Coursework reports 2013–14

CO3343 Computing art and image effects

Coursework assignment 2

General remarks

This coursework assignment consisted of four parts and discussed issues related to graphics, image and video processing. More specifically, it aimed at developing students' awareness of the area of Non-Photorealistic Rendering (NPR) including the methods applied there and how they have been used to achieve various artistic effects. Furthermore, the students, after choosing an appropriate image, were asked to apply specific NPR techniques on it, in order to achieve a cartoon-like effect using *Processing*. The last part of the coursework assignment required the application of the same techniques on a short video clip of the student's choice.

Overall, students did well, including some submissions which were of a very high quality. Almost all students who attempted at least the first three parts gained a passing mark.

Comments on specific questions

Part A

This asked students: (a) to provide a brief overview of NPR techniques, commenting on their application on 3-dimensional versus solely 2-dimensional input; and (b) to describe the use of such techniques on a relevant film of their preference, outlining the effect of the application and giving a personal view. This essay-type question needed the students' own words of explanation to demonstrate understanding and a simple reproduction of material from sources would not be sufficient.

Most submissions presented very good descriptions of Non Photorealistic Rendering. Some were more generic and provided a variety of example techniques; while others focused on the specific methodologies illustrated in the coursework assignment (edge detection/emphasis and colour reduction). Both of these approaches were valid and could lead to high marks. Nonetheless, there were some attempts that, although they provided a very extensive and detailed description of the mathematical foundations and history of the area, lacked description of the underlying artistic intentions and effects. Some other submissions were limited to visual effects achieved manually, not exposing the challenges of automatic methods.

Moreover, many of the submissions failed to recognise that the application of non-photorealistic rendering techniques on top of 2D images is actually more difficult than performing it on 3D; although the former is usually simpler to implement, a sophisticated effect can prove much more difficult to achieve without necessary 3D depth information.

Regarding the selection of films, there were generally good examples. However, in some cases a connection of the technique with the film subject and the intended artistic effect was missing.

Finally, the use and referencing of bibliographic material was generally very good, in contrast to the first coursework assignment.

Part B

Students were asked to present a photographic image that would be particularly suitable for applying the techniques of part C; namely, edge detection and colour quantisation, explaining the attributes of the image that make it appropriate for this task.

The vast majority of students chose an adequate image but sufficient justification was most of the times thin or completely absent. Candidates are always reminded to follow the word guidelines, as they give a good indication of the amount of depth that is required by each part.

On the other hand, there were some very good answers that backed up their choice well, identifying in it aspects that would facilitate the application of the algorithms; such as: a limited number of distinctive colours; well-defined and separated objects and areas; and a relatively simple background.

Part C

This asked students to implement an algorithm of their choice for edge detection and another one for colour quantisation; and to apply them to the image selected in Part B in order to achieve a cartoon-like effect. Also, candidates were asked to provide a description of their implementation comparing it to other similar techniques. Furthermore, they were asked to experiment with parameters dictating the sensitivity of edge detection and the number of colours used. This experimentation was expected to be systematic and to cover a large parameter space, illustrating and commenting on its effect on the image. The software should be interactive, allowing for the real-time variation of these parameters based on the position of the mouse pointer; while pressing the space bar would save a screenshot of the result. Finally, candidates were asked to select an 'optimal' set of values, corresponding to their preference, and to provide insight as to the quality of the result, together with possible further improvements.

While there were a few exceptionally good answers that demonstrated a large variety of values and illustrated their effect on the image, there were also submissions that lacked the necessary parameter experimentation.

With respect to interactivity, while most students used the suggested method; namely, variation based on the mouse position; others decided to use different means, such as key-strokes or even dedicated GUI buttons. These were perfectly acceptable and attracted full marks, as long as they provided the requested functionality. However, there were also a few submissions that completely lacked this important capability.

Finally, with respect to the implementation, the majority of students did relatively well. Nevertheless, some did not indicate which parts of the code they implemented themselves, effectively not distinguishing them from the remaining code (which should be attributed). Also, there were a small number of submissions that relied on external image processing software to carry out the functionality requested. The students' code essentially would only make external calls to the software and present the results of the former. Such practice was inappropriate for this coursework assignment.

Part D

This asked students to modify the code of the previous part so that it operates on video and apply it on a short clip of their choice.

This was attempted by most of the students who implemented Part C as it was a straightforward extension of the former.

Many students faced performance issues in the implementation of this part, resulting in low frame rates during video reproduction, especially when real-time modification of the algorithm parameters was involved. Such a result was acceptable, as performance was not a central part of this coursework assignment. Nevertheless, there were also submissions that provided optimised implementations that avoided unnecessary calculations in every frame, resulting in a pleasant visual outcome. These efforts were highly appreciated by the Examiners.