SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)
COIMBATORE -641035

DEPARTMENT OF ECE

19ECE301 IMAGE PROCESSING AND COMPUTER VISION

INTRODUCTION TO COMPUTER VISION
IMAGE FORMATION AND PROCESSING

COMPUTER VISION

What is computer vision?

- Computer vision is a subfield of artificial intelligence that deals with acquiring, processing, analyzing, and making sense of visual data such as digital images and videos.
- For example, a computer vision system can be trained to recognize images of humans and animals, and then use that data to take automated actions such as sorting them into different categories.

COMPUTER VISION

Human vision vs Computer vision

Human vision system

Eye

- a sensory organ that captures images of the environment

Brain

an interpreting organ responsible for understanding the image and putting it into context

Basket, Grapes, Apples, Lemon Olives

Computer vision system

Sensory device

- camera

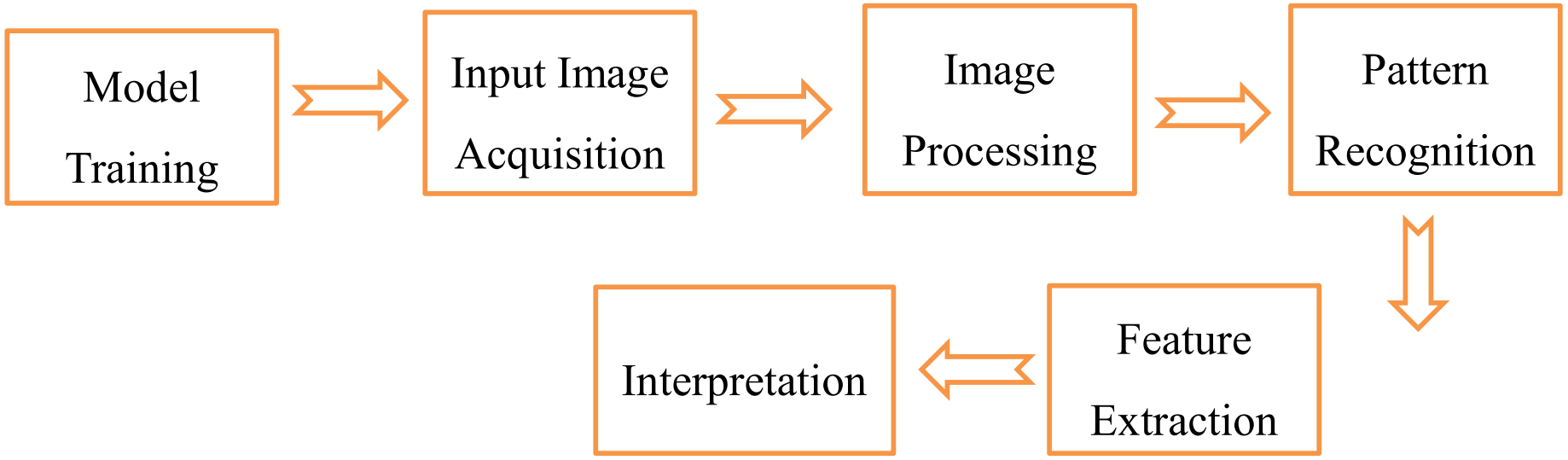
Interpreting device

computer

Basket, Grapes, Apples, Lemon Olives

COMPUTER VISION

It is the field of artificial intelligence dedicated to the task of simulating the human ability to perceive and understand objects in the world. It involves a combination of image processing, feature extraction, and pattern recognition techniques to make sense of data captured from images or videos.



COMPUTER VISION

- **Model Training:** Machine learning algorithms are used to teach the computer how to recognize patterns in the data it receives. This is done by feeding the computer large amounts of labeled data so that it can learn the patterns and relationships between objects.
- **Input Image Acquisition:** Input images are the source of the data. They can be captured using cameras, drones, satellites, etc.
- **Image Processing:** Once the images are acquired, they need to be pre-processed. This involves tasks such as image enhancement, noise removal, image segmentation, etc.

COMPUTER VISION

Feature Extraction: Features are the characteristics of the objects in the images which are extracted and used for further analysis. Features can be color, size, shape, texture, etc.

Pattern Recognition: The extracted features are then used to recognize patterns in the data. This step is the actual task of computer vision and involves the use of supervised and unsupervised machine learning algorithms to recognize objects in the images.

Interpretation: Once the objects have been identified, the data can then be interpreted to make sense of the scene and draw conclusions.

COMPUTER VISION

Applications :

1. Facial recognition
2. Self-driving vehicles

IMAGE FORMATION

What is image formation ?

- Image formation is an analog to digital conversion of an image with the help of 2D Sampling and Quantization techniques that is done by the capturing devices like cameras.
- The mapping of a 3D world object into a 2D digital image plane is called imaging. In order to do so, each point on the 3D object must correspond to the image plane. We all know that light reflects from every object that we see thus enabling us to capture all those light-reflecting points in our image plane.

IMAGE FORMATION

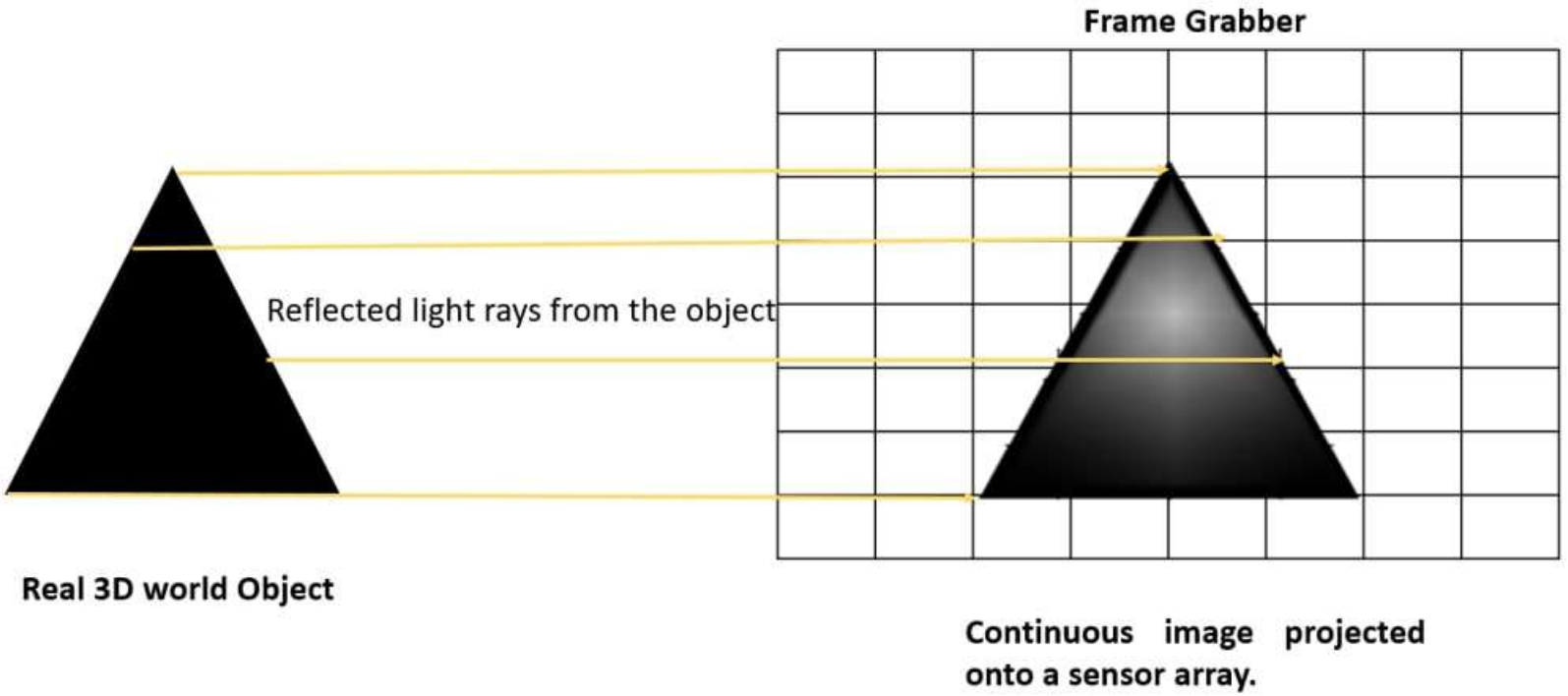
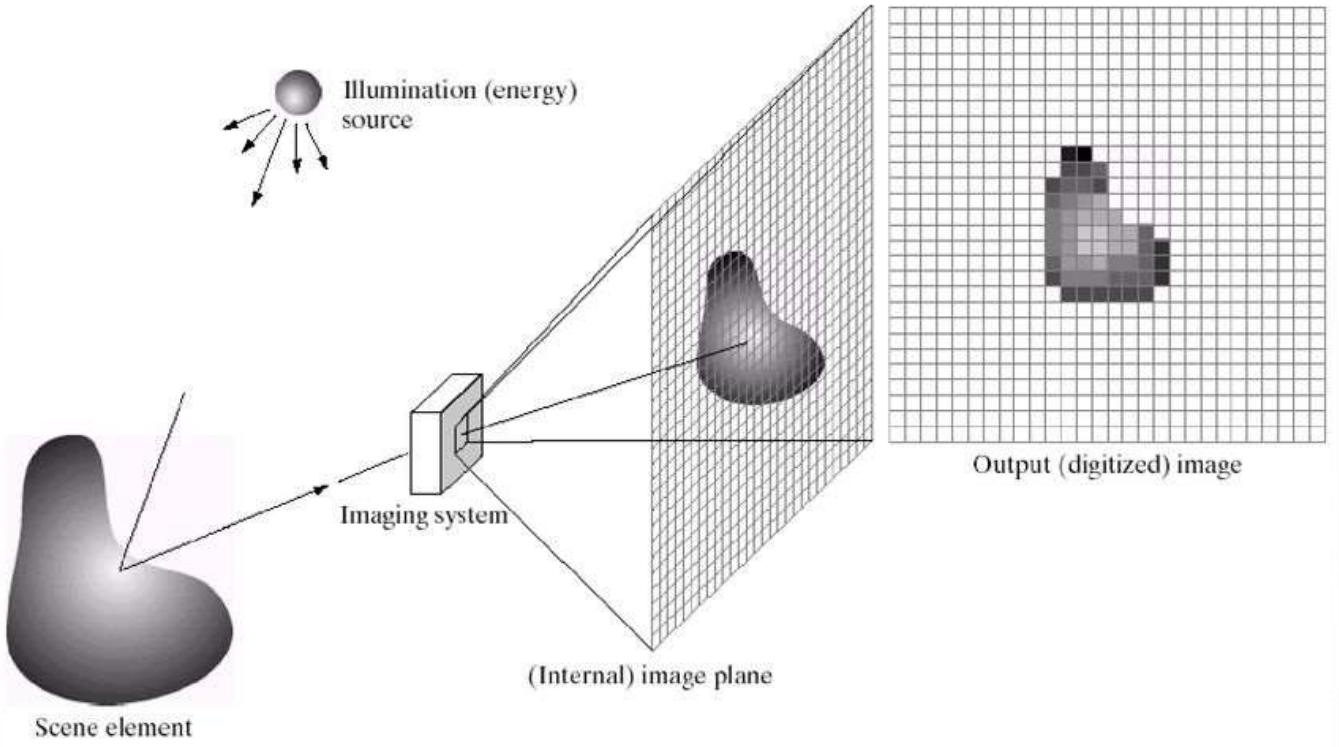


IMAGE FORMATION

Image Acquisition Process



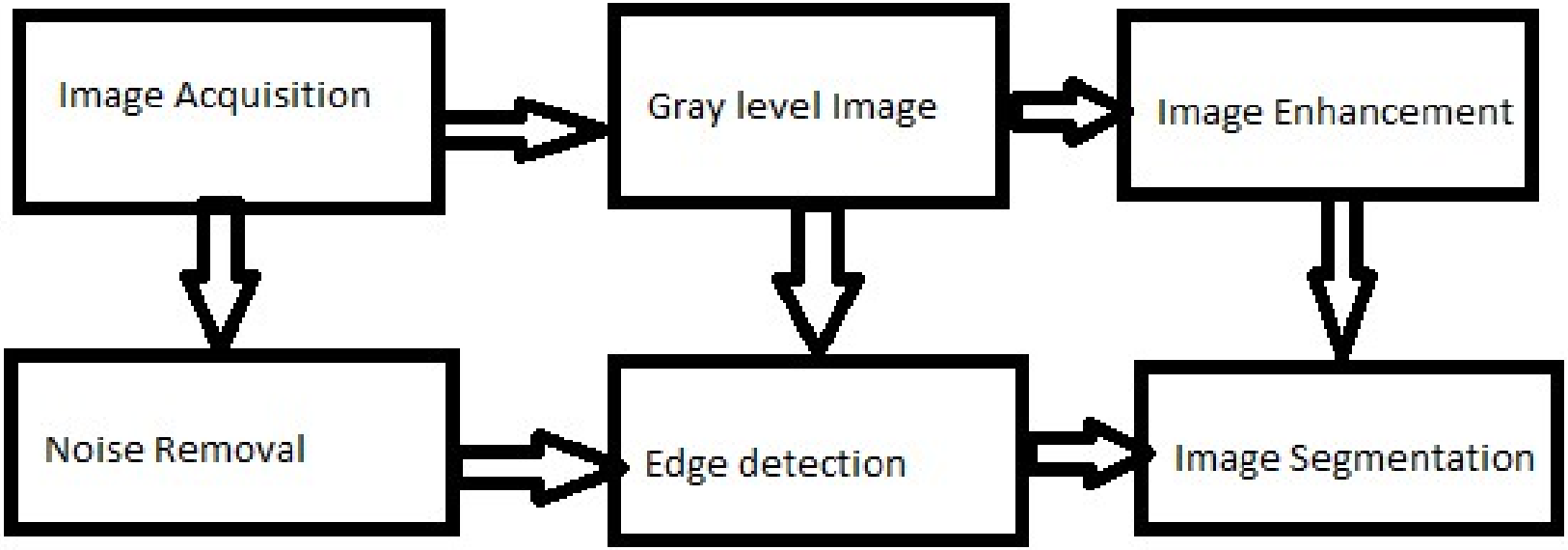
a b c d e

FIGURE 2.15 An example of the digital image acquisition process. (a) Energy ("illumination") source. (b) An element of a scene. (c) Imaging system. (d) Projection of the scene onto the image plane. (e) Digitized image.

IMAGE PROCESSING

What is image processing ?

Image Processing is the process of transforming an image into a digital form and performing certain operations to get some useful information from it.



THANK YOU