Assignment A2 Report

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1.1 Graphics Primitives

Primitive: The term Primitive in OpenGL is used to refer to two similar but separate concepts.

1. What a stream of vertices represents when being rendered (e.g. "GL_POINTS"). Such sequences of vertices can be arbitrarily long.
2. The result of the interpretation of a vertex stream, as part of Primitive Assembly.

Processing a vertex stream by one of these primitive interpretations results in an ordered sequence of primitives. The individual primitives are sometimes called "base primitives".

Paraphrased from: Official OpenGL Wiki.

1.2 Graphics Pipeline

1. Object geometry defines the vertices/primitives to render.
2. Model transformations define the transformation to perform on the objects.
3. Lighting calculations determine how light affects the objects.
4. View transformations determine any transformations to how the final image should be displayed.
5. Culling/Clipping skips unnecessary data.
6. Projection transformation projects the data.
7. Rasterization converts the objects to pixel data.

1.3 Co-ordinate Systems & Transformation

The following co-ordinate systems are used during each stage of the graphics pipeline:

- **Model Co-ordinate System (MCS).** Local co-ordinates of the model.
- **World Co-ordinate System (WCS).** Global co-ordinates of all objects.
- **Viewer Co-ordinate System (VCS).** Local co-ordinates of the viewer.
- **Normalized Device Co-ordinate System (NDCS).**

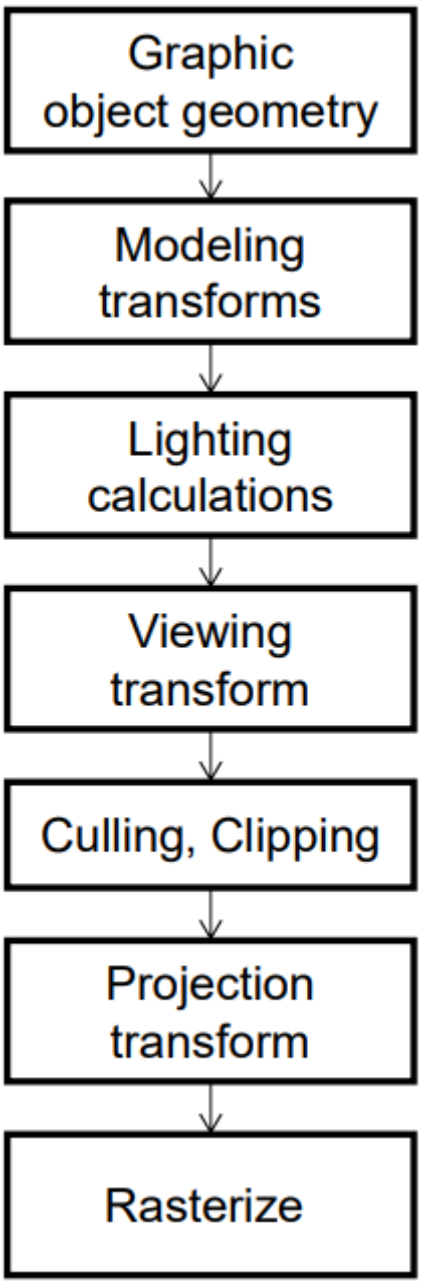

Figure 1: Diagram of the graphics pipeline.

- **Screen Co-ordinate System (SCS).**

The following transformations are applied:

- **Model Transformations**
  - Scaling, rotation, translation.
- **View Transformations**
  - Position/rotation/zoom of camera.
- **Projection Transformations**
  - Projects objects into the plane.
- **Display Transformations**
  - Maps the view to the display window.

1.4 Scan Conversion

A scan conversion algorithm converts primitive data into pixel data.

1.5 Hand-on Midpoint Algorithm

The data is available in this file: Pixel Data

The code used to generate the data: Code

2.1 OpenGL Primitives

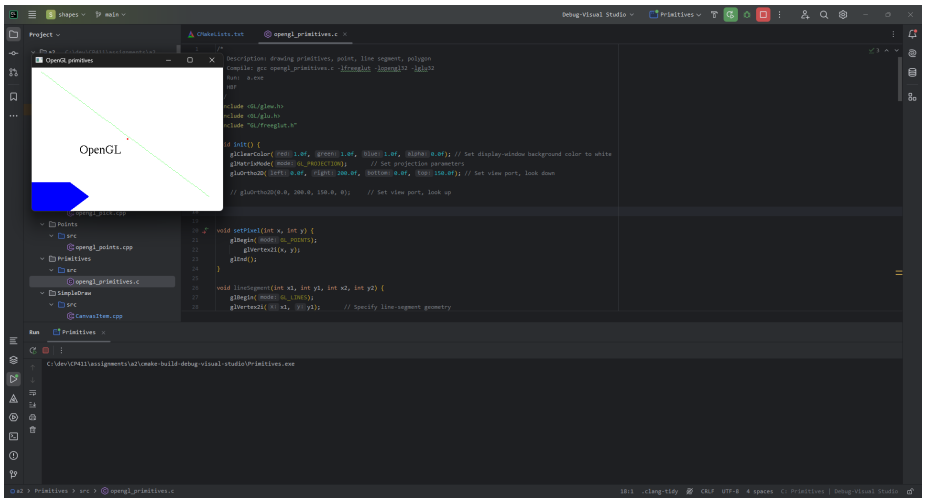

Figure 2: OpenGL Primitives

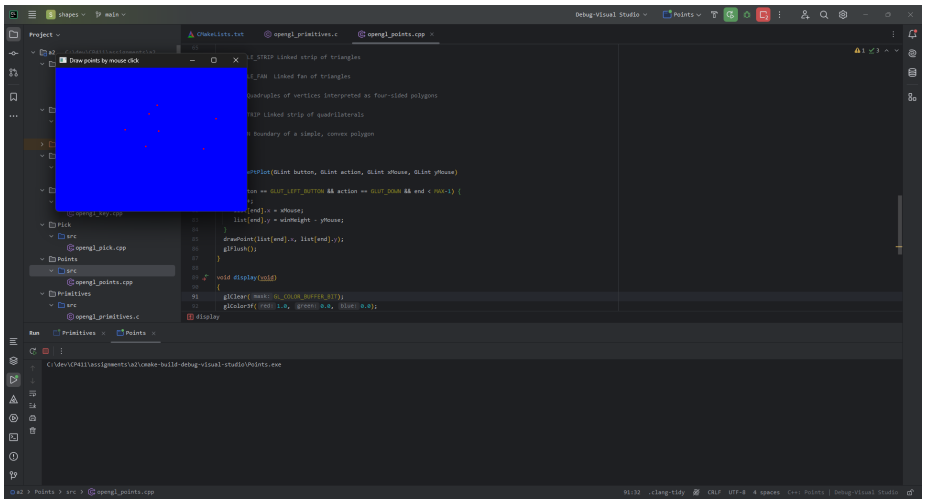

Figure 3: OpenGL Points

2.2 Interactive Graphics

2.3 Bitmap File I/O

3.1 Display Window & Menu

3.2 Data Structures

3.3 Draw Rectangle

3.4 Draw Circle

3.5 Edit Features

3.6 Save/Open SVG Files

3.7 Export to Bitmap File

3.8 Circle & Square Artwork

3.9 Program Design

References

1. CP411-A2
2. Official OpenGL Wiki

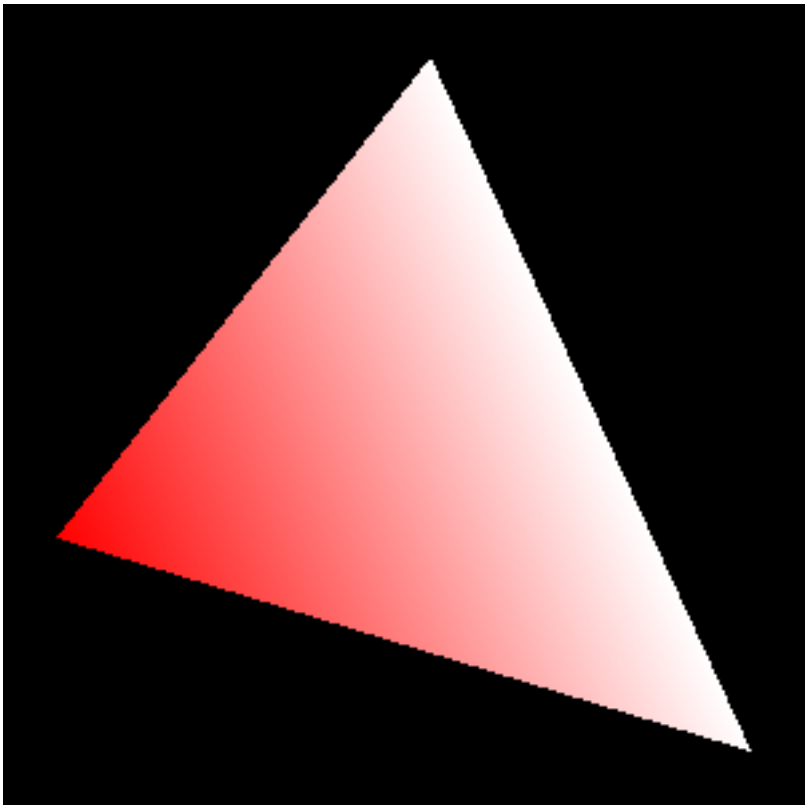

Figure 4: Output