3D Models
CSCI 4830/7000
Spring 2011

The Goal

- Create a file that can be loaded into an OpenGL program and display an arbitrary three dimensional object
  - Must be general enough to describe any object
    - May need to accept some limitations
  - Must be flexible in creation and use
  - Must be efficient

Utah Teapot

- Defined in terms of a set of Bezier patches

- Complex shape

- Has Problems
  - Lid
  - Spout

Stanford Bunny

- Intended to replace teapot

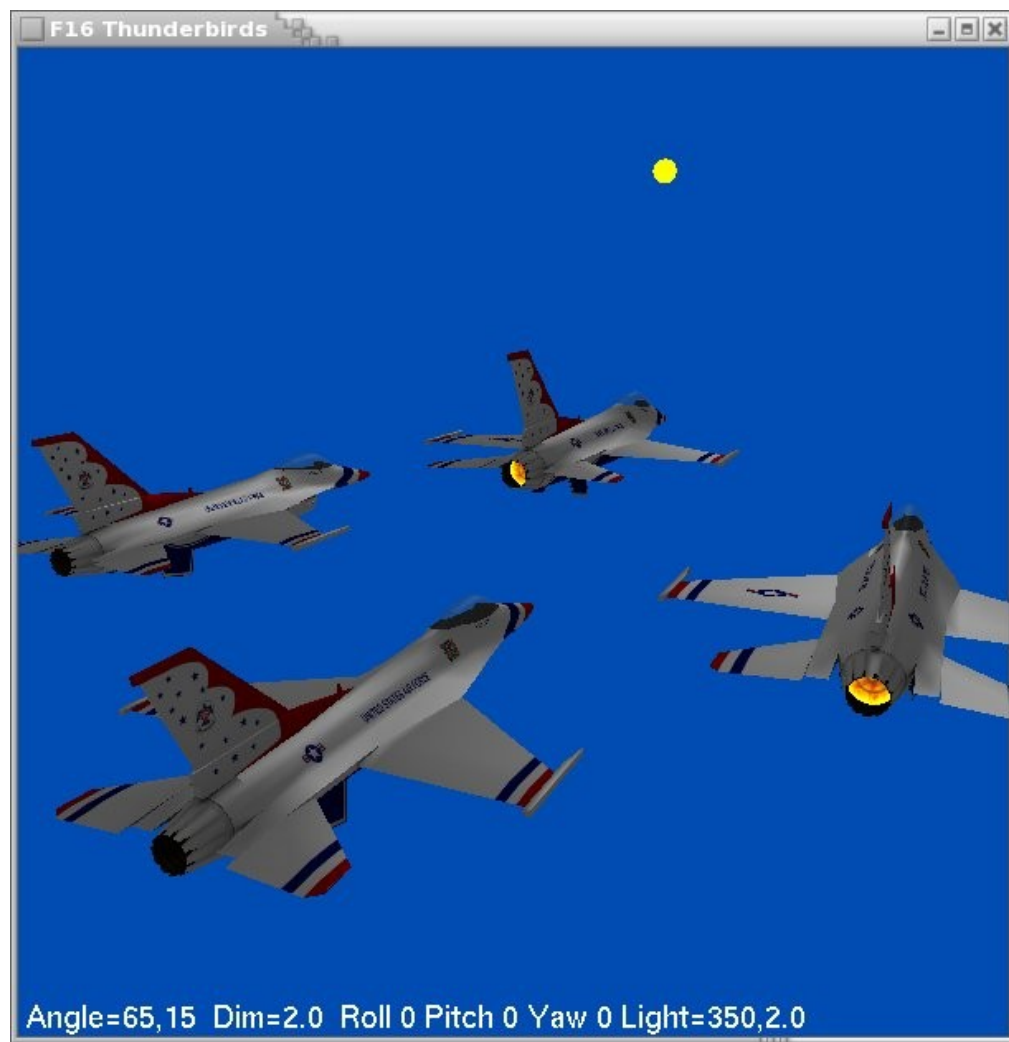- Input by 3D scanner

- Very complex

Stanford Armadillo

- Input by 3D scanner

- Extremely Complex

- Good for testing performance

Super Bible F16

- Moderately Complex

- Introduces challenges
  - Textures
  - Transparency
  - Emission Color
  - Control surfaces

Design Decisions

- ASCII Text
  - Easier to view
  - Free format or line oriented
- Binary
  - Efficient
  - Byte gender
  - Word length
- Structure

Structure

- What must be stored
  - facets or patches
  - direct or hierarchy
- Efficiency
  - Store once, load many times
- Simplify loader implementation
  - Header to simplify memory management
  - Simple instruction set
  - File management (e.g. textures)

Example File Formats

- PLY
  - Also called Stanford Triangle Format
  - Text and binary versions
- OBJ
  - Developed by Wavefront Technologies
  - Relatively simple text format
  - Supported by many programs
- 3DS
  - Developed by Autodesk
  - Binary files
  - Lots of advanced features

More Example File Formats

- MD5
  - Used by Doom
  - Text based
  - Animations
- COLLADA
  - Sponsored by Khronos Group
  - XML based
  - Defines entire scenes
- Many more

Creating Objects

- Blender
    - Open source
- Maya
    - Free educational version
- Can be used to convert objects to more convenient format
- Beware: Many objects found on the web are badly broken.