Lecture 4-2:   Common Sensing Techniques for Reactive Robots

Reading: *Introduction to AI Robotics* (Sec. 6.6 – 6.9)

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Objectives:

- Define the following terms in one or two sentences: hue, saturation, image, pixel, image function, computer vision

- Given an RGB image and a range of color values be able to threshold the image on color and construct a color histogram

- Write computer vision code to enable a robot to imprint on and track a color


_____ refers to the processing of data from an image.

One way to use computer vision is for ranging such as using triangulation when a structured light is projected onto an object. The vision collapses the 3D world into a 2D image.

An alternate approach is _____ where two cameras are used to take several images of the same scene that are offset a little. The size of the shift is the ***disparity*** and by locating the same object in both images and using the focus and location of the two cameras, geometry can be used to find the distance to the object.

It is also possible to use computer vision to determine motion or whether there are static or moving objects in the robot's environment. To implement ***vision from motion*** , subtract two consecutive images of the same scene. Continuous objects move as one but it is necessary to know the exact movement of the camera and/or robot.

The primary benefit for using a vision system versus ultrasonic and infrared range finders is the fact that the camera and detect and track _____ in the environment.
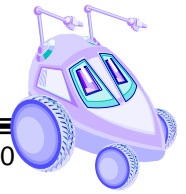
Color tracking can be implemented with one camera and there will not be correspondence problems.

Name one advantage and one disadvantage of stereo ranging systems.

_____ is when a robot's sensing information is used to generate a higher level percept about the robot's environment.

Examples of low level features are lines, corners, edges, and circles.

Examples of high level features are tables, trash cans, doors, other robots

The most common geometric primitives such as line segments, circles, corners, edges are typically sufficient for modeling the environment. A histogram of range data to form the lines in an environment can be used to find corner features, edges and doorways.
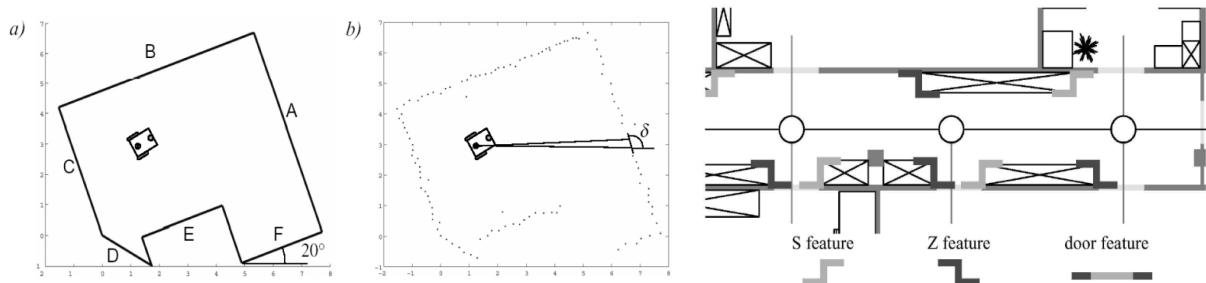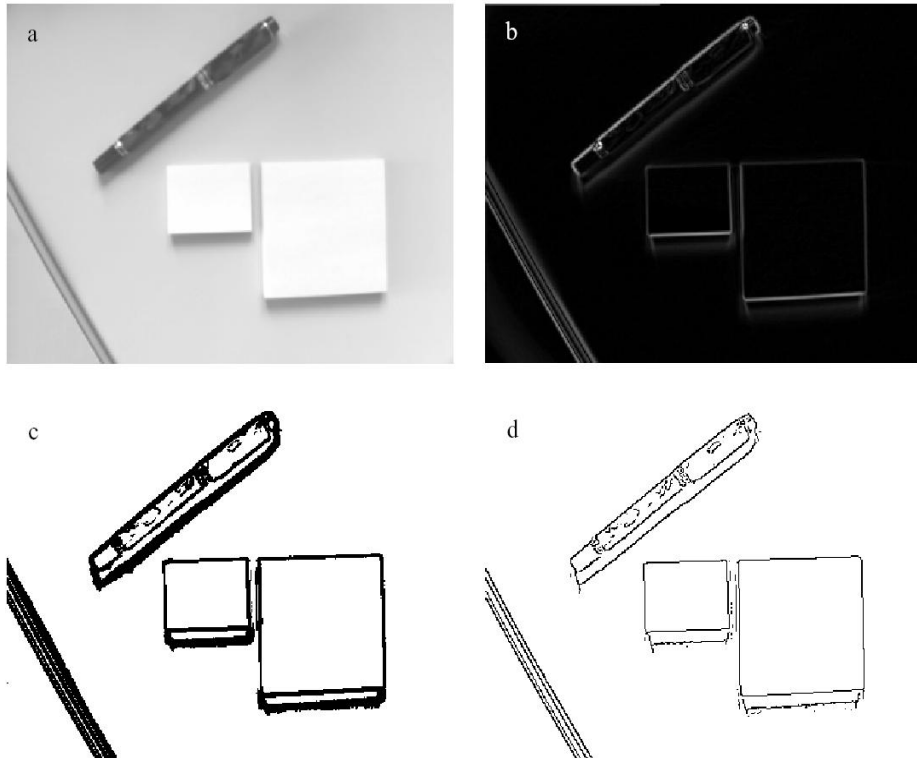

In order to use an image for feature extraction it may need to be preprocessed by conditioning, labeling, grouping, extracting and matching.

The most common method for conditioning an image in order to identify features is to use
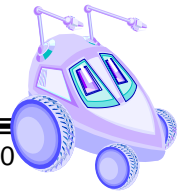
_____.

The following figure shows an example of using edge detection and nonmaximum suppression on an image for feature extraction.

Another technique for identifying features in an image is to use

_____, which is the process of determining which

pixels in an image are connected and represent the same object in the space.
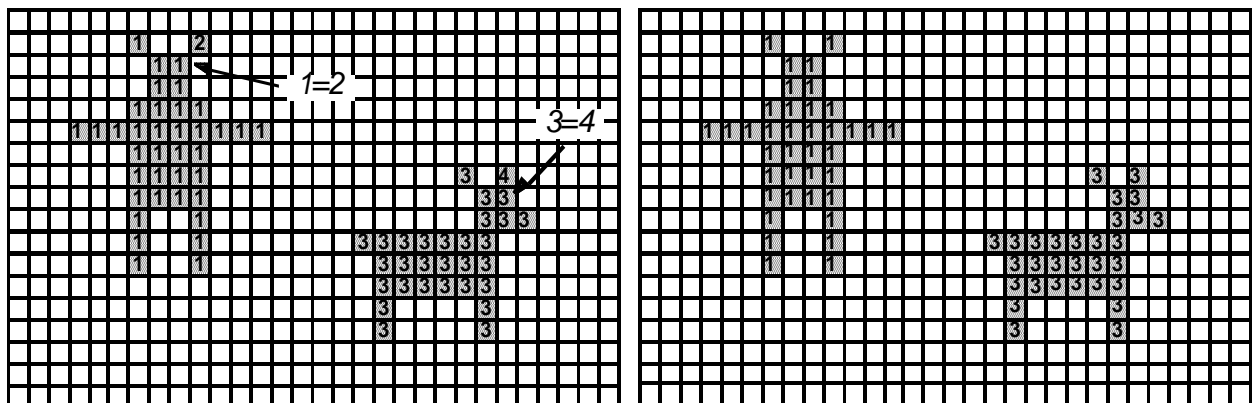
Finally, whole images can also be used for feature extraction and typically these are designed to identify specific structures for _____.