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
Computer Science and a Language
Electronic and Computer Engineering
Computer Engineering

Hilary Term 2017

Computer Vision

11 January 2017 **Goldsmith Hall** **09.30-11.30**

Dr Kenneth Dawson-Howe

Instructions to Candidates:

Attempt **two** questions. All questions carry equal marks. Each question is scored out of a total of 50 marks. Each question should be answered in a separate answer booklet. The images on this paper should appear in colour (or if grayscale they will be outlined in colour). If they do not appear in colour please ask to speak to the examiner.
You may not start this examination until you are instructed to do so by the invigilator.

1. (a) Using computer vision, develop a system to automatically locate people who knock on an office door or try to gain access to the office, but do not enter the office. You are provided with only a video from a surveillance camera mounted down the corridor, looking towards the office such as in the images shown. You can assume that the location of the office door in the video stream will be provided. You must provide full details of each of the techniques that you use.

[25 marks]

1. (b) Having detected the people visiting the office, develop a system using computer vision, which records a full frontal image of each person. You can assume that they will walk towards the camera at some stage. You must provide full details of each of the techniques that you use.

[25 marks]

2. (a) Given a view from a static camera looking at the road from the side (sample images below), using computer vision, develop a system to locate the road markings (the white lines) which delineate the lanes. You must provide details of all of the techniques which you use.

[25 marks]

2. (b) Using computer vision operations, develop a computer vision system to count the number of people cycling along the side of the road based on a camera view (from a static camera) such as those shown above. Note that the view may be temporarily partially occluded by pedestrians. You must provide details of each of the techniques that you use.

[25 marks]

3. (a) Compare and contrast the HLS and RGB colour representations and describe how local averaging (i.e. smoothing) could be applied to an image in both representations. You must provide technical details of the representations and of local averaging.

[15 marks]

3. (b) Using SIFT features (among other operations), develop a computer vision system to join multiple images taken from a single location together. You must provide details of each of the techniques that you use. Sample images from such a camera are shown above.

[35 marks]