

## MTRN4230 Robotics Problem Solving Exercise 1 (PSE1) Description

Problem Solving Exercise 1 requires you to work individually to process several sample images and demonstrate the ability to do basic object detection. It is worth 5 course marks in total.

### Aim

To understand how to use basic image processing algorithms and apply them to detect well-defined objects

## Assessed Tasks

### Image Processing (total 10 points)

Using the four images from Matlab's default image set mentioned below, apply as many image processing operations as necessary to obtain the following results:

- Segment the visible green circuit board in the 'board.tif' image using colour segmentation and display it in green with the remainder of the image shown in grayscale with 50% intensity (2 points). Hint: `imread`, `double`, `imshow`, `im2gray`, `imclose`, `imopen`, `imdilate` are useful functions to get you started and you may need to use `repmat` to convert a binary image to (m x n x 3) format.
- Use edge detection to draw the complete outline of the hand in the 'hands2.jpg' image overlaid on the original hand (2 points). Hint: `edge`.
- Plot all SURF descriptors overlaid on 'pillsetc.png' (2 points). See section 13.3.2.1 on p374 of Corke. Hint: `detectSURFFeatures`.
- For the blue chips displayed in 'coloredChips.png', draw all the perimeters in red and indicate all the centroids by black crosses (4 points). Hint: `regionprops`.

For each subtask, display the results in a single figure with two subfigures (use `subplot`), showing the original images side by side with the modified images. You are recommended to generate all four figures in one script which will produce four separate figures. The `colorThresholder` tool is especially useful for segmenting objects manually.

### Marking Criteria

Your demonstrator will check the results visually in your problem solving session and will ask questions to test your understanding of the techniques used. For each task, full points for complete results. Half points for a reasonable attempt at the task. 0 points for missing or very incomplete results or inability to explain the methods used to the demonstrator.

### Due date

Show your individual solutions to the above tasks to your demonstrator within your tutorial time in week 4. There is a total of 10 points for this PSE which is scaled to 5% of your final grade in MTRN4230.

### Resources

Corke's Machine Vision toolbox is installed on the lab machines and is closely associated with the textbook. Example function calls above relate to this toolbox although other image processing toolboxes exist in Matlab and can do the same thing. For more sample images in Matlab and where to find them, see

<http://au.mathworks.com/matlabcentral/answers/54439-list-of-builtin-demo-images>

Use the course discussion forum for getting help.