Vision Sensor

- External non-contact type contact type
- In Robotics
  - To let them look around
  - Find parts for picking/placing in app loc
  - Earlier fixtures were used for accurate positioning (expensive) -> Now vision
- Other tasks Other tasks
  - Determination of configuration, obj. mot.
  - Reconstruction of 3D geometry

Elements in Vision Sensor

- A camera (A camera (Vidicon Vidicon, CCD, etc.) , CCD, etc.)
  - Sensing array, Associated electronics Sensing array, Associated electronics
  - Output signal format, Lens Output signal format, Lens
- Five major parameters for choice of camera
  - Field of view Field of view
  - Resolution Resolution
  - Working distance Working distance
  - Depth of field Depth of field
  - Image data acquisition rate

- For size measurement
  - No. of pixels > 2 x largest-smallest object size ratio
  - Lighting to illuminate the object of interest
  - Frame grabber card or video capture card to interface with computer
  - Vision software for processing image data Vision software for processing image data
  - Digital input/output interface for control

Step in vision Sensing

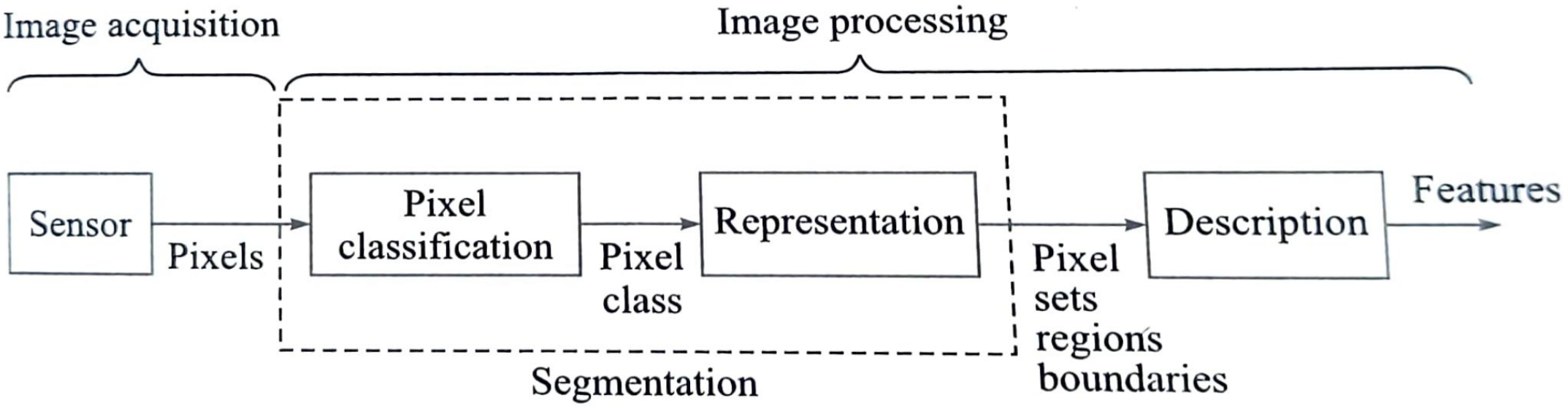

Fig. 4.16 Visual sensing

Vision Sensing (M/c Vision)

- Image Acquisition
- Image is obtained
- Digitized for further processing: Partitioning the image into cells (Pixels)
- Assigning a number based on brightness

Four Elements for Acquisition

A light source

Lens to focus reflected light from object

Image sensor to convert light signal to electrical signal

Electronics to read sensed image

Image Processing

- Examines the digitized data
- Locate and recognize object within image field
- Different steps
  - Segmentation
  - Parameter extraction
  - Pattern recognition

Image Processing

- Segmentation
  - Breaks the scene into several segments
  - If multiple objects, separate images are formed
- Parameter extraction
  - Looks at segmented objects to find key features, e.g., size, shape, intensity, etc.
- Pattern recognition
  - Attempts to match observed features with the stored criterion ->To identify objects

Classification

- Low-level vision level vision
  - Processing image for feature (edge, corner, extraction – Operations are carried on pixels
  - Operations are carried on pixels ->Extracts above features w.r.t. intensity
- Intermediate-level vision level
  - Objects are recognized and 3D scenes are recognized and 3D scenes are interpreted – Concerned with grouping of entities (pixels into line)
- High-level vision
  - Equivalent to image understanding
  - Interpretation of scenes in terms of the objects in it
  - Based on knowledge of objects relationships
  - Distinguishes a line as a part of object structure from those as a surface texture