Lesson 10 – Animation: Overview

Interface – Integral to MAX (always active)

Time Slider - “Active Time Segment”. Slide or Click arrows or “<” & “>” keys.

Play, Frames (forward, backward), Current Frame field, Key mode toggle

Key buttons – Auto Key (also Set Key/Set Key Mode)

Track View – Curve Editor (mini-curve editor) & Dope Sheet. “Graph Editors”

Motion Tab – Parameters (Keys/Controller), Motion Path (Trajectory)

“Animation” pull-down – Mostly specialized tools

Basic Motion

1. Activate “Auto-Key”
2. Choose a point in time (frame)
3. Move object
4. Play

Keys – “Keyframe Animator”

Key – An event
A key determines **WHAT** happens.
Example: A door is closed (0 degrees). A door is open (90 degrees)

Keyframe – Key on the timeline, at a specific frame
A keyframe determines **WHEN** the event happens
Example: The door is closed at frame 0. The door is open at frame 30

Frame – Passive event dependent on the rules (controller) of the bracketing keys
Example: The door opens from frame 0 until frame 30

When Auto-key is **ON** (red)
First time: a key will be made at the current frame AND at frame 0.
Subsequent: Keys made (or modified) at the current frame only

When Auto-key is **OFF** (gray)
No keys are created, thus no animation.
Object/Transforms will be modified, but not animated
“Layout Mode”

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Motion Path – Helps visualize motion.
Visible for animated objects when “Motion (tab)/Motion Paths” is active

Path – Yellow (start) to Red (end)
Frames – White Dots
Keyframes – Boxes
Bezier Handles – Adjust motion path at intermediate keys

Keyframes can be freely positioned on the timeline. Changes speed.
Faster = Fewer frames
Slower = More frames

Key Mode Toggle – Forward/Back a Frame or Key

Preview – Quick rendering of animation for review. Fast, but low quality.
"Tools/Preview-Grab Viewport/Create Preview Animation…"

Range – Usually “Active Time Segment”
Image Size – Default is 50% of rendering size.
Visual Style – Preference = Hidden line or wireframe the quickest
Display Filter – Can visualize non-renderable objects (like cameras)
Output – Defaults to AVI. Uncompressed best, but LARGE

“Save Preview As…” to save a copy (preview is always being overwritten)

Rendering – Use “Render Setup” dialog box (F10)

Main settings:

1. “Time Output” - Active Time Segment – The timeline

2. “Output Size” – Drop down offers presets.
   Custom – Allows any frame size. Best for computer presentations.

3. “Render Output”
   a. Name – File name (prefix)
   b. Location – Folder to render file(s) to.
   c. Format –Type of file to render to (AVI preferred).

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What can be animated? – Virtually everything can create keys

Transforms – Move, Rotate and/or Scale
Camera = “Walkthrough”

Parameters – Creation and Modifiers

Sub-Objects
Shapes (Vertex, Segment, Spline) + Extrude/Lathe
Meshes (Vertex, Edge Faces)

Also NURBS, Polygons, etc…

Materials
Colors – Base, etc…
Settings – Transparency, Roughness, etc…

Texture maps
Animated bitmap – AVI, Still sequence. File’s first frame = frame 0
Mix material – Animate between 2 materials (with or without bitmaps)
Procedural – Noise (“Phase”). Gradients (sliders)

Lights – Intensity, dimmer, color, etc…

Camera (Physical)
Exposure (EV) value
Depth of Field (DOF)

Creating Keys – 2 modes:

1. Auto Key Mode – Basic animation
   When active (RED) creates key when adjustment is made.
   If key exists, then that key is modified

2. Set Key Mode – Mainly for Character Animation (or complex mechanics)
   When active, keys only created if “Set Keys” button is clicked.
   Allows playing with animation at a given frame.
   Defaults to transform animation-only. Must otherwise set filters.

Set Keys Button – Creates keys of current transform state at current frame

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Motion Path vs Spline – Motion keys create a spline or vise-versa

Useful for mechanical motion (i.e. a circle path)

Select object to animate and then “Motion tab/Motion Paths/Conversion Tools”:
Start Time and End Time
Samples = Number of keys created. Max = each frame a key

“Convert To” – Extracts spline from Motion Path (trajectory)
“Convert From” – Spline is translated to Motion Path (trajectory)
First vertex of spline = First frame

Path constraint controller is generally the better solution.

Time Configuration

Frame Rate – Frames per second (fps).
Internally measured in “ticks” (4800 ticks per frame. 160 ticks per second)

Media may dictate frame rate:
NTSC (30 fps)
PAL (25 fps)
Film (24 fps).
Custom - Can be “whatever”. Good rule is to use 30 fps

Time Display
Frames
SMPTE (Timecode) – Minutes: Seconds: Frames
xxxx :TICKS – For fractions of frames

Playback – Viewport only.

Active Time Segment
Animation – Expands/Contracts the “time window” without modifying keys.
Start/End Time or Length or Frame count

Re-Scale – Repositions key proportional to the new time segment.
Scaling down by even factor will cause issues with odd frame keys

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Output - Main settings (Render Production):

1. "Time Output"

    a. Single – renders current frame ONLY.
    b. Active Time Segment – The timeline
    c. Range – Typically a sub-set of the active time segment
    d. Frames – User defined order. Usually used to re-render bad frames

    "Every Nth Frame" = useful for testing (i.e render every 50th frame)

2. "Output Size" – Frame size. Drop down offers presets:

    a. Custom – Allows any frame size. Best for computer presentations.
    b. NTSC DV – For DVD's. Media dictate size (i.e. DVD is always 720x480)
    c. HDTV – 1920x1080 or 1280x720. Blu-Ray.
    d. Others – Mostly film formats.

3. "Render Output"

    a. Name & Location – File name & which folder to render to
    b. Format – AVI (MOV) - Assembled sequentially in single file.

        Multiple files – JPG or TIF. Each frame is a separate file
            Necessary when using network rendering ("render farm")
            Also, useful for editing mistakes (in Photoshop)

        Codecs (Compression/Decompression)
            Compression – Each format has different mechanisms
            Uncompressed – Maximum quality (and maximum file size)
                If file is to be edited, best to use "Uncompressed".

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Walkthrough (or Flythrough) - Animated camera & target

Presentation length

Important to establish scope (total length required) early
Multiple scenes may require using a storyboard

If music is needed, track(s) length will likely determine total time

Consider breaking presentation into animated segments

Look for opportunities to utilize still images (reduces required rendering)

Setup “active time window” before creating keys

Rule of thumb – 30 frames per second

Keys can be created manually (auto key) or using a path (spline)

If manually (auto-key) - less (keys) is more

If a path, best to use “Path Constraint” controller

Transitions – Quick starts and stops or gentle motion (“Ease Curves”)

Render times – Critical to assure successful completion of animation

Some Thoughts:

1. Excessive geometry slows rendering times. Efficient modeling is key.
2. Consider opportunities for using texture maps in place of geometry
3. Reflections, especially in transparent materials render slowly
4. Avoid high quality rendering settings. Likely not required in animation
5. Frame size (number of pixels) of non-device dependent formats

If specific media required (i.e. DVD), then frame size is fixed.
Otherwise, digital media can be cheated:

For example:

640x480 (307,200 pixels) = 10 min a frame
600x400 (240,000 pixels) = 8 min a frame (20% reduction)