# Introduction to Tools Programming

3DS Max Basics

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Experience:

- Software developer & 3D Graphics researcher
- Unity3D, 3DS Max and Autocad Tools programmer at MMC.

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# Key learning objectives

At the end of this class, you will be able to:

- Learn the basic workflow of a 3D Editor like 3DS Max.
- Learn a new language for tool scripting. (MaxScript)
- Understand how important are the scripting tools to our video game development pipeline.
- Develop your own tools with MaxScript.
- Develop your own tools with C++ SDK API
- Use this tools within your custom engine to boost your workflow.

# Content

Content for today’s class:

- Why tool scripting
- State of the art on 3D Editors
- 3DS Max basic principles
- 3DS Max UI Interface
- 3DS Max modelling principles
- 3DS Max rendering.
- Exercise.

# Tools Programming, why?

What do we think when we think about video game development?

**Gameplay / graphics / AI / physics / vfx**

How do we stick all of this together?

# Tools Programming, why?

## TOOLS!

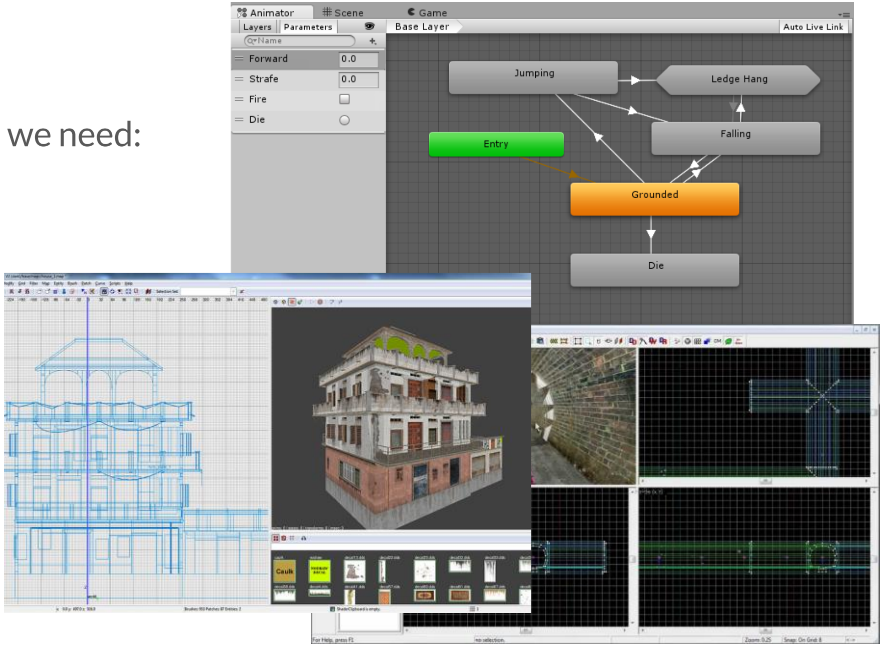
- Make everything in your engine more accessible.
- Save time and money.
- Improve our artists efficiency.
- Make our artists happy (ourselves too!)

Game development is **not difficult** but requires lot of **TIME**

# Tools

We have different types of tools, depending on what we need:

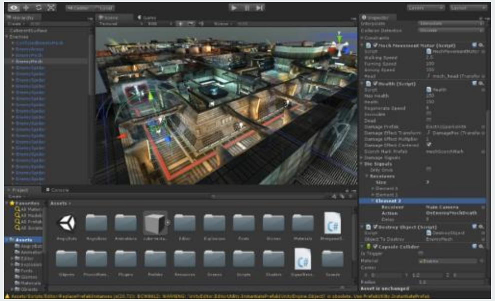
- Modelling tools
- Scene edition tools
- Animation tools
- Particle generation tools
- Sound edition tools
- Utility tools



Forward 0.0
Strafe 0.0
Fire □
Die ○

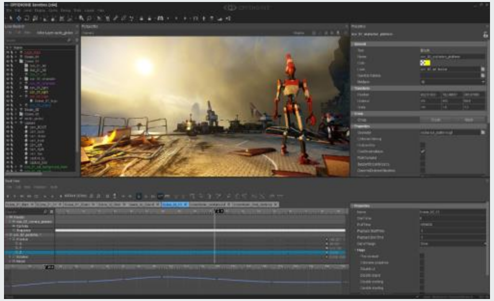
# State of the art

Engine editors: pack of a large number of the previous tools



Unity3D - 2005

Unreal Engine - 1998

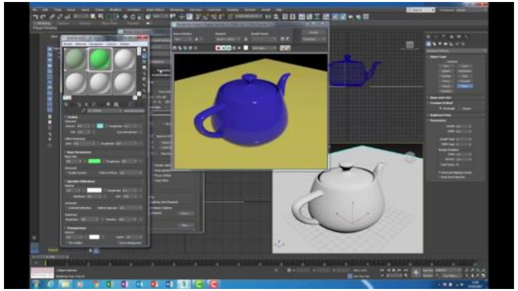


Cry Engine - 2005

And many others: lumberyard, frostbite,ogre…. All with their own tools.

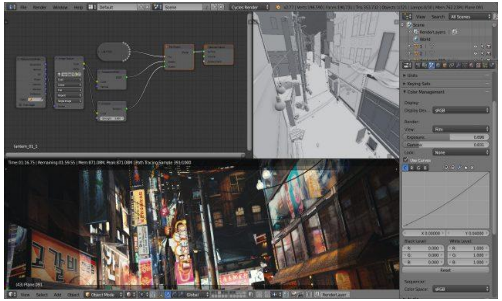
# State of the art

3D Editors: Used to create assets for video games.



3DS Max - 1990

Maya - 1998

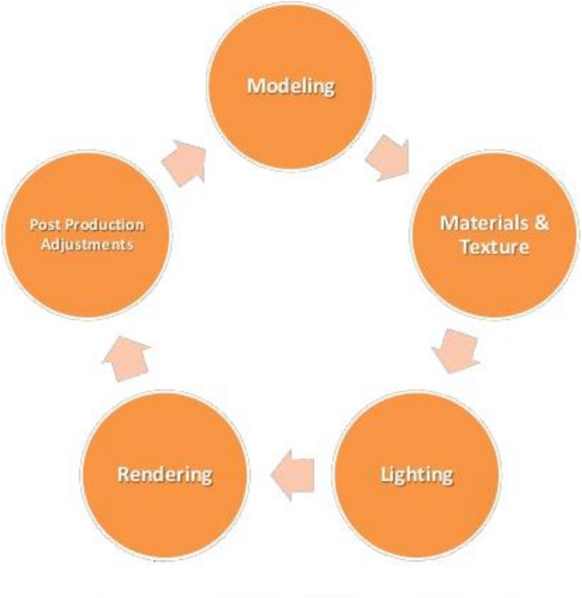


Blender - 1998

And many others: houdini, cinema4D, zbrush, mudbox....

# Artist overview

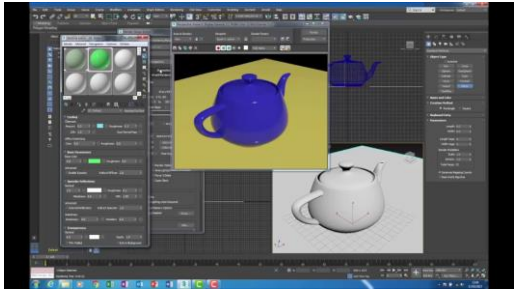
- ***Planning phase (HLDD & GDD)***
- Modelling phase
- Material & texturing
- Lighting
- Rendering
- Post processing & adjustments

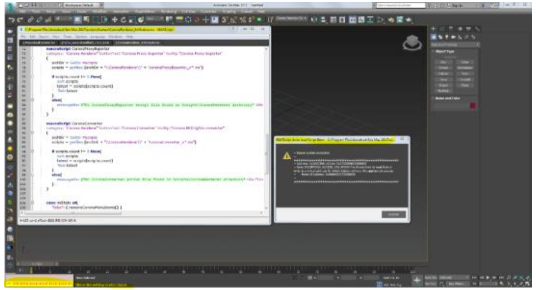


# 3DS Max: beginner introduction

- Not enough time to create our own scene editor (**Not our purpose**)
- We will use 3DS Max as our Scene Editor
- We link our data to the engine through the tools we will built!
- Tool scripting integrated within the platform.

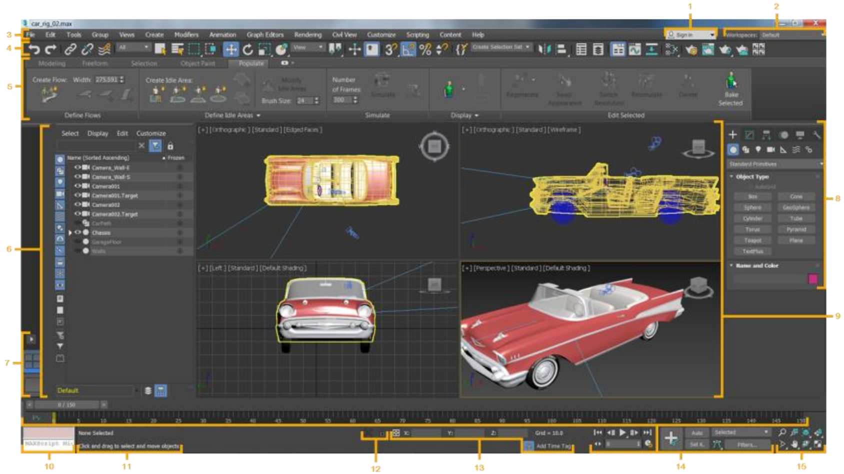
AUTODESK®
3DS MAX®





# 3DS Max: Basic UI Interface

- Viewport layout
- Main toolbar (shortcuts)
- Command panel & ribbon (edition)
- Quad Menu (tool shortcuts)
- Scene explorer

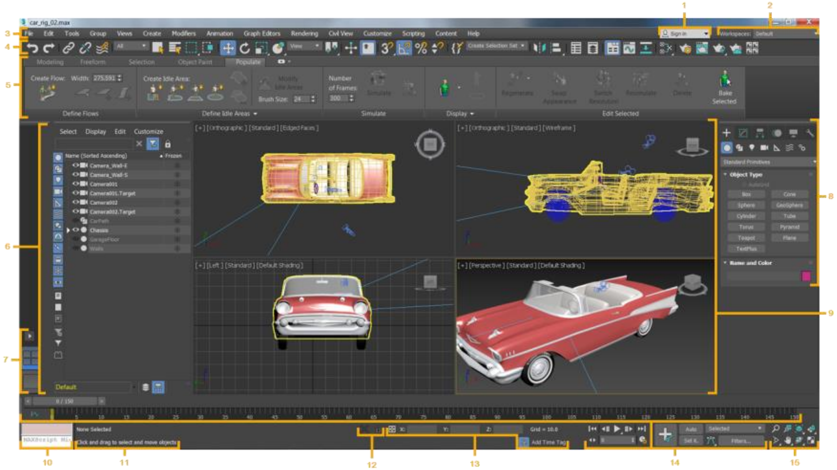


You can customize your UI to your needs.

# 3DS Max: Basic UI Interface 2

Viewport:

- Four side viewport: top, bottom, left, 3d
- We can setup different cameras (orto, persp..)
- Can be configured to different resolutions
- Display settings can be changed (quality…)
- Different rendering settings



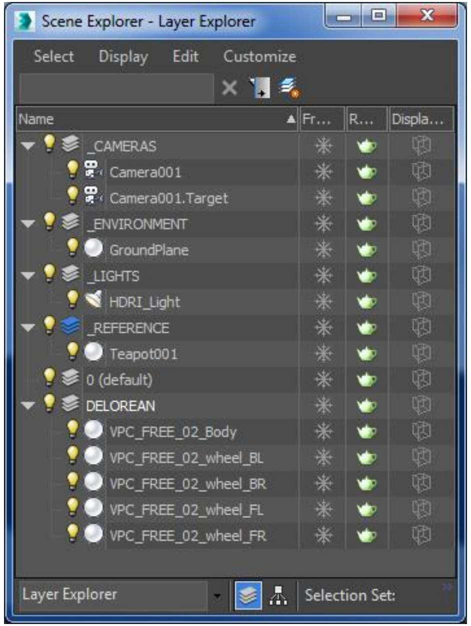
# 3DS Max: Basic UI Interface 3

Scene explorer

- Can order the scene by hierarchy or by layers
- Layers: very useful to set groups of objects by type (e.g colliders and meshes)

Toolbar explorer:

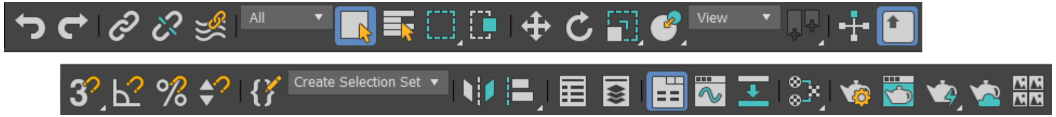
- Allows us to set transforms
- Edit selection tools.



_CAMERAS
Camera001
Camera001.Target
_ENVIRONMENT
GroundPlane
_LIGHTS
HDRI_Light
_REFERENCE
Teapot001
0 (default)
DELOREAN
VPC_FREE_02_Body
VPC_FREE_02_wheel_BL
VPC_FREE_02_wheel_BR
VPC_FREE_02_wheel_FL
VPC_FREE_02_wheel_FR

# 3DS Max: Basic UI Interface 4

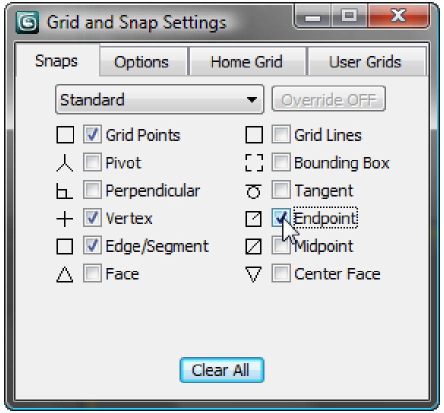
The main toolbar panel:



- It allow us to work with quick access actions
  - Link tools
  - Space warps (used for force field effects)
  - Selection tools
  - Transformation tools
  - Coordinate system tools
  - Snapping tools
  - Editor windows
  - Rendering setup
  - ....

# 3DS Max: Snaps

- Cursor sticks to desired positions given a configuration settings
- Allows us to place geometry on exact places
  - We can snap to grid points, very useful when we want to place objects symmetrically in the scene.
  - Other snapping settings might help us to place geometry into Vertices, pivots and other positions.
- Snap settings also allow us to modify our viewport grid sizes



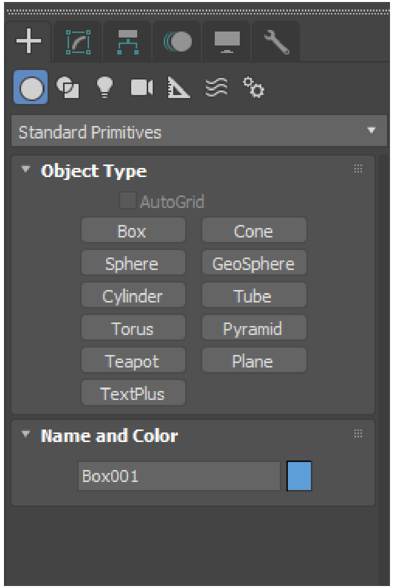
Standard

☑ Grid Points — □ Grid Lines
□ Pivot — □ Bounding Box
□ Perpendicular — □ Tangent
☑ Vertex — ☑ Endpoint
☑ Edge/Segment — □ Midpoint
□ Face — □ Center Face

# 3DS Max: Basic UI Interface 5

Command panel: Allows us to create, modify, transform and modify custom properties of the selected objects.

- Create: create any type of geometry or object (see next slide)
- Modify: Allows us to edit the parameters of the selected modifier.
  - Edit poly and edit mesh very useful, use one or another depending on the situation.
  - Edit poly: works only on quads
  - Edit mesh: works only with triangles



Standard Primitives

Object Type

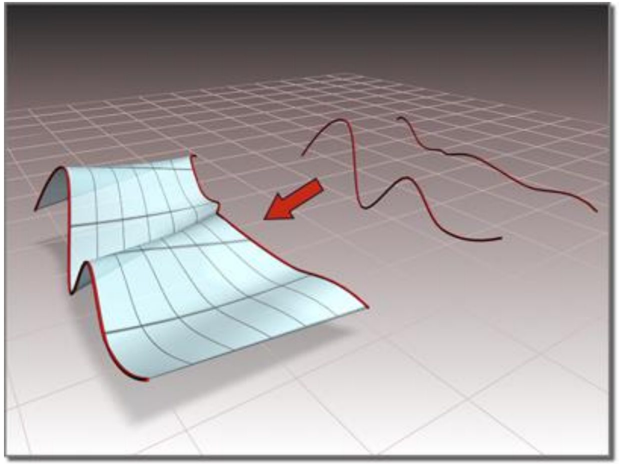
□ AutoGrid

Name and Color

Box001

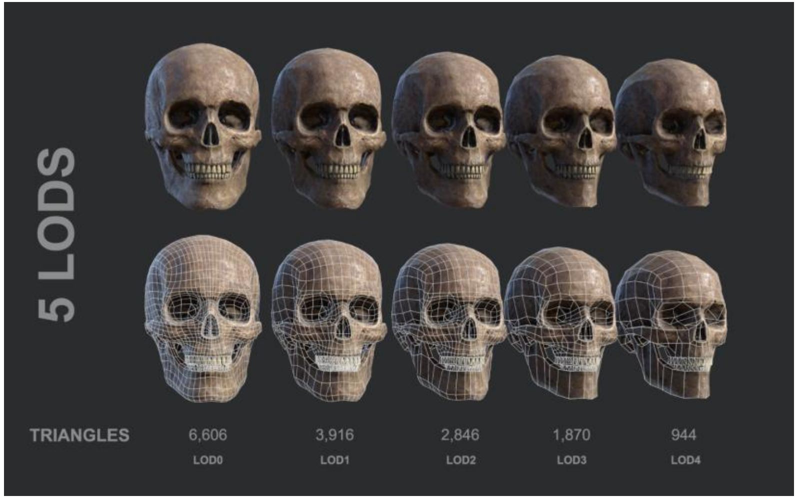
# 3DS Max: Creating and editing geometry

- Standard primitives
- Extended primitives
- Compounds
- Particles
- Nurbs
- Helpers
- ...



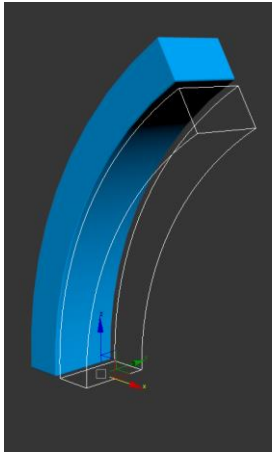
# 3DS Max: High poly vs Low poly

- Depending on the asset we will work on high Poly models, specially in softwares such as zbrush Or mudbox.
- When needed, the given asset needs to have his Vertices number reduced.
- Many different ways to reduce polygons, including the optimize modifier or manually break down the polygons.
- Used to bake normal maps on high poly and used it then on low poly.



# 3DS Max: Modifiers

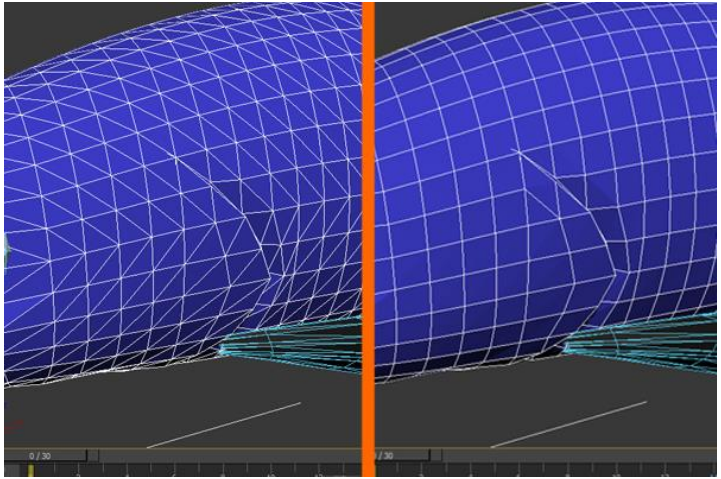
- Elements that allow us to modify the geometry of meshes and its properties.
- Can be applied in stacks (more than one at once).
- The order of object modifiers will change it's behaviour.
- Very useful depending on the situation.
- Examples:
  - Bend, TurboSmooth, Noise, Optimize….



# 3DS Max: Modifiers

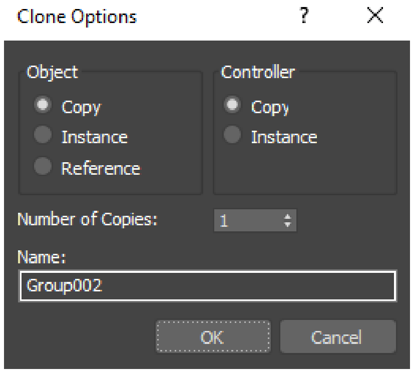
There are two important modifiers

- Editable poly: Works with quads, easy to work with for artists, no problems on uv mapping and topology settings.
- Editable mesh: works with triangles, intended to be used as thelast step on modelling, as it frees up memory.



# 3DS Max: Copy/instance/reference

- Objects can be duplicated in three different ways
  - Copies: an exact independent duplicated object from the one selected
  - Instance: creates an  exact duplication of the current selected object, and modifying this new object is the same as modifying the original one
  - Reference: it has the same behavior like an instance, but in this case, applying for example a new modifier to the referenced object will change be only applied to this reference and not the original object



Clone Options

Object
● Copy
○ Instance
○ Reference

Controller
● Copy
○ Instance

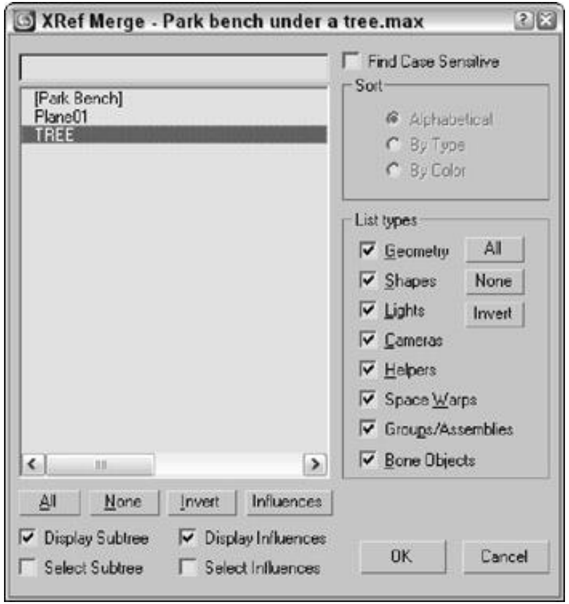
Number of Copies: 1

Name: Group002

- You can also duplicate objets in arrays!

# 3DS Max: Prefabs [xrefs]

- Work as external referenced objects.
- We will use them to place prefabs in our scene.
- Any change on the original xref will be reflected in the scene reference to that xref.
- Very useful when working as a team.



XRef Merge - Park bench under a tree.max

[Park Bench]
Plane01
TREE

□ Find Case Sensitive

Sort
● Alphabetical
○ By Type
○ By Color

List types
☑ Geometry
☑ Shapes
☑ Lights
☑ Cameras
☑ Helpers
☑ Space Warps
☑ Groups/Assemblies
☑ Bone Objects

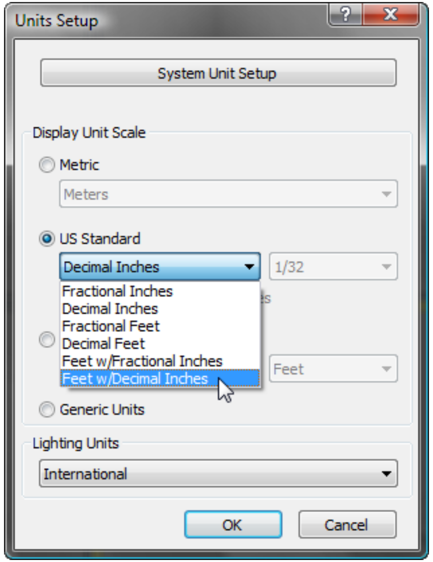
☑ Display Subtree
□ Select Subtree
☑ Display Influences
□ Select Influences

# 3DS Max: Units

- Very important to set our units before starting to work in 3DS Max.
- There are two types of units in 3DS Max
  - Internal system unit: The one that will be used by the software itself To do the calculus.
  - The display unit: The unit that will be shown in the interface.

We will work in **meters!**

Note: Units mismatch between files may lead to wrong scale on our assets



○ Metric
Meters
● US Standard
Decimal Inches
1/32

○ Generic Units

Lighting Units
International

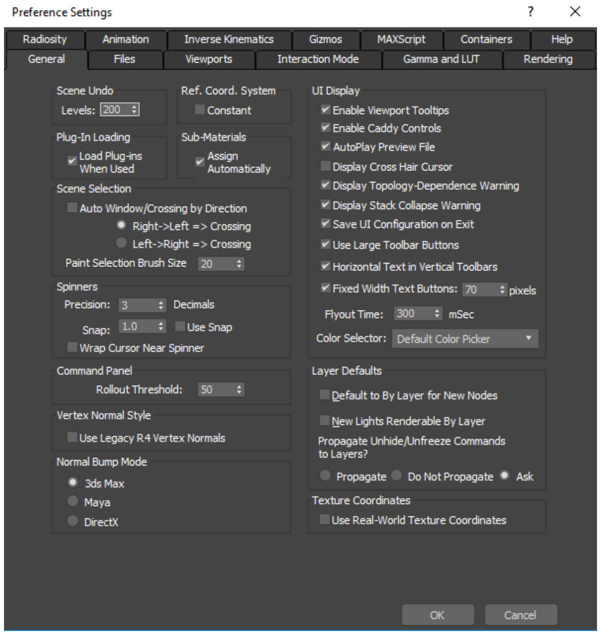
# 3DS Max: Preparing our scene

Before continuing, prepare your 3Dsmax preferences!

- Autosave always enabled, with incremental saving
- Undo settings. At least 200 backup actions
- Be sure that the auto-backup option is checked,

  Max crashes a lot!
- Remember to properly set the units! Different scenes

  With different units may lead to undesired behavior.



Scene Undo

Levels: 200

Ref. Coord. System

□ Constant

Plug-In Loading

☑ Load Plug-ins When Used

Sub-Materials

☑ Assign Automatically

Scene Selection

□ Auto Window/Crossing by Direction

● Right->Left => Crossing

○ Left->Right => Crossing

Paint Selection Brush Size 20

Spinners

Precision: 3 Decimals

Snap: 1.0 □ Use Snap

□ Wrap Cursor Near Spinner

Command Panel

Rollout Threshold: 50

Vertex Normal Style

□ Use Legacy R4 Vertex Normals

Normal Bump Mode

● 3ds Max

○ Maya

○ DirectX

UI Display

☑ Enable Viewport Tooltips

☑ Enable Caddy Controls

☑ AutoPlay Preview File

□ Display Cross Hair Cursor

☑ Display Topology-Dependence Warning

☑ Display Stack Collapse Warning

☑ Save UI Configuration on Exit

☑ Use Large Toolbar Buttons

☑ Horizontal Text in Vertical Toolbars

☑ Fixed Width Text Buttons: 70 pixels

Flyout Time: 300 mSec

Color Selector: Default Color Picker

Layer Defaults

□ Default to By Layer for New Nodes

□ New Lights Renderable By Layer

Propagate Unhide/Unfreeze Commands to Layers?

○ Propagate ○ Do Not Propagate ● Ask

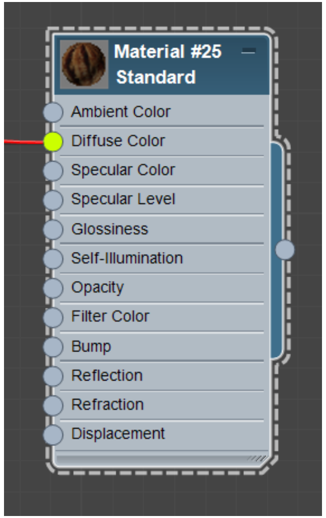
Texture Coordinates

□ Use Real-World Texture Coordinates

# 3DS Max: Materials

- Materials: Sets the parameters to be applied to a surface
  This parameters determine how this surface will react to light.
  - Use textures for each channel
  - Same object, different materials (multi/sub-obj)
  - Each face needs a material id to be set.

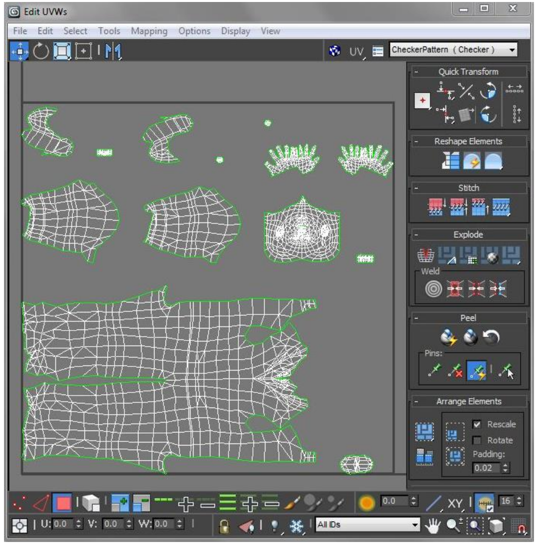
**Max does not support PBR (yet)!**



# 3DS Max: UV Mapping

- We need to project our 2d texture into our 3d model.
- We use this 2D space called UV mapping to do this
- We cannot directly apply the texture into this coordinates
- We need to unwrap the uvs as an initial step.
- Many different ways of unwrapping the uvs!

TIP: Very useful to use the checker texture



CheckerPattern ( Checker )

☑ Rescale

□ Rotate

Padding: 0.02

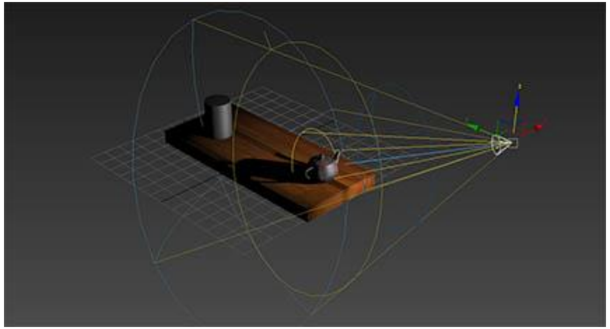
U: 0.0 V: 0.0 W: 0.0

All IDs

# 3DS Max: Lighting

Lighting: This is what makes the hard work, makes everything look better than it is when rendered.

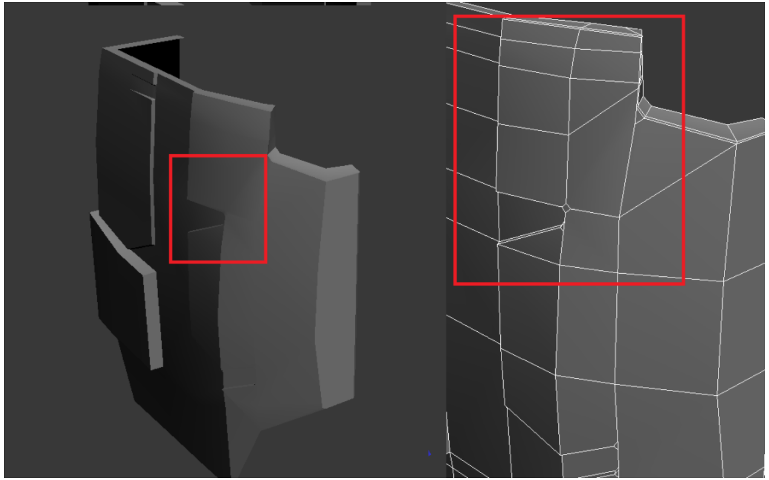
- We need to place lights in our scene to control lighting.
  There are few types available in max:
  - Directional lights (target)
  - Omni lights (target)
  - Spot lights (target)
  - Ambient lights



There are three types available in max: photometric, standard and Arnold, we will stick to standard ones

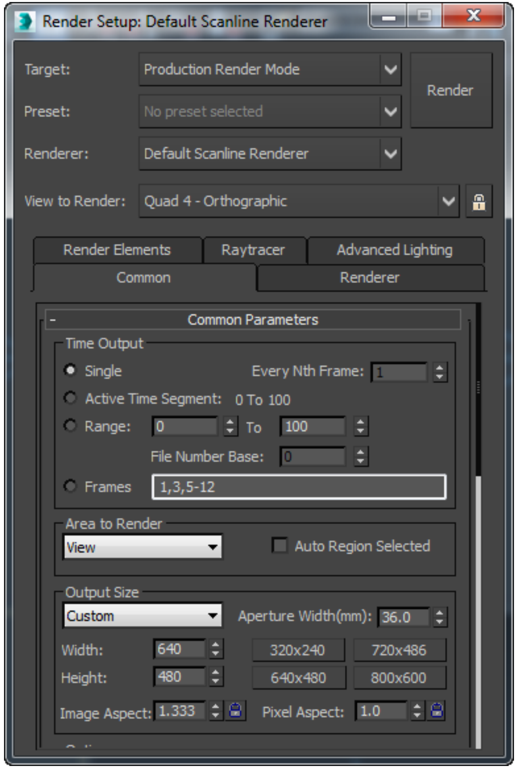
# 3DS Max: smoothing groups

- 3ds Max uses Smoothing Groups to create hard/soft edges between polygons.
- It splits and combines the normals between edges.
- It's important, or our model won't be properly shaded in the engine. We will calculate the normals on our exporter tool!



# 3DS Max: Rendering

- Many different renderers
- Many different techniques
- Many different settings and different materials depending on the technique that is going to be used



Render Setup: Default Scanline Renderer

Target: Production Render Mode

Preset: No preset selected

Renderer: Default Scanline Renderer

View to Render: Quad 4 - Orthographic

Common Parameters

Time Output

● Single    Every Nth Frame: 1

○ Active Time Segment: 0 To 100

○ Range: 0 To 100

File Number Base: 0

○ Frames 1,3,5-12

Area to Render

View    □ Auto Region Selected

Output Size

Custom    Aperture Width(mm): 36.0

Width: 640

Height: 480

Image Aspect: 1.333    Pixel Aspect: 1.0

# Exercise:

Try to create your own mesh!

- Model a simple maze plane based and texture it!
- Model your own whitebox map, quake/doom style and texture it
- Model a mail post and texture it!

Shortcuts: https://en.wikibooks.org/wiki/Autodesk_3ds_Max/Shortcuts

# Exercise: Whitebox [DOOM]

- Create a basic, closed whitebox
    - We can create the classical corridor, or maze based scene
    - In this case, it's very useful to work with the fps view when checking our scene.

# Exercise: MailPost

- Create a basic mailpost
  - Load the provided image

# Resources for 3DS Max Basics

- https://area.autodesk.com/all/tutorials/3ds-max/
- https://en.wikibooks.org/wiki/Autodesk_3ds_Max/Shortcuts
- https://3dtotal.com/tutorials/3ds-max