AC3D Modeler Overview
What I'll talk about

AC3D terminology

AC3D features

Things to be careful of

I will not talk about all the keys or buttons to press for every imaginable operation. See the html documentation!
**AC3D Terminology**

**Vertex**: 3D position, possibly with texture coordinates

**Surface**: a linked list of vertices, which may be displayed as a polygon, a polyline (closed, piecewise linear curve), or a line (open, piecewise linear curve)

**Object**: a collection of surfaces

**Group**: a collection of objects that can be organized hierarchically
Terminology Note

AC3D’s definitions for surface, polyline, and line DO NOT correspond to the usual definitions of these terms:

Surface: a smooth or piecewise-linear 2-manifold, with every point homeomorphic to an open disc (e.g. a sphere, torus, polygonal mesh, etc)

Polyline: a piecewise linear curve

Line: either an infinite, linear curve or a bounded linear curve (i.e. a line segment)
Views

3 orthogonal views
  pan around
  zoom, either current view or all orthogonal views

3D view
  spin mode
    vertical mouse spins about horizontal axis
    horizontal mouse always spins about y-axis
  walk mode
    forward/back, left/right, up/down
    turn head left/right
Creating Basic Objects

• Polygon, polyline, line, ellipse, rectangle
• Cylinder, sphere, box
• Disk
• Rectangular mesh
More advanced object creation

Extrude a polygon, polyline, or line
   Extruding a polygon yields a closed object

Revolve a polyline or line
   Revolving a line touching the axis at both ends can yield a closed object
   Revolving a polyline that does not touch the axis yields a closed object

Take the convex hull of a set of points
   Useful for joining two objects
Selection, move, resize, rotate

Select either vertices, objects, or groups

- click on vertex or edge
- use selection box

Move in coordinate plane

Resize along coordinate axes (i.e. non-uniform scaling)

Rotate about coordinate axis
Snapping

Grid snapping available during vertex placement

Vertices may be snapped together after the fact

Objects may be automatically shifted to make certain vertices line up
Shading properties

Render as polygons, polylines, or lines

Flat or smooth shade (where possible)

Backface culling on/off

If rendering is rasterization bound, backface culling speeds things up

Usually used for closed objects, where back faces are not typically seen anyway
Normals

Polygon vertices on basic, closed shapes are created in CCW order when viewed from outside.

Normals are created to be pointing outward.

Surfaces of revolution may be created with wrong orientation.

use flip normals to fix.
Shared vertices

Shared vertices allow adjacent polygons to know that they are adjacent

also allow vertex normals to be computed across adjacent faces for smooth shading

Basic mesh shapes created with shared vertices

Exactly coincident vertices may be shared later

Grid snapping or vertex-vertex snapping can make them coincident
Output formats

AC3D's format preserves all model info

several formats also exported, and a few imported
(importing is harder!)

Eventually, you'll need to export to a format your program can read (not until 2nd homework)

Raw triangle format probably easiest

but throws away hierarchy, object and shared vertex information

save individual objects to separate files to preserve object information and allow animation
Watch out!

Avoid using too many triangles or hidden triangles

more triangles = longer rendering time

revolving polygon or object creates hidden, internal polygons (wasteful)

the same goes for extruding closed objects

If you want to use backface culling in your HMD application, check for proper normal orientation