Advanced Computer Graphics: CM50203

Ray Tracing Assignment

Submission

You should demonstrate the output of your ray-tracer, including render images and animations (if applicable – as a video file), to the lab tutor at 9am 11th April. The lab tutor will sign the front of your hard copy to ensure it has been seen. Hard copies that are not signed will not be marked. You should hand the hard copy of the coursework to the lab tutor after the tutor has seen the outputs and signed the front of the coursework (11th April). You can demonstrate your ray-tracer on a lab computer or a personal laptop.

Task Specification

Ray tracing is one of the principle methods of rendering scenes in computer graphics. In this coursework, you are expected to implement a ray tracer with various features. A set of basic features will be enough to get a pass mark, while more sophisticated features will give you more credit.

You should begin by downloading the object file from the Advanced Computer Graphics Moodle page. This includes 3D objects, texture and material information.

Compulsory. The first step is to implement a 'ray caster' that shades each pixel with an objects basic colour (up to 50% - a pass mark).

- You should use a perspective view of the scene (not an orthogonal one).
- Include a single light source and a reflectance model for each object (ambient, lambertian and specular components).
- Make one of the object surfaces reflective (as in a mirror – ideal specular reflectance).

The **additional** features are each worth a proportion of marks, and up to 100% can be achieved by implementing these. They are ordered here in a rough order of difficulty – from least to most challenging.

- Include shadows (up to 5%).
- Include a second light source – appropriately updating shadows and reflectance (up to 5%).
- Create an animation by rotating the scene and/or the objects inside (up to 5%).
- Make one of the objects transparent (i.e. made of glass) (up to 10%).
- Add a texture map to one of objects (see download files) (up to 10%).
- Render a scene with motion blur (up to 15%)

A hardcopy report **must** be given in, showing evidence of each feature – in separation and all together. The report should show images of renders and brief text describing what each render contains and how it is achieved. It should also contain clearly commented

source code, explaining what part of each code implements what feature. The marks reflect successful implementation as well as a weighting towards the brief description of each feature.

Implementation Choices

You can implement the ray tracer in any language you prefer. The lab machines contain OpenGL, QT, C++, Java, Python and Matlab.

Feedback

Laboratory tutors are fully briefed regarding marking criteria; they are available in every laboratory session for instant feedback. During the consolidation week (week beginning March 10th – week 6) the lab class will be dedicated to feedback and coursework help.

Final feedback will be available within three weeks of the submission deadline.

Getting Started

Download and unzip the supporting coursework code from Moodle into a directory. There is a file called 'quick_start_2014'. If you run this file, it will load 2 objects, a plane, two example light sources and a camera position. When you render the scene, you may wish to place a camera and lights somewhere else (I will leave this to you).

When you run 'quick_start_2014' it will also generate OBJ files for the different scene objects. This may also be useful to you depending on whether you want to load the objects using a different language from Matlab.

There is also another file called 'Ray_Caster_Tutorial'. This is a tutorial style file for setting up a ray caster and a view of the scene. You can use this file to help get started on the coursework. In fact, following these steps (in any language) will initialise a ray caster. From this, other features can then be added.