COMP4061 – SSA4 Advanced Computer Graphics Summative Assignment

The deadline for submission is the 9th March 2018 (2pm). You should complete all questions [total 100 marks] and submit your work as a pdf file. This assessment contributes 8.5% of the overall COMP4061 module marks. To answer questions, you are limited to use up to 100 words for a 10-mark question or 200 words for a 20-mark question. You may use diagrams to assist answering if you find it appropriate.

Essential background reading

You should study the following materials in order to answer the questions.

- M. Garland, "Multiresolution modelling: survey and future opportunities," *In State of the Art Report (STAR), Eurographics, 1999.*
- Lecture notes.

Assignment

1. Compare the main difference between applying **appearance-based metric** and **geometric-based metric** to measure the quality difference between two polygon meshes. Analyse in which part of the graphics rendering pipeline each metric should be applied to perform quality measurement. [20 marks]

2. Explain how the **Haudorff distance** can serve as a metric to determine the dissimilarity between two polygon meshes, even when these meshes are formed by different number vertices and connectivity. [10 marks]

3. Describe the data structure of **progressive meshes**. Analyse the rendering efficiency of progressive meshes visualisation, given that the user is allowed to freely rotate the viewpoint during the visualisation process. [20 marks]

4. Explain how progressive meshes implement the **refinement** and **decimation** processes. [10 marks]

5. Analyse how the incorporation of **level-of-detail modeling** impacts the rendering performance and network bandwidth consumption of a large distributed virtual environment system. Evaluate the suitability of using **progressive meshes** to implement the level-of-detail modeling in such a system.

   Note that in the above distributed virtual environment system, all graphics models of the virtual environment are maintained by a remote server. During runtime, each client will download relevant graphics models on-demand from the server to support interaction and visualisation. [20 marks]

6. Explain the main issue of applying **level-of-detail modeling** to support interactive visualisation of a large 3D scene, given that the user is allowed to change the viewpoint from time to time. Describe two different methods to tackle such a challenge. [20 marks]