

# Assignment 3 – Robotic Vision

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## Advanced Robotic Systems – MANU2453

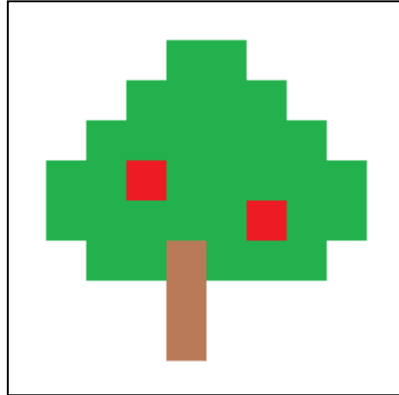
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# General Instruction

- Complete the assignment in **team**.
- Submission **deadline**: Saturday of Week 12.
- 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 (2 Marks)

- 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 (5 Marks)

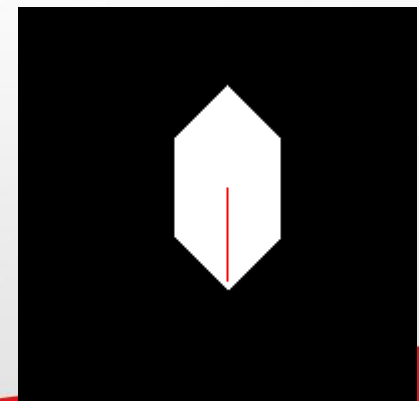
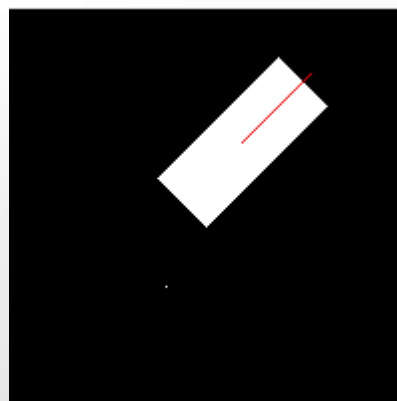
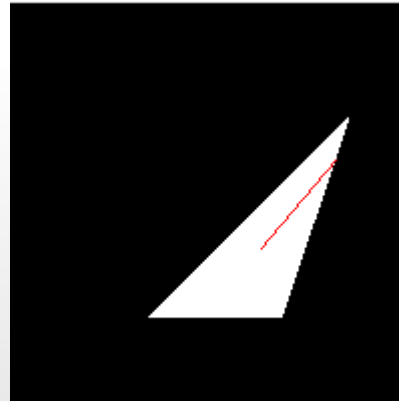
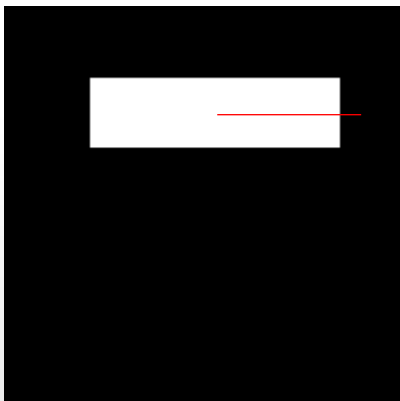
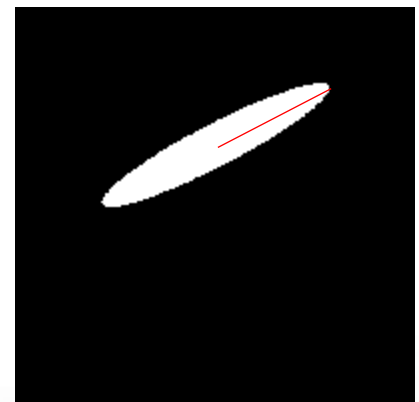
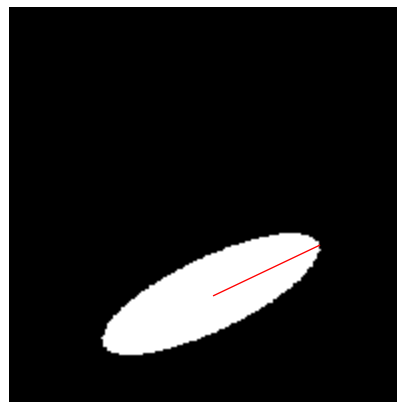
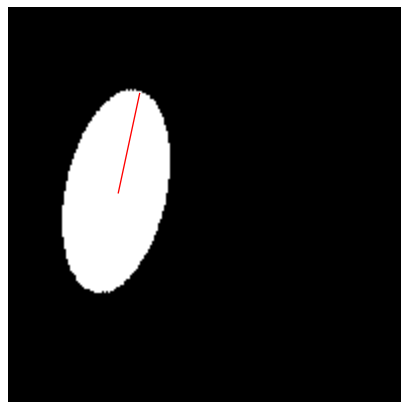
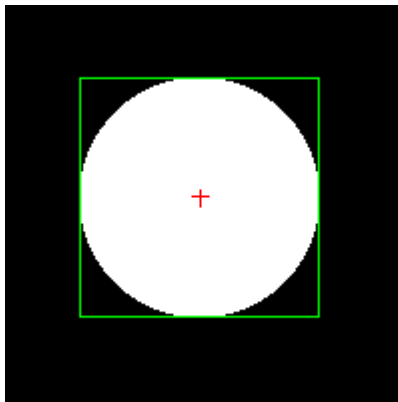
- Write a code to **rotate** the Cameraman image (given in MATLAB) by 30 degrees. (2 Marks)
  - No need to crop the image to original size.
- Write another code to **shrink** the Cameraman image by half. (1 Marks)
- Write yet another code to **double** the size of the Cameraman image. (2 Marks).
  -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

# Problem 3 (3 Marks)

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

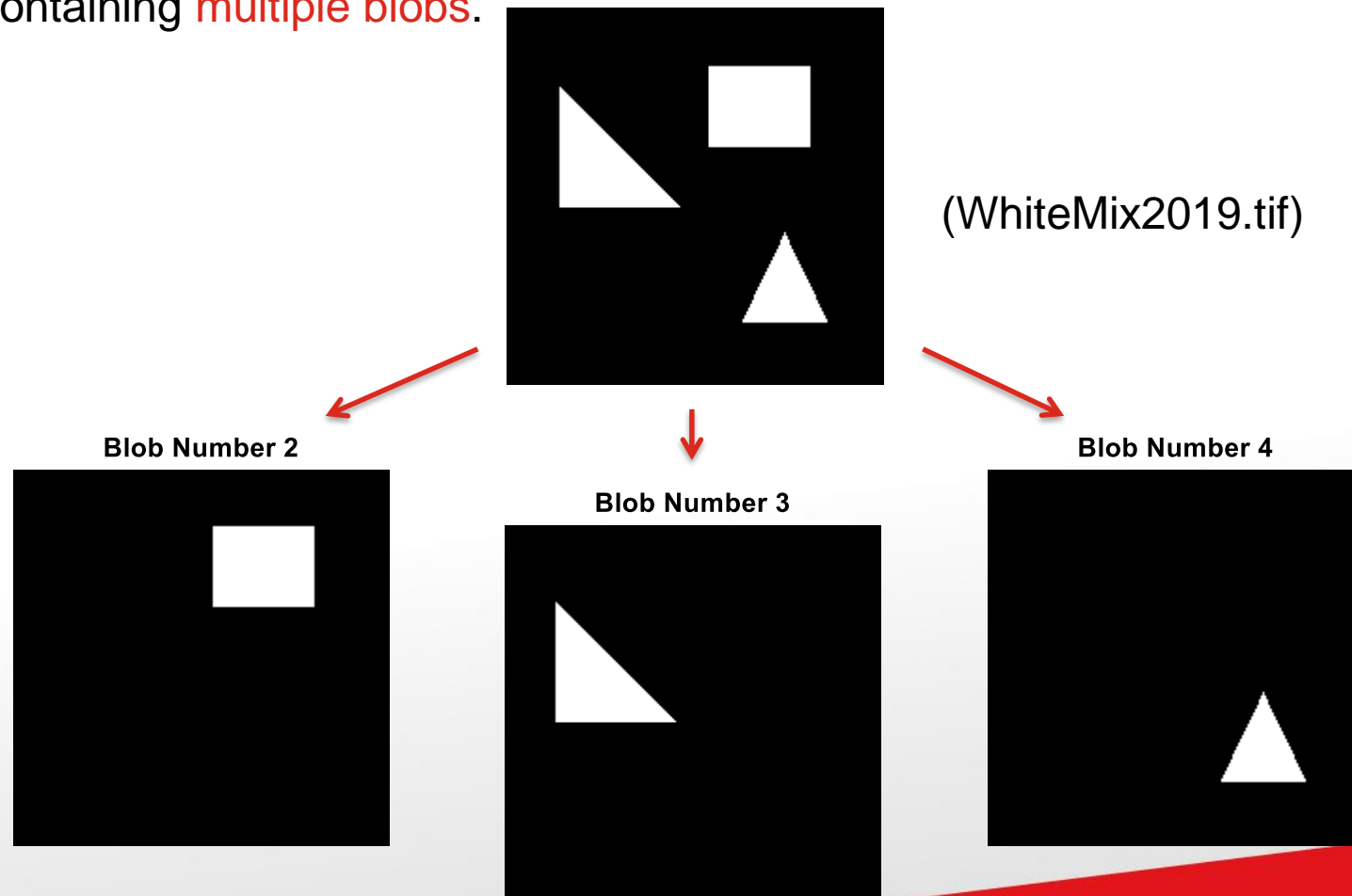
# Problem 4 (4 Marks)

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



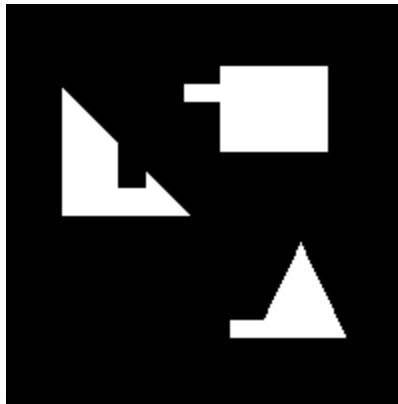
# Problem 5 (3 Marks)

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



# Problem 6 (3 Marks)

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



(WhiteMixComplex2019.tif)



# 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