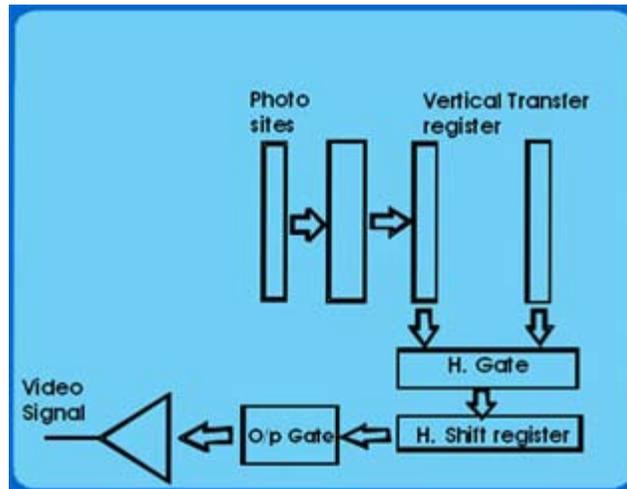


Figure 25.3 Process flow of image signals.

### Image

- Sample analog video signal. A/D conversion
- Spatial discretization – due to discrete line (scan) or sampling time of A/D converter
- Discretization in brightness (due to finite number of bits of digital value)

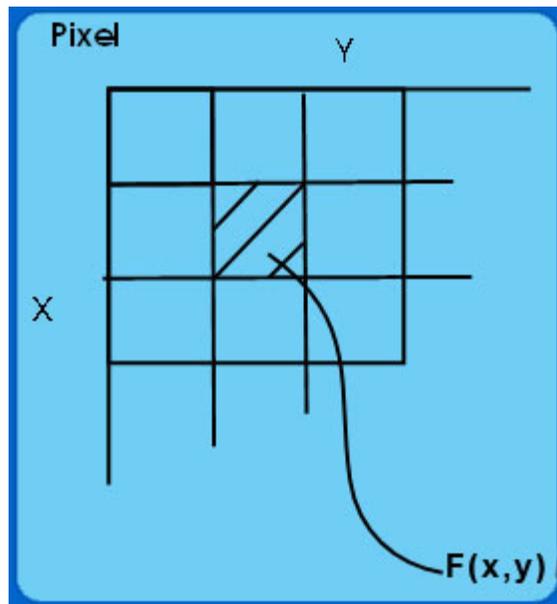


Figure 25.4 Special discretization with finite no. of pixels.

### Lighting

- Diffused Light
- Backlight – silhouette (binary)
- Directional lighting
- Structured lighting

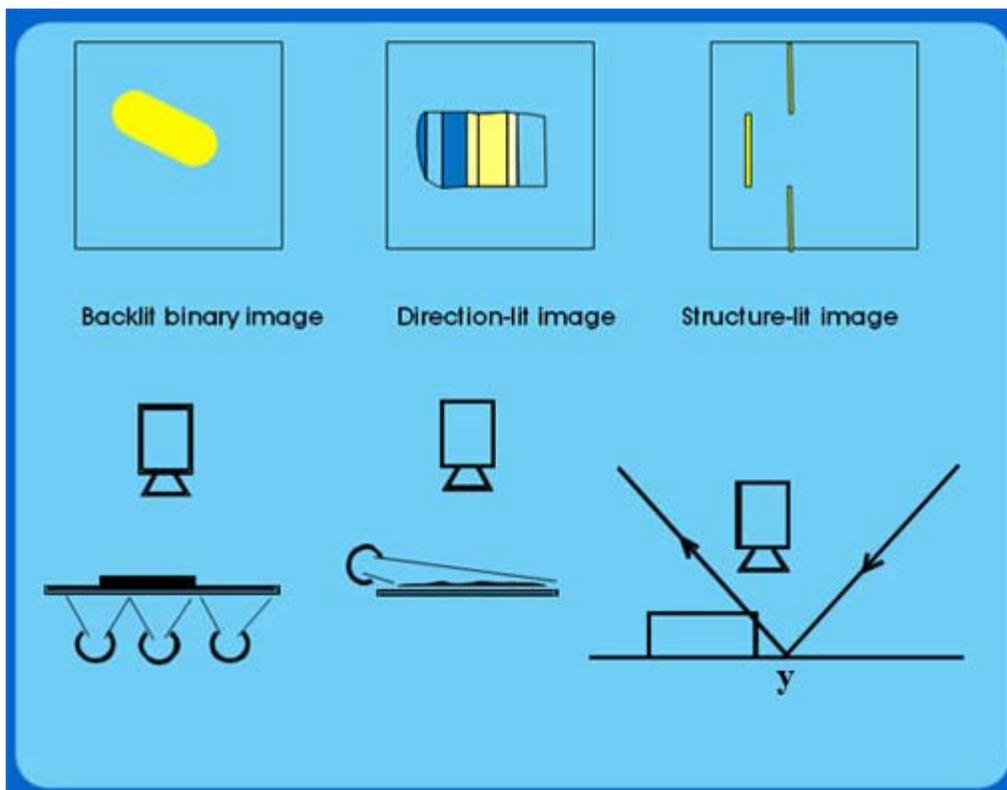


Figure 25.5 Various arrangements of light sources while imaging.

### The Eye

- 6-7 million cone receptors
- Bright light vision
- Rod receptors in most retina
- 75-150 million dim light gray image

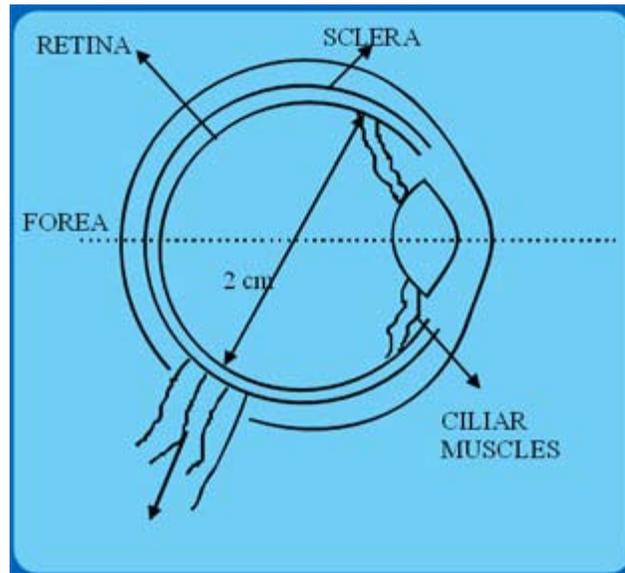


Figure 25.6 The eye.

## Recap

In this course you have learnt the following

- Robot Vision
- Image Processing
- Image Acquisition
- Charge-coupled Device
- Image
- **Lighting**
- The Eye

Congratulations, you have finished Lecture 25. To view the next lecture select it from the left hand side menu of the page.

