

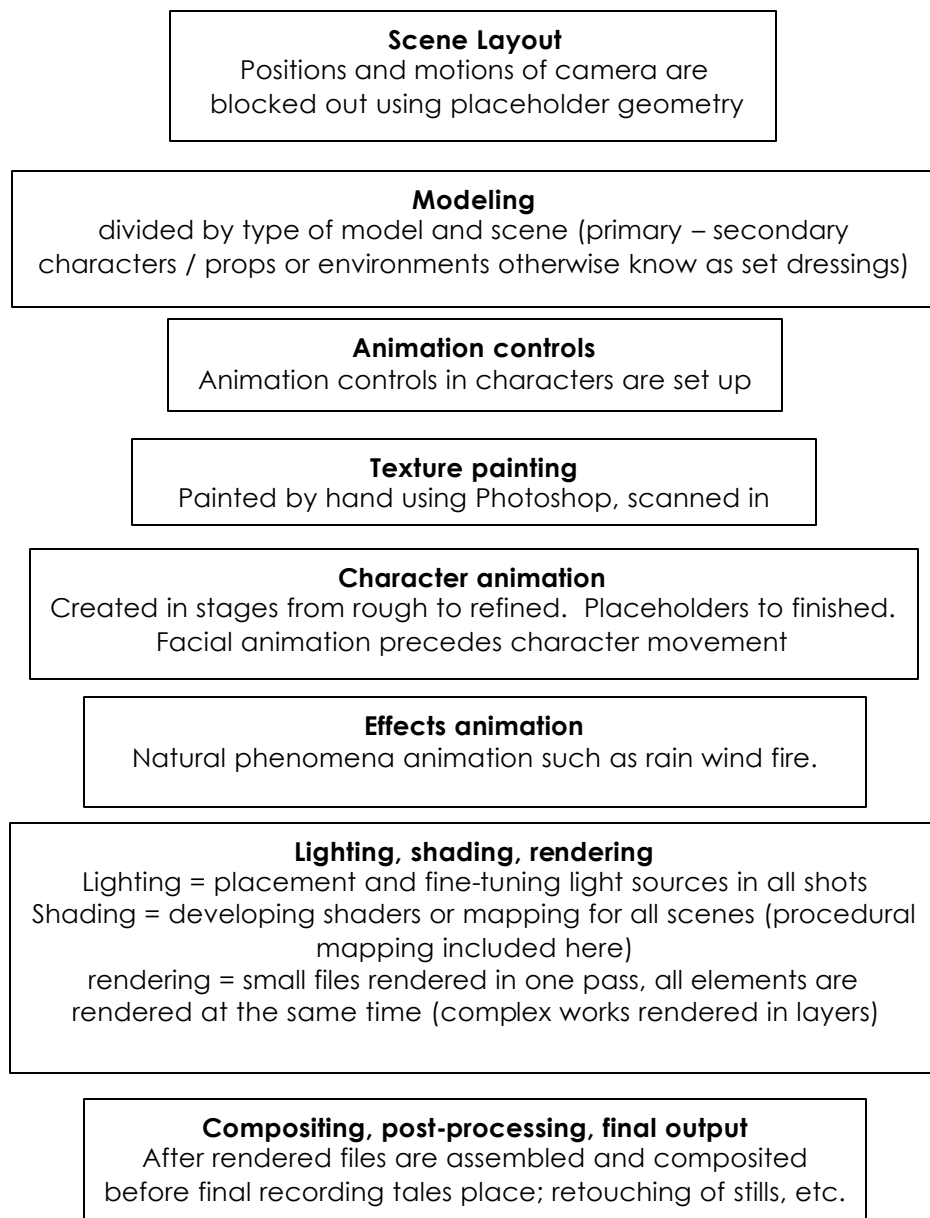
Terms for 3d Graphics

Production Process (the basic modules)

Modeling: the spatial description and placement of imaginary 3-dimensional objects, environments, and scenes with a computer system.

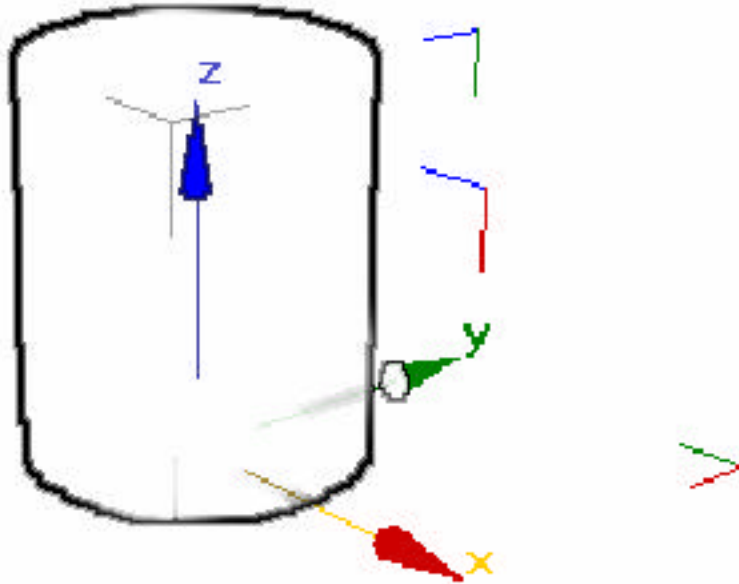
Animation: using either key framing techniques where start and end positions are set for all objects in a sequence or motion capture where all positions are fed to the objects directly from live actors whose motions are being digitalized.

Rendering: represent visually the animated models with the aid of a simulated camera, simulated lights and texture maps and procedural shaders.



3d Space

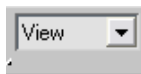
Cartesian Coordinate System (x, y, z): represents 3 dimensional space (width, height, depth) in a 2 dimensional screen. A point in a 3d universe can be pinpointed with 3 values (x, y, z).



View: changes based on view focus in the window; x is always to the right, y is up, and z is straight back (except in perspective where view and world are represented the same)

Local coordinate system: axes relative to the object – usually placed at the center of the object (see above); used to specify positions, orientations, or transformations of that object in question. (Also called: *object coordinate system*). This axis system is tied to the object not to the world space.

World coordinate system: useful for placing objects in relation to each other (global coordinate system). Keeps track of all objects within the greater system. IMPORTANT: In the world coordinate system seen from the front (for example), the X axis runs in a positive direction to the right, the Z axis runs in a positive direction upward, and the Y axis runs in a positive direction away from you. This is different that your normal understanding of x, y, z directions.



Change the mode by which you view objects

Projection plane: all units are described in 2d space using a projection plane (grid). This plane is drawn to the specific view window open.

Orthographic View: squarely facing origin; can see only 2 axes at one time. Views face planes of world coordinate systems. No perspective or convergence of lines (front, back, left, right, top, bottom). Think of this view as a map, plan or elevation.

Perspective View: parallel lines converge as they become further away. Objects are not true to size but are smaller or larger based on where they are in the world.

IDST 147 3D Imaging for Multimedia

Axometric View: parallel projection. No perspective. All 3 axes are viewed.

User View: axiomatic view created when an orthographic view is rotated. Parallel lines do not converge but all three axes can be viewed and transformed.

3 planes in 3d space: xy, yz, zx

6 views in orthographic space: front, back, left, right, top, bottom

Grid: represents units, the world origin and the axes. Found in each view. Can be turned off in each view. Can be used to 'snap' objects to units in space.

Axis: invisible straight line (vector) stretching infinitely in both directions. Each axis runs at right angles (perpendicular) to the other axes. (See above) Axes in 3ds Max are color-coded.

Generic units: arbitrary imaginary units that do not correspond to real world units of measure.

Origin: point where x, y, z-axes meet.

Grid: represents visually the generic units, the world origin, and the axes within view.

Object Pivot: All objects have a pivot point representing an object's local coordinate system. The pivot point of an object Functions as the center for rotation and scaling when you select the Pivot Point transform center.

Snap: 

View Navigation

Pan

Rotate / Arc Rotate

Zoom

Viewport Display

Wireframe: previews model as lines only

Shaded: previews model with 'skin'

Bounding box: previews model as bounding box (for scenes with memory issues)

Isolate: select an object and preview it exclusively. Its local axis becomes a temporary world axis.

Object Transformations (Movement)

Translate: used to move an object or group of objects in a linear way to a new location in 3d space

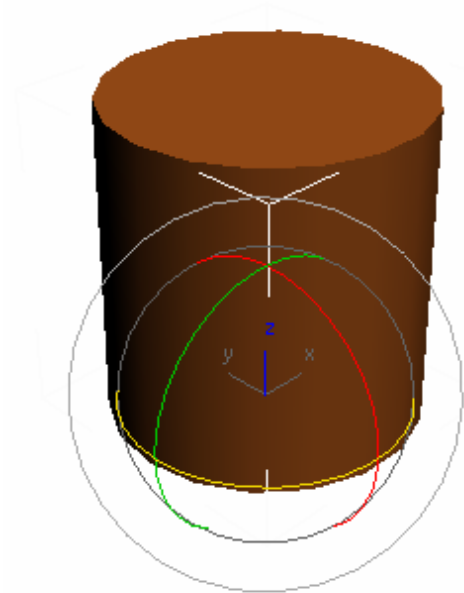
Rotate: used to move an object or group of elements around a specific center or axis.

Scale: used to transform the size and/or proportion of an element or group of elements.

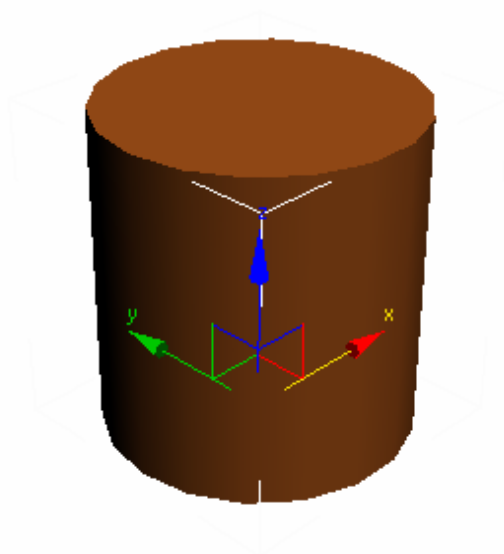
Uniform Scale: proportional change in volume of object.

Non-uniform scale: changes the volume in the object disproportionately.

Non-uniform scale (squash): keeps the volume of the object but squashes / stretches it.
All the above objects rely on the x, y, and z constraints to control how translation, scale and rotation affect the object.

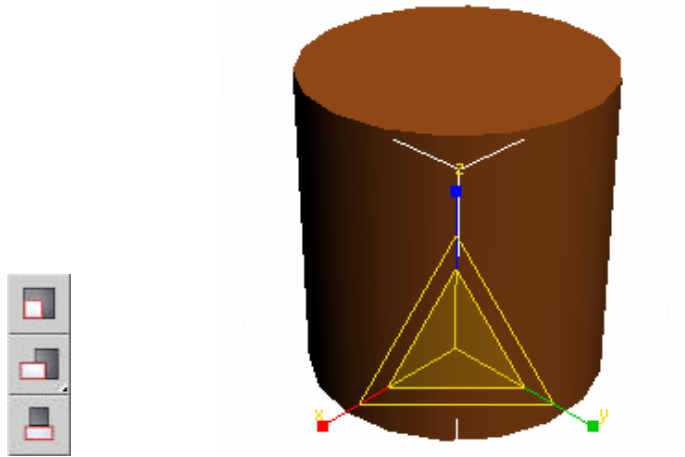


Transform Gizmo for Rotation (ver 5)



Transform Gizmo for Translate (ver 5)

IDST 147 3D Imaging for Multimedia



Transform Gizmo for Scale (Uniform, Non-Uniform – ver 5)



Selection Only

File Formats

File formats to import into 3ds Max for modeling (File: Import)

- .ai – illustrator files
- .dxf – universally recognized format for 3d models
- .3ds – 3d Studio mesh (works well when working between versions of Max)

Image file formats to import into 3ds Max for image placement and composition (Views: Viewport Background)

- .tif
- .mov (for textures)
- .avi (for textures)
- .bmp
- .png
- .jpg

Primitives

Geometric primitives: simple shapes with a fixed structure. In 3ds Max these are called **standard primitives** - box, sphere, torus, cones, cylinders, teapot, cone, geosphere, tube, pyramid, plane. (also 2d equivalents – called **splines**- line, circle, arc, ngon, text, section, rectangle, ellipse, donut, star, helix).

Types of Modeled Surfaces

Polygons: no matter what type of surface you start with – 3d software converts it to polygons before rendering. Polygons are simple triangles or rectangles, each representing a plane and defining a small area of the character's surface.

Advantages: better for more complex surfaces with different types of seams

Disadvantages: in order to make a smooth surface you need lots of polygons to describe it. High-resolution polygons are slow to deform and tear easily.

Resolve this issue: create a low polygon model and animate it then use a mesh smooth modifier to add resolution.

Patches: a surface with curves as edges. Relies on the following types of curve –bezier. Patches are either 3 – 4 sided. This is the preferred method of creation in Max.

Advantages: surface topology can be altered on the fly. The same object has both low-res and high-resolution information in it.

Disadvantages: must be build with the same amount of edges. Patches are for the most part without sharp edges.

Nurbs: non-uniform patches that allow holes in their geometry. Relies on the following types of curves – point (cardinal) and CV curves (b-spline). Non-uniform patches differ because each one of their vertices can have a different weight and can therefore affect the curvature of the spline independently.

Advantages: can have holes in them and multiple surfaces with multiple edges can be seamed together. Different vertices can have different weights.

Disadvantages: processor intensive and a bit buggy.