Introduction to Computer Animation

Lecture 6

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3D Animation

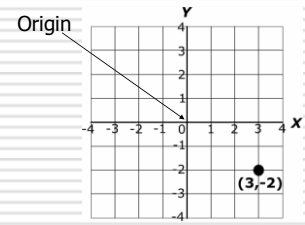
- Extra dimension!
- Lots of control
- Big demands on hardware

XY Coordinates

- Coordinates in two-dimensional space
- X,Y

- Cartesian coordinates

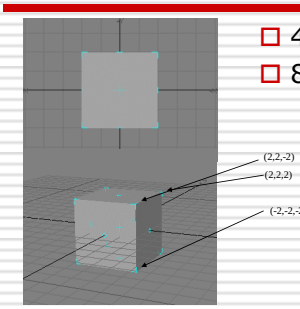
XY (3)



XYZ Coordinates

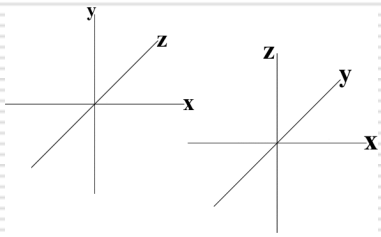
- In 3D we have an extra plane.
- …so we have an extra coordinate.
- The Z axis coordinate
- Indicates the distance along the Z axis from the origin that the point is

Depth

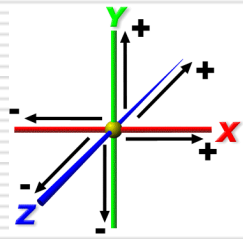


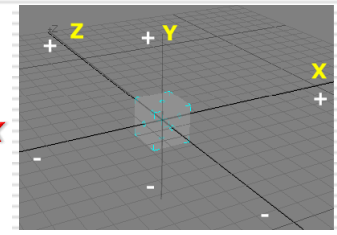
- 4 points = square
- 8 points = cube

Common Configurations

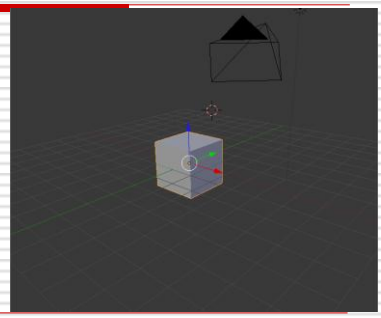


3D modelling XYZ

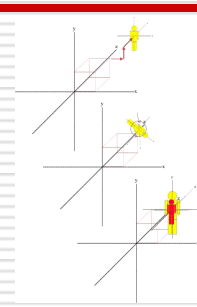




- Red = *X*
- Green = *Y*
- Blue = *Z*



Transformations

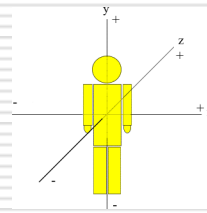


- Translate
  - Move an object
- Rotate
  - Rotate an object
- Scale
  - Increase or decrease an objects size

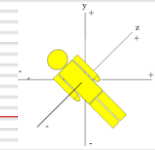
Translation

- Object is moved some amount in all three axes.
- Translate(3,-2,5)
  - Move along x 3 units
  - Move along y –2 units
  - Move along z 5 units

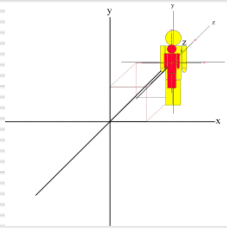
Rotation



- Object can be rotated around any of the three axes
- Rotate(0,0,45)



Scale



- Increases or decreases an objects size
- Scale(3,3,3)
- Scale(4,1,1)

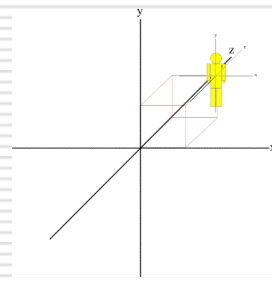
Transformation (summary)

- Translation
  - Values added to the object
- Rotation
  - Object rotated by number of degrees around indicated axis
- Scale
  - Object axis values are multiplied by axis values
    - A value of '0' will reduce the size of an object to zero on that particular axis
    - Negative values will reverse an object
    - Fractional values (below 1) will reduce an objects size

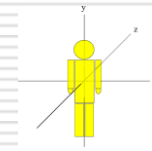
Absolute v. Relative Transformations

- Absolute
  - refer to an absolute location in the 3D world
- Relative
  - refer to a location relative to an object

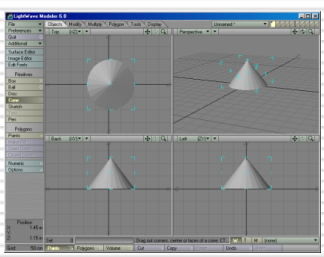
Local Coordinate Systems



- Individual objects have their own coordinate systems (Local).



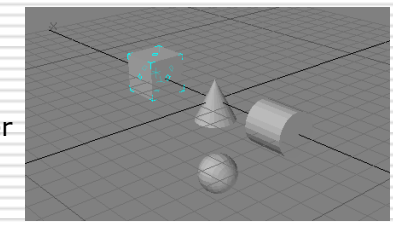
View Ports



- Orthographic
- Perspective

Geometric Primitives

- Cone
- Sphere
- Cube
- Cylinder
- Plane
- Torus



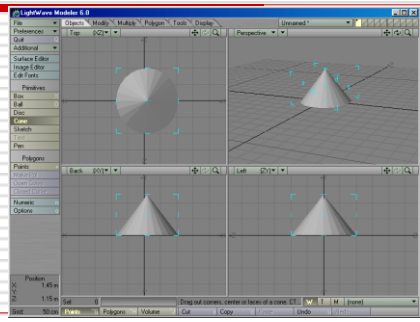
3D Software

- LightWave
- 3D Studio Max
- Maya
- TrueSpace
- Blender
- IDL
- MatLab

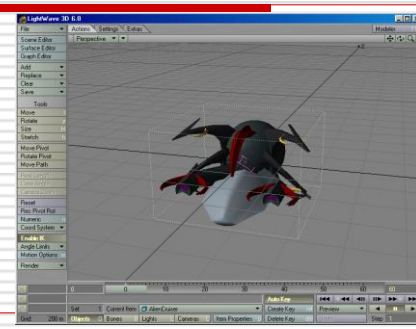
Differences in interface

- LightWave – 3 applications
  - Modeler
  - Layout
  - Hub
- Maya
  - Single application for modelling and animation
  - Separate application for rendering
- Blender
  - Single application for everything
  - Separate application for rendering

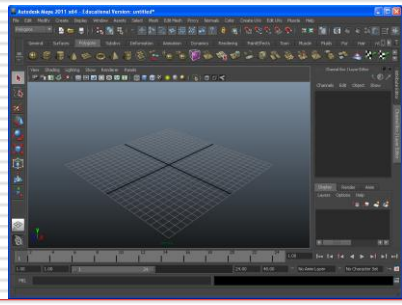
LightWave3D



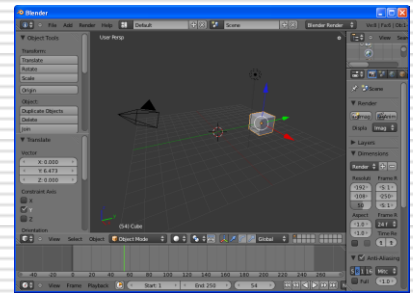
LightWave3D (again)



Maya



Blender

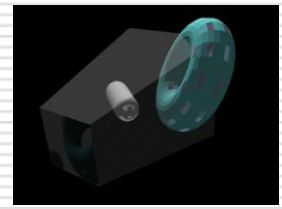


Rendering

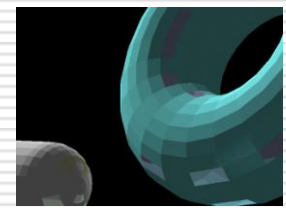
- Creation of a final image/animation from a 3D scene
- VERY hardware intensive for a 3D scene

Picture Projection Plane

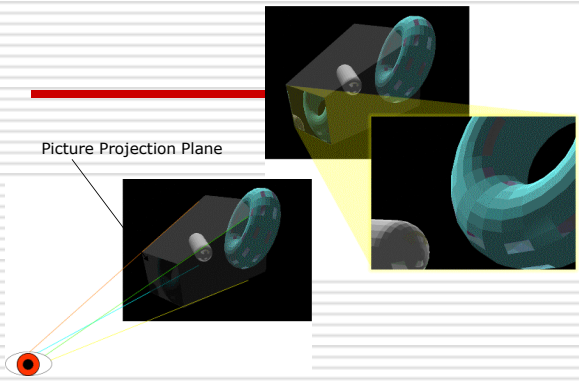
- Plane on to which the 3D image is rendered as 2D



3D scene



Virtual camera view



Today

- Introduction to 3D
  - Mainly modelling