COM6503: 3D Computer Graphics

Assignment 2 (60%): Why are texturing approaches useful in 3D Computer Graphics?

Dr Steve Maddock

Deadline: 3pm, Tuesday 17 January, 2023

1. Introduction

A range of texturing approaches are used in 3D Computer Graphics when rendering polygon mesh objects. These include colour mapping, normal mapping and solid textures, as well as others (albeit many of which are some form of 2D texture map). Your goal in this project is to write a report that argues for why texturing approaches are useful in 3D Computer Graphics.

Learning Outcomes

This assignment addresses the following module learning outcomes:

- Identify and compare a range of techniques for increasing the realism of rendered scenes;
- Summarise and appraise information on a specific topic in computer graphics.

2. The report

Things to consider

The following is a list of some of the things you should consider in your report

- What real-world effects are texturing approaches used for? (Hint: patterns of colour, bumps in surfaces, etc.)
- Why are texturing approaches used rather than other areas of computer graphics, e.g. modelling approaches?
- What range of texturing approaches are available and how are they used in producing the look of real-world objects in a scene?
- For some real-world effects, different techniques could be used. How would you decide which one to use? What are the positives and negatives of approaches and the challenges of using approaches?
- You should also consider practical things that affect certain texturing approaches, e.g. 'filtering' 'aliasing', 'texture atlases' and 'texture compression';
- Different rendering approaches may be used in computer graphics, e.g. (Blinn-)Phong rendering, physically-based rendering and ray tracing. How does this affect the range of available texturing approaches? (Try to represent this as a table or a diagram so that you can reduce the amount of text you write.) (Hint: some texturing approaches may be different for some rendering approaches or may not be used with some rendering approaches.)

Structure

The report should start with a short introduction to the general topic and your reasoning behind the report structure.

This should be followed by some further sections that structure the parts of your report. It is your decision what sections you will use to structure the report and what the order of these sections should be.

The report should finish with a short conclusions section.

Illustrations

These are an important part of the report.

You **must** take three photographs of real-world objects or scenes to illustrate your report.

- These should be photographs that include something that demonstrates a texturing effect, e.g. one photo might be a pattern of surface colour. Each photo should illustrate a different texturing effect.
- Choose your photos carefully so that they support what you are saying in the report.
- You might also use some extra photographs that show close-up views of parts of your original photographs, or, if the resolution is good enough, you can just zoom in on parts of your photographs.

You should also:

- Use screenshots from assignment 1 to illustrate your report (since you used texture mapping in assignment 1); (You might even take a photograph that matches part of the scene you created in assignment 1.)
- Use examples from commercial software to illustrate different approaches (you may have to learn how to use commercial software such as Unity or Blender to do this – both of these pieces of software are free to students);

General illustrations from the internet:

- You must check the copyright permissions before you use any illustrations from the internet.

Decisions and skills

As part of the assignment, you will need to make decisions about what should be presented, make decisions about the ordering of information, decide what should be assumed and what should be explained (you can assume I know about my lecture notes – as an example, there is no need to explain the detailed workings of any common texturing approach covered in my lecture notes; a brief summary using a diagram would suffice), link to reliable information sources, and use appropriate language in your report. You are finding, understanding, filtering, organising and presenting information. You are demonstrating that you can summarise and appraise information about computer graphics.

References

I expect to see at least 3 published research papers in your reference list, as well as other kinds of reference, e.g. online materials that are reputable. Google Scholar (https://scholar.google.com) is a good place to search for academic papers.

3. Deliverables

- The report should be 3000 words (+/- 10%). This total does not include the list of references, the figure captions or any appropriate tables of information. You may include as many pictures as you deem appropriate.
- You should submit the report via Blackboard as a pdf document.
- You must include the following statement at the start of the report:

```
/* I declare that this work is my own.
Author: < name >, < email address > */
```

4. Marking

The following aspects will be considered:

- Coverage of the topic area and relevance of material – Is the material included relevant? Is there evidence of independent reading to find advanced/interesting information for the report? Are the references good?
- Knowledge and understanding of relevant material – Do you demonstrate knowledge and understanding of what you are writing about? Is deeper understanding demonstrated by comparing and contrasting ideas? Is your information accurate, or is some of the material misleading or even incorrect, demonstrating that you don't understand it?
- Organisation, clarity of expression and diagrams – Is the report tidy and organised, with a good flow of information? Are all points in the writing expressed clearly and succinctly, and supported with the use of diagrams? Good use of illustrations – photographs, screenshots from Assignment 1, other illustrations. All diagrams should have a figure number and a caption and be referred to from the main text.

5. Other

- Standard lateness penalties will apply.
- Turnitin will be used to check for use of unfair means.
- See the Department's student handbooks for more detailed information on lateness penalties and unfair means:
  - UG: https://sites.google.com/sheffield.ac.uk/comughandbook/
  - PGT: https://sites.google.com/sheffield.ac.uk/compgtstudenthandbook