CPSC 314
Computer Graphics

Dinesh K. Pai

A first look at OpenGL

What is OpenGL?

- OpenGL = Open Graphics Library

- An open industry-standard API for hardware accelerated graphics drawing

- Implemented by graphics-card vendors

- Maintained by the Khronos-Group

What is OpenGL?

- **Pros & Cons:**
  - + Full specification freely available
  - + Everyone can use it
  - + Can use it anywhere (Windows, Linux, Mac, BSD, Mobile phones, Web-pages (soon), ...)
  - + Long-term maintenance for older applications
  - + New functionality usually available earlier through Extensions
  - - Inclusion of Extensions to core may take longer
  - ? Game-Industry

OpenGL Pipeline

- Reference:
  Textbook Chapter 1
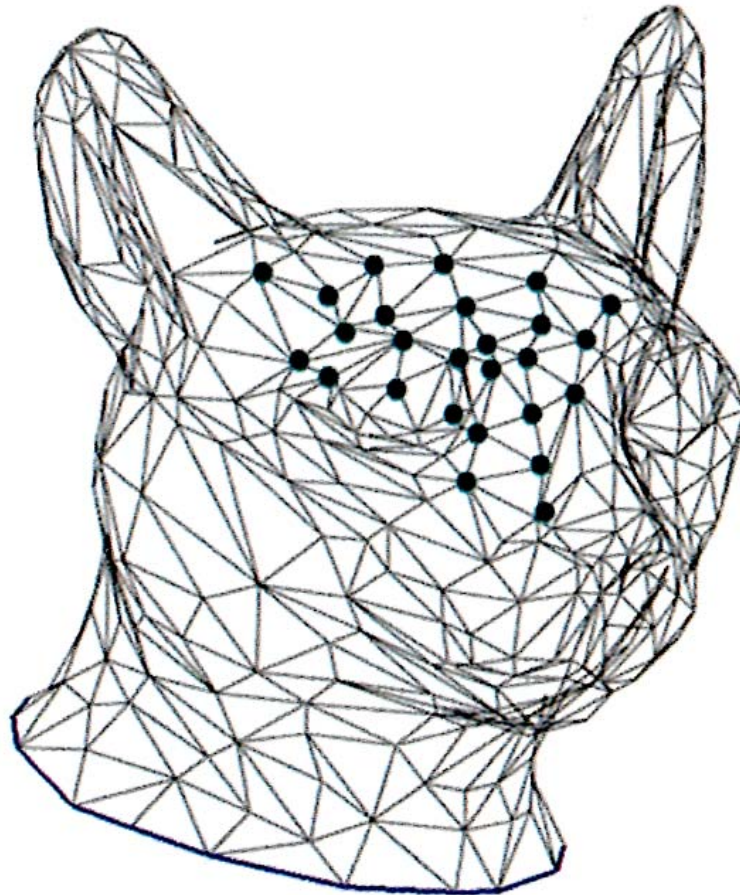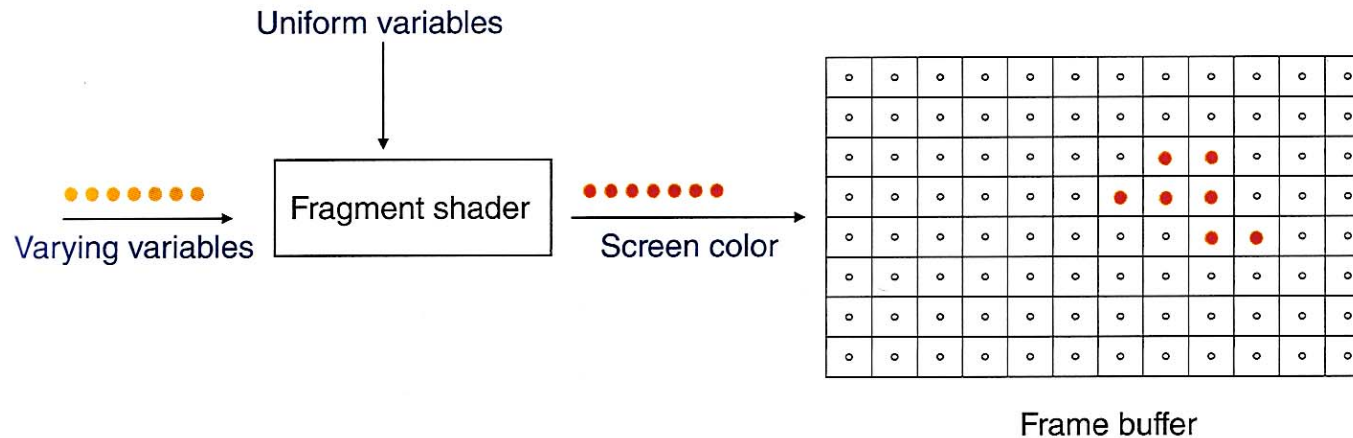
OpenGL Pipeline: Vertex Shader
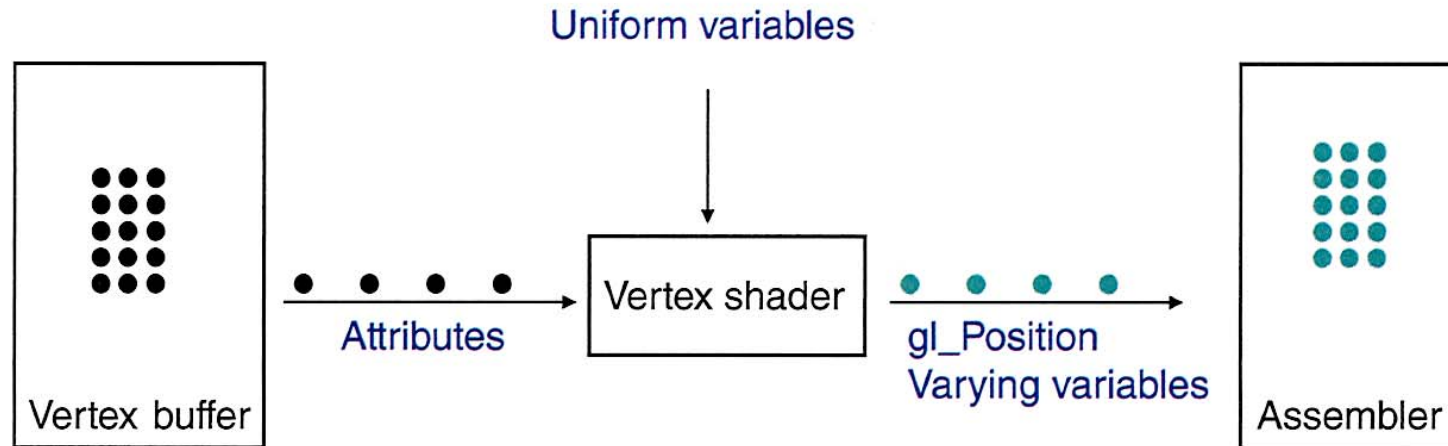
- Vertices are stored in a vertex buffer.
- When a draw call is issued, each of the vertices passes through the vertex shader
- On input to the vertex shader, each vertex (black) has associated attributes.
- On output, each vertex (cyan) has a value for gl_Position and for its varying variables.

OpenGL Pipeline: Rasterization
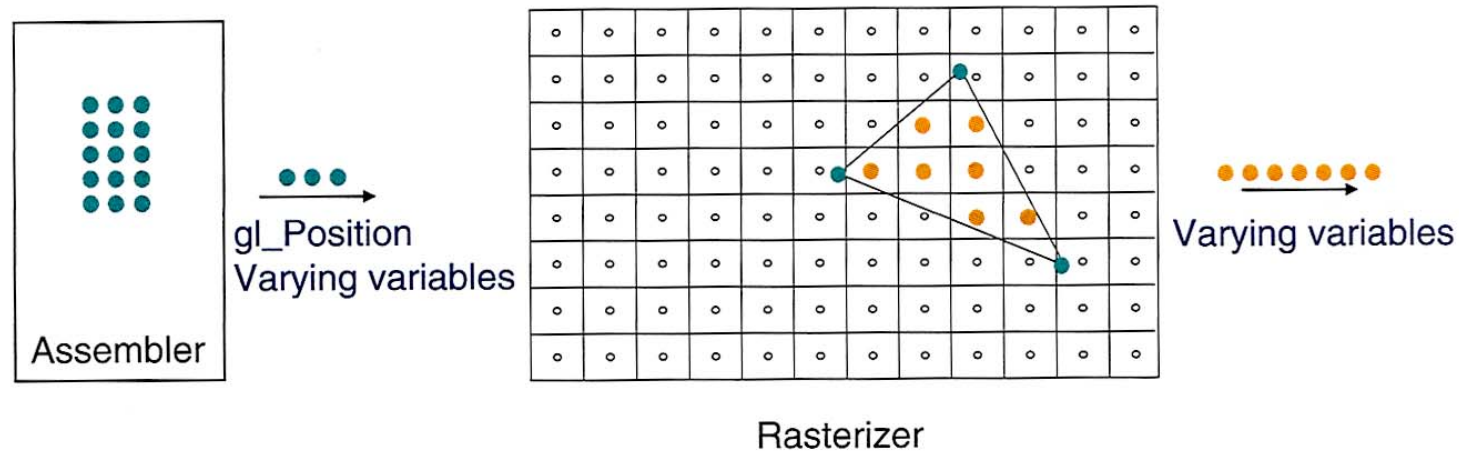
- The data in gl_Position are used to place the three vertices of the triangle on a virtual screen.
- The rasterizer figures out which pixels (orange) are inside the triangle and interpolates the varying variables from the vertices to each of these pixels.

OpenGL Pipeline: Fragment Shader
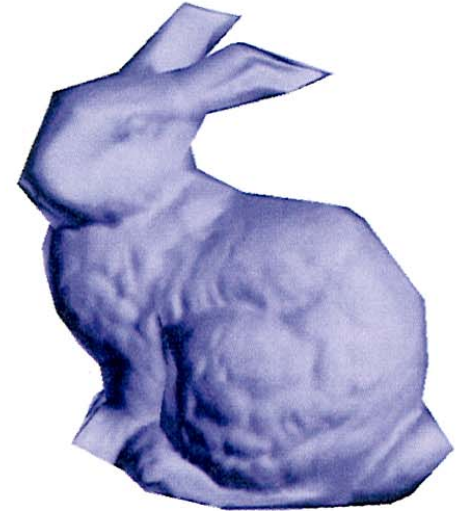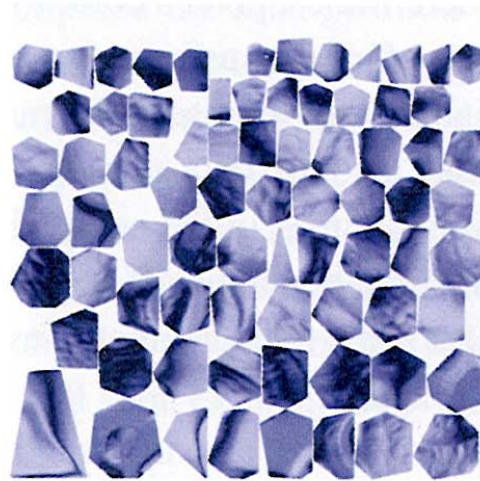

Frame buffer

- Each pixel (orange) is passed through the fragment shader, which computes the final color of the pixel (pink).
- The pixel is then placed in the framebuffer for display.

OpenGL Pipeline: Fragment Shader
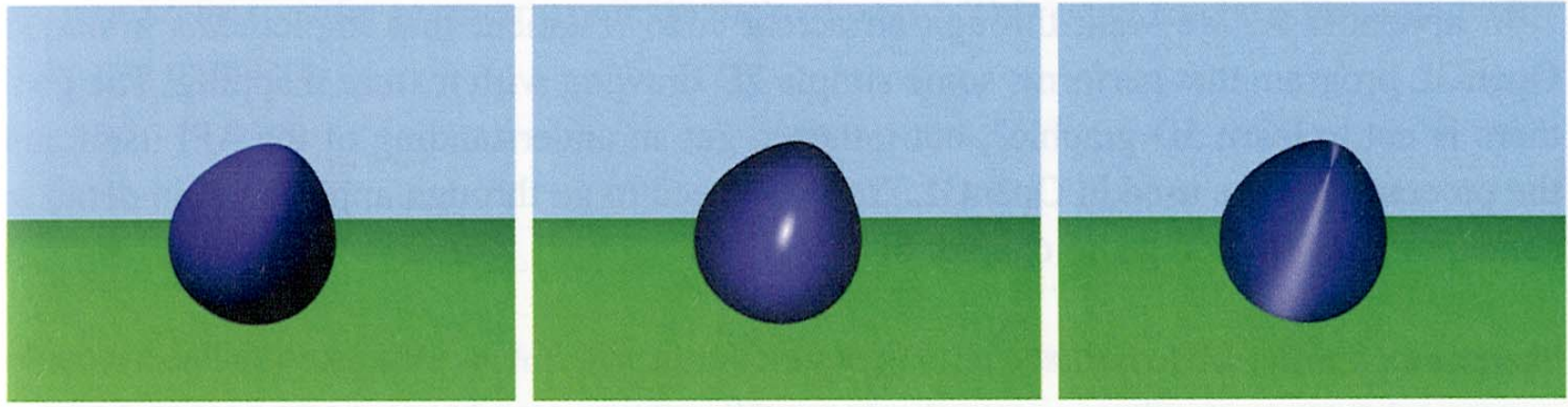
- By changing the fragment shader, we can simulate light reflecting off of different kinds of materials.

Texture Mapping

- A simple geometric object described by a small number of triangles.

- An auxiliary image called a texture.

- Parts of the texture are glued onto each triangle giving a more complicated appearance.

Summary

- ## What is OpenGL?

  - ### A software interface that allows a programmer to communicate with the graphics hardware

  - ### A programming interface for rendering 2D and 3D graphics

  - ### A cross-language multi-platform API for computer graphics