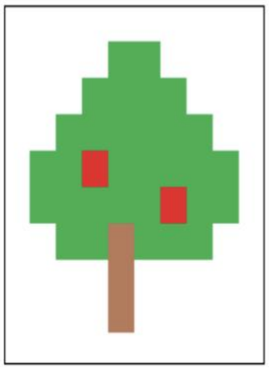
Robotic Vision Advanced Robotic Systems

General Instruction
• Complete the tasks
• Submission deadline:
• You will need to write MATLAB codes to solve the problem.
• Do not use built-in MATLAB vision toolbox, and the following keywords:
    • bwlabel, imrotate, imresize, corner, edge, reshape, imfilter, regionprops, imfill.
• Submit a report with:
    • Details of the algorithm (Theory / Concept)
    • Explanation of the MATLAB codes you wrote
    • The results
• Submit also your MATLAB codes.
• They will be tested and checked to make sure that they really work.

Problem (1)

- Given the following colour image (AppleTree.png):



- How do you find out the position / coordinates of the red apples?
- Note: This needs to be automated – not by manually counting the pixels to locate the apples!
- Note: The algorithm must be robust towards changes in lighting condition and different apple redness.

Problem (2)

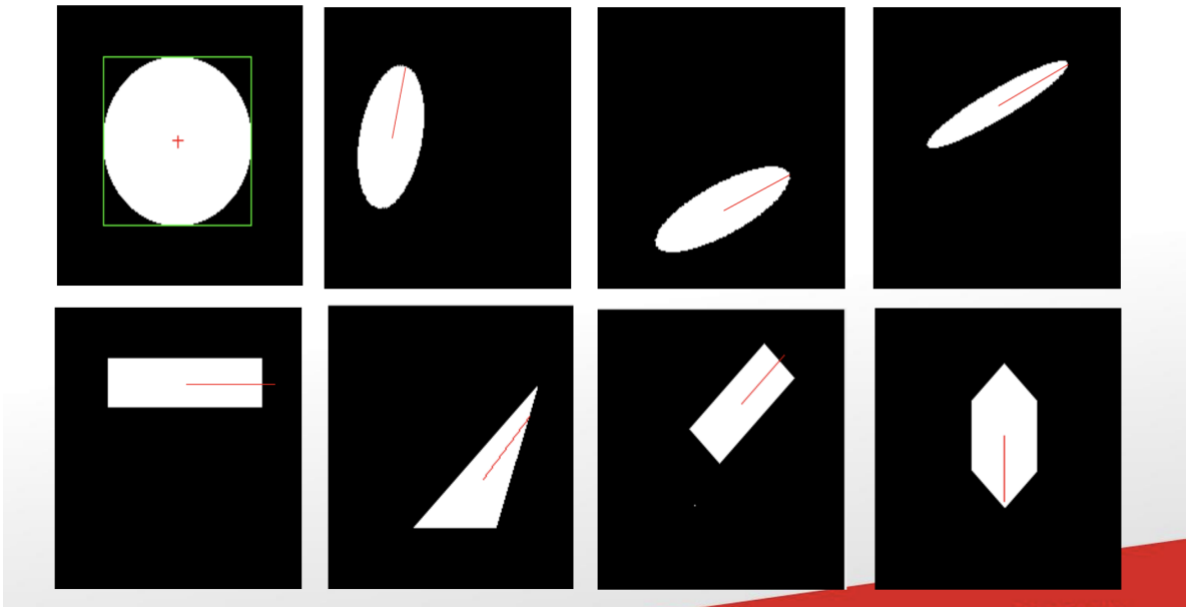
- Write a code to rotate the Cameraman image (given in MATLAB) by 30 degrees. (2 Marks)
  - No need to crop the image to original size.
- Write another code to shrink the Cameraman image by half. (1 Marks)
- Write yet another code to double the size of the Cameraman image. (2 Marks).
  - Note: need to handle black pixels in between "expanded" pixels.

Problem (3)

- Write your code to detect the corners of a square, rectangle, triangle, and diamond.
  - WhiteSquare2019.tif
  - WhiteRectangle2019.tif
  - WhiteTriangle2019.tif
  - WhiteDiamond2019.tif

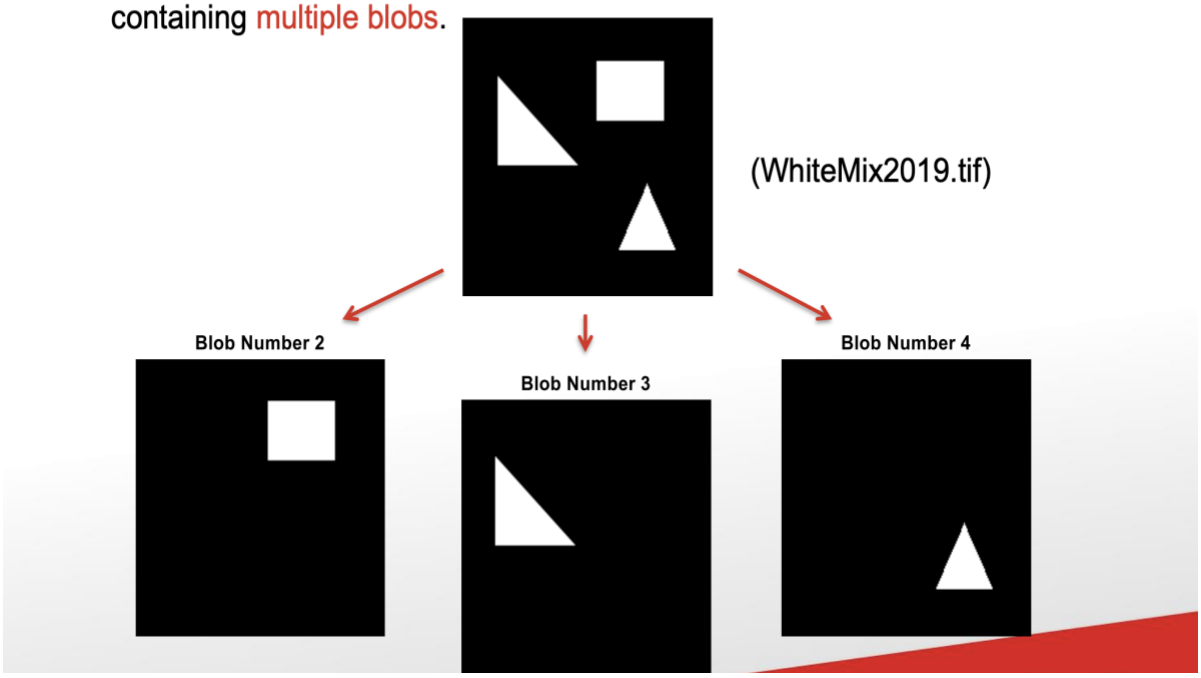
Problem (4)

- Write your own codes to detect the centroids, bounding boxes, major axes, angle, area, perimeter, and circularity of various shapes.



Problem (5)

- Create your own codes to label the connected components in an image containing multiple blobs.



Problem (6)

- Similar to Problem 5 but more challenging: Create your own codes to label the connected components in an image containing multiple blobs.

(WhiteMixComplex2019.tif)

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Rubric

- If you complete the individual tasks correctly, you will get the full points for the tasks.

- 1 point will be deducted for each of the following mistakes:
  - Code is not robust, i.e. can work for only one single condition
  - Not adequate discussions (for questions which require discussions)
  - Result inaccurate
  - Use of any of the forbidden keywords
  - Error in code or calculation
  - Any other minor mistakes

- 2 points will be deducted for each of the following mistakes:
  - Code does not solve the intended problem.
  - Any other major mistakes