

程序代写代做 CS编程辅导



UOW
AUSTRALIA



School of Computing and Information Technology

Student to complete:

WeChat: cstutorcs

Family name

Other names

Student number

Table number

Assignment Project Exam Help

CSCI435 / CSCI935

Computer Vision Algorithms and Systems

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Examination Paper
Spring Session 2020

Exam duration 2 hours

Items permitted by examiner *Open Book*

Aids supplied Nil

Directions to students 4 questions to be answered.
Each question is worth 10 marks.

This paper is worth 40% of the total marks for the subject

- Answer each question on a separate page clearly
- Convert the answers into **one** pdf file
- Submit the pdf file

4 Questions – 10 marks each

Total: 40 marks

Please answer the questions clearly and with as much detail as possible. Please start each answer on a new page.



- 1) Quality of images in terms of resolution and colour fidelity. Nowadays, most digital cameras are single sensor-based.
 - a) Name the major component (excluding lens) in a single sensor based digital camera and describe the function of this component.
 - b) List three components that would affect most significantly sharpness of the captured images and explain how each of these three components affects the sharpness.
 - c) List three components that would affect most significantly colour fidelity of the captured images and explain how each of these three components affects the colour fidelity.
 - d) Most cameras nowadays provide a capturing model called HDR (high dynamic range) for a situation where the range from the lowest illumination to the highest illumination in the scene at the time when the image is being taken is extremely high. Explain the common approach or method for achieving HDR imaging in most of the digital cameras.
 - e) If an image captured by a camera appears to be dark and you wish to see the details in the dark areas, suggest a possible method to enhance the image and explain HOW the method would work to make the details in the dark regions more visible.
- 2) You need to implement a system that can automatically detect car registration plates (*yellow background and black digits and letters*) in an image and outline the plates with a bounding box as shown below.

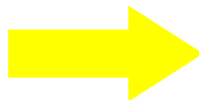


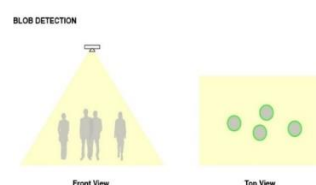
Figure 2.1: Detection of the car registration plate in an image and extraction of its bounding box

Operational conditions: frontal view, good lighting conditions, good quality camera and near distance as shown in Figures 2.1 and 2.2 (more images to illustrate the conditions).



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- a) Propose a solution to the problem. The solution takes a colour image as input and outputs the bounding box of a registration plate, if any. Divide the solution into components and describe the solution using a block diagram or flowchart. Explain the function, input and output of each components.
 - b) For each component in the solution, choose suitable algorithms and briefly describe how the algorithms works.
 - c) Describe how you would test your solution and measure its performance.
 - d) Discuss whether your algorithm would work in a raining or snowing day and in a night. Explain why it works or why it does not work.
 - e) Discuss whether your solution would be able to extract multiple registration plates in a single image if there are two or more cars in the image. Explain why it is or why it is not.

- 3) A stationary video camera is often installed on the ceiling of a store entry to count how many people are entering and/or leaving the store. Figure 3 illustrates the camera setting:



Front & top views



Shopping trolley

Figure 3 Overhead people counter: in and out

- a) How will you classify this problem with regards to computer vision problems you have studied in the subject?
- b) Based on the algorithms you have studied in the subject, design a solution (block diagram) that counts people without distinguishing entering and leaving.
- c) Design/select AND describe the algorithms for each block/component in your solution.
- d) What are the possible factors that may affect the accuracy of your system?
- e) How would you modify your solution or algorithms such that the system is able to count the number of people leaving the store with shopping trolleys?

- 4) You are asked to design a computer vision system to classify the vehicles into three major types: **trucks, sedans and vans**, by only analysing a single image taken by a camera installed in a free-way exit gate for every vehicle passing through the gate. Following are some sample images.



Figure 2. Samples images of trucks (1st row), vans (2nd row) and sedans (3rd row)

- How will you classify this problem with regards to computer vision problems you have studied in the class?
- Based on the algorithms you have studied in the class, propose a solution that takes images and output the category of the vehicle in the images. Describe the solution in a block diagram and explain the function of each components of the solution.
- Design/select AND describe the algorithms for each block/component in your system.
- Based on your solution, which type of vehicles is likely to have a high classification accuracy or likely to be easily classified, explain why this is the case in the context of your solution?