



Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

Faculty of Engineering, Mathematics and Science

School of Computer Science & Statistics

Integrated Computer Science
Integrated Engineering
Computer Science and Business
Computer Science and Language

Michaelmas Term 2021

Year 4

Computer Vision

Dr Kenneth Dawson-Howe

14 December 2021

RDS-SIM Court

09.30-11.30

Instructions to Candidates:

Attempt two questions. All questions carry equal marks. Each question is scored out of a total of 50 marks.

For Application questions, a series of computer vision operations must be detailed to solve the application problem. The input to and output from each technique used must be clearly and precisely stated. How each technique is used within the context of the application must also be described including the setting of any parameters.

For Compare and Contrast type questions marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques.

In all questions you must describe computer vision theory and should not refer to code or library calls (OpenCV or any other library).

1. (a) **[APPLICATION QUESTION]** Given an image of a packing label taken from any angle (such as that shown below left) describe how you would locate and extract any visible bars codes within the label (again as shown below right). Your solution must consist of a series of computer vision techniques and you must provide details of how the techniques will be applied including expected input and output for each technique. [25 marks]



Image of Packing Label



Extracted Bar Codes

1. (b) **[COMPARE & CONTRAST QUESTION]** Compare and contrast:

- RANSAC for finding straight lines.
- Hough transform for lines.
- Recursive boundary splitting to find straight lines.

You must provide a list of the differences and similarities between the techniques. Each of the differences and similarities must be clearly explained. **NOTE:** Marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques

[25 marks]

2. (a) **[APPLICATION QUESTION]** Describe how you would automatically locate and track the coloured helmets of horse riders in a video feed from a stationary camera which gives views like those below. Your solution must consist of a series of computer vision techniques and you must provide details of how the techniques will be applied including expected input and output for each technique.

[25 marks]



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2. (b) **[COMPARE & CONTRAST QUESTION]** Compare and contrast:

- Support Vector Machines.
- Chamfer Matching.
- Scale Invariant Feature Transform for recognition.

You must provide a list of the differences and similarities between the techniques. Each of the differences and similarities must be clearly explained. **NOTE:** Marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques

[25 marks]

3. (a) **[APPLICATION QUESTION]** Using edge detection describe how you would find the road markings (i.e. the white and yellow lines) in a video from a moving camera giving images such as those in the scenes below. Discuss when your approach might give false positives and what you might do to deal with that. Your solution must consist of a series of computer vision techniques and you must provide details of how the techniques will be applied including expected input and output for each technique.

[25 marks]



3. (b) **[COMPARE & CONTRAST QUESTION]** Compare and contrast:

- Static background model.
- Median Background Model.
- Gaussian Mixture Model.

You must provide a list of the differences and similarities between the techniques. Each of the differences and similarities must be clearly explained. **NOTE:** Marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques

[25 marks]