MTRN4230 Robotics ASSIGNMENT 2

AIMS

The following assessment aims are derived from course learning outcome 4:

1. Knowledge of basic image processing techniques for robotics.
2. Demonstrate the ability to combine basic image processing techniques to achieve a given outcome.

DUE DATE

Assessment criteria	***Due date and submission requirements***	***Deadline for absolute fail***	***Marks returned***
Upload completed assignment + code	*Week 3: 11:59pm, Friday via Teams*	*Week4:11:59pm, Wed.*	*1 week after submission*

GETTING STARTED

1. Download all images relevant to this assignment.
2. Develop your Matlab script in the same folder as the images and avoid using absolute paths (i.e.: Always use **imread('image.jpg')** instead of **imread('C:/absolute/path/image.jpg')**).
3. Assignment submission should consist of two files:
    a. A report containing all steps, answers and resulting images,
    b. A single Matlab script for the assignment.

ACTIVITIES

1. Part 1: Complete the following tasks using 'toysflash.png':
    a. Display the height, width, and depth of the image. (0.5 point)
    b. Create a binary mask covering the blue cup in the image. Display this binary mask in a separate image. (1 point)
    c. Similarly create a binary mask covering the plastic ball at the front of the image. Display this binary mask in a separate image (1 point)
    d. Generate a colour mask for both objects as shown in Fig. 1. Briefly describe how you achieved this goal. (0.5 point)

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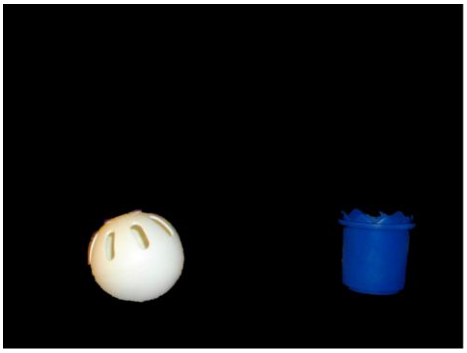

Figure 1 Colour mask for the cup and the plastic ball.

2. Part-2: Complete the following tasks using 'chess_knights_run.png' and 'knight.png':
    a. Plot all SURF descriptors overlaid on 'chess_knights_run.png'. (0.5 points)
    b. Match SURF descriptors from 'knight.png' to 'chess_knights_run.png'. Visualise the matched pairs. (1 point)
    c. Using theses two images and the feature matching concept, find the distance between the two white knights on the chess board in pixels. Describe how you solved this problem. (2 points)
3. Part 3: Complete the following tasks using 'oranges.jpg' image: (3.5 points)
    a. Display markers on the centre of each orange slice. A correct solution should have 13 or more centres identified with no more than 1 incorrect centre. Briefly write down the steps you followed to achieve this task. (1 point)
    b. Detect all boundaries separating the orange slices. Display this boundary on the original image. A correct solution should show more than 80% of all edges and less than 5 incorrect boundary lines. Briefly write down the steps you followed to achieve this task. (1.5 points)
    c. Draw individual circles over each orange slice. Each circle should be displayed with a different colour. Display the resulting image. (1 point)

MARKING CRITERIA

Overall mark for this item is 20%. It has been distributed as below:

Part1	5%
Part2	7%
Part3	8%

Resources

Use **Color Thresholder** tool to manually segment the required colour regions.

Hints: **imread, imshow, imerode, imclose, imfill, edge,detectSURFFeatures, matchFeatures, bwareaopen, imbinarize**. Note: these are only some of the functions which may be useful. You are free to use any other function as well.

Use the course discussion forum for clarifications and getting help.

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