

Tools Programming

Introduction to 3DSMax

Class 1

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Experience:

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

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

- Learn the basic workflow of a 3D Editor like 3DS Max.
- Understand how important are the scripting tools to our video game development pipeline.
- Learn a new language for tool scripting. (MaxScript/Python)
- Develop your own tools for 3DSMax with MaxScript/Python.
- Develop an asset Import/Export pipeline between a 3D Modelling program and your custom engine.
- Build your own tools within a custom engine to boost your development speed.

Content (10 Weeks)

- Introduction to 3DSMax
- Introduction to tools scripting [Maxscript]
- Tools scripting 1[Maxscript / Python]
- Tools scripting 2[Maxscript / Python]
- Tools programming 3DSMax [SDK C++]
- Asset integration pipeline 1 [MaxScript/C++]
- Asset integration pipeline 2 [MaxScript/C++]
- Asset integration pipeline 3 [MaxScript/C++]
- Custom engine Tools [MaxScript/C++]
- Final deliver [MaxScript/Python/C++]

Content

Content for today's class:

- Why tools 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?

Game design / Graphics / AI / Physics / VFX

How do we stick all of this together?



Tools Programming, why?

TOOLS!

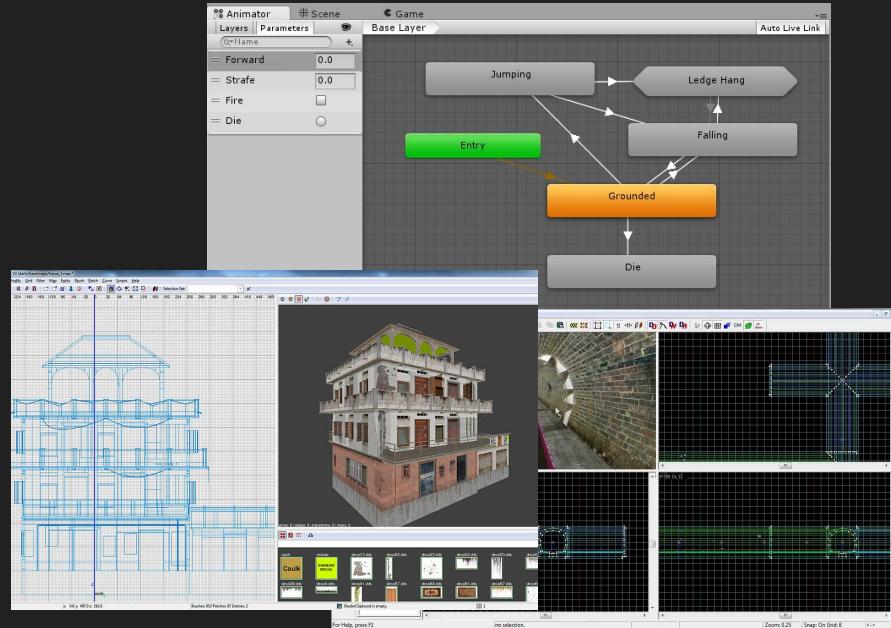
- Make everything in your engine more accessible.
- Save time and money.
- Improve our artists efficiency.
- Make our artists happy (ourselves too!)

Game development is **NOT DIFFICULT** but requires lot of **TIME**

Types of Tools

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

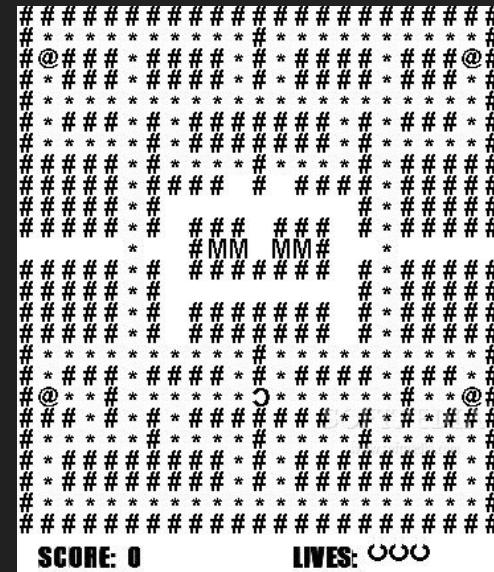
- Modelling tools
- Design tools
- Scene edition tools
- Animation tools
- Particle generation tools
- Sound edition tools
- Utility tools



Tools background

Early days:

- No dedicated videogame tools
- Videogames were mainly made by programmers
- Game/Level design was almost non existent
- Levels were hardcoded in the game's code.



TODAY

State of the art

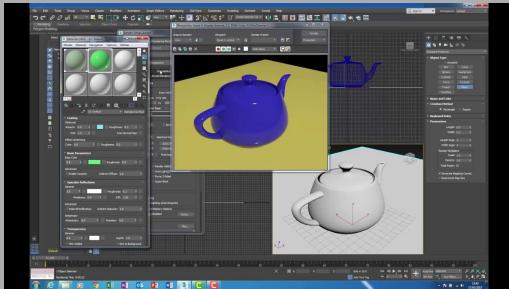
Engine editors: pack of a large number of the tools mentioned



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

State of the art

Modelling Editors: Used to create assets for video games.



3DS Max - 1990



Maya - 1998



Blender - 1998

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

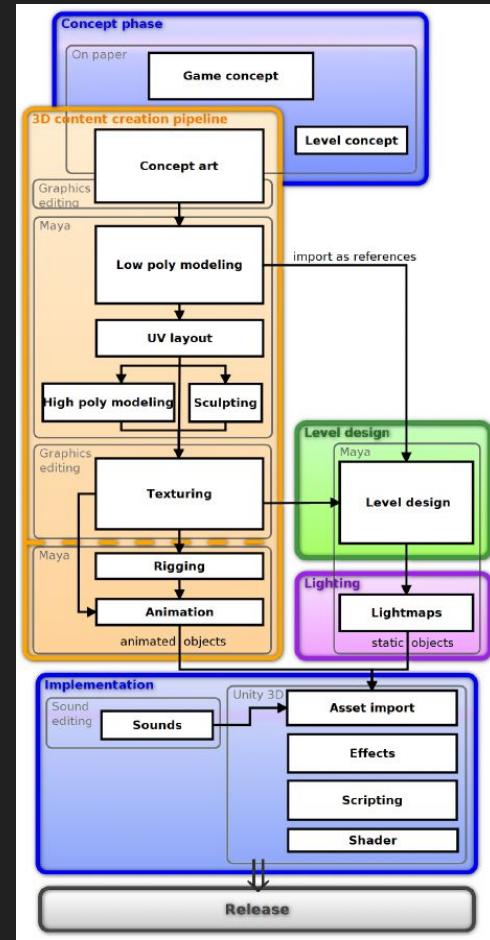
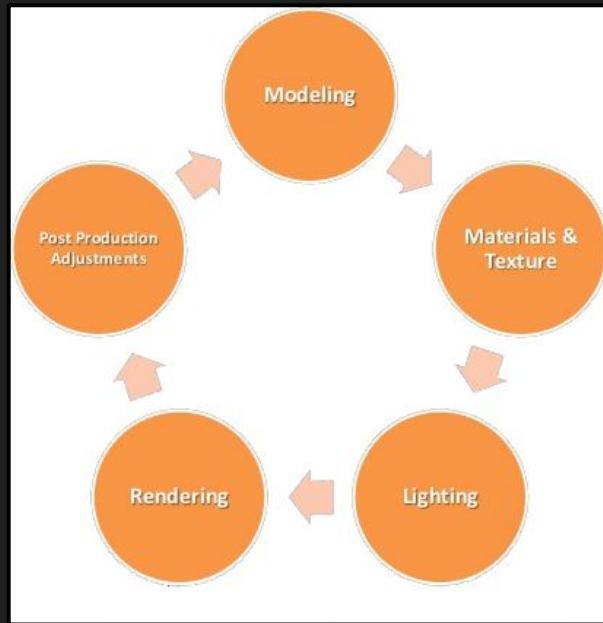
Artist overview

Traditional Artist pipeline

- Concept Art
- Modelling phase
- Material & texturing
- Lighting
- Rendering
- Post processing & adjustments

Videogame Artist pipeline

- Planning phase (HLDD & GDD)
- Concept Art
- Modelling phase
- Material & texturing
- Asset Import/Export
- Lighting, Lightmapping
- Post processing & adjustments



Planning phase

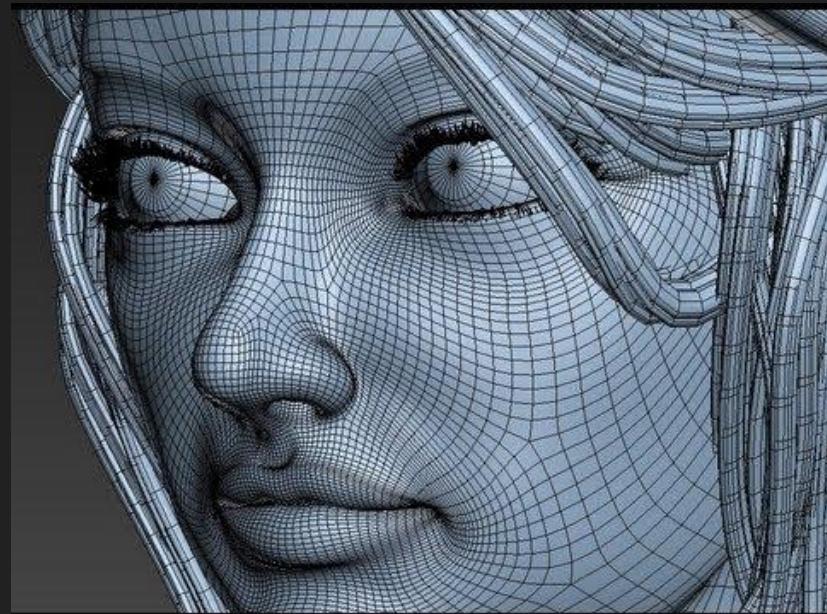
Concept art: tell me about the game with an image



GDC: <https://www.youtube.com/watch?v=CYbYvlmd7Bw&t=2714s>

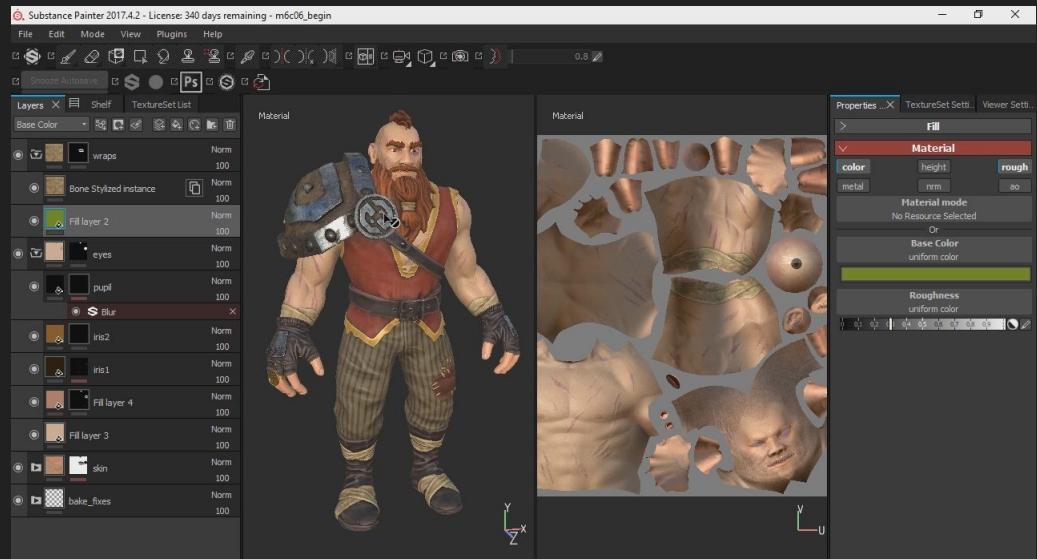
Modelling phase

Modelling vs sculpting

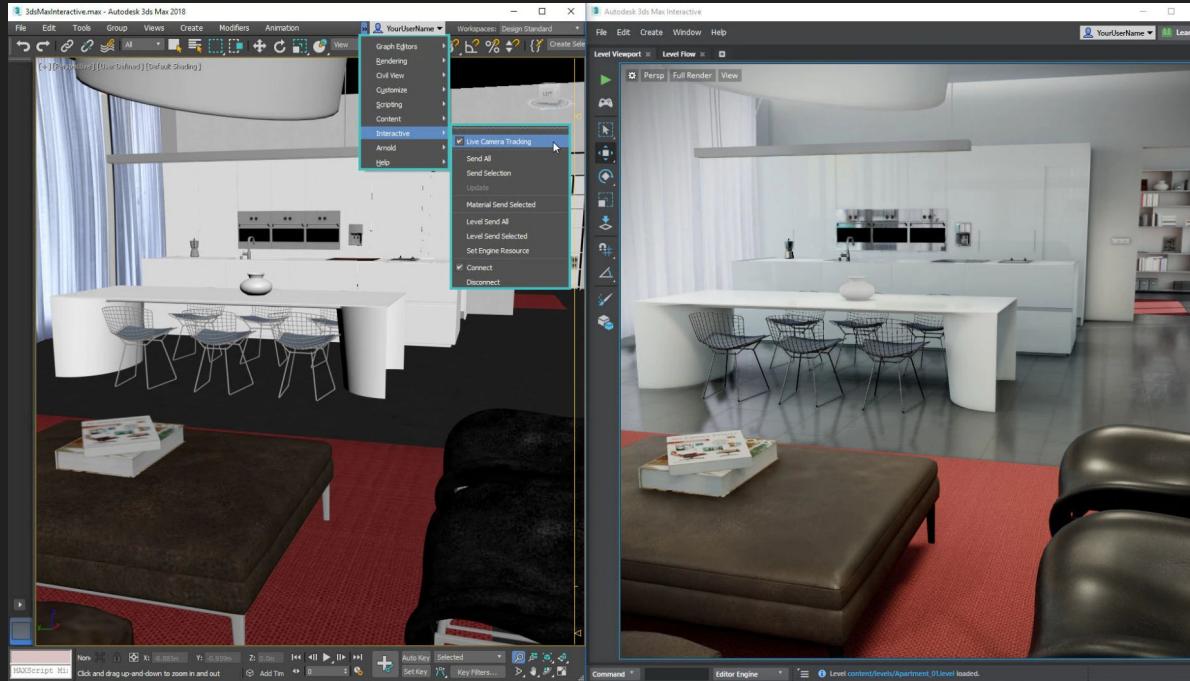


UV mapping & texturing

- Many different solutions
 - 3DSMax, maya... and texture editors such as photoshop
 - Painting softwares: mudbox, substance painter.
 - Some editors are more animation & cinema oriented, e.g maya, cinema4d...



Lighting, rendering and PostFX

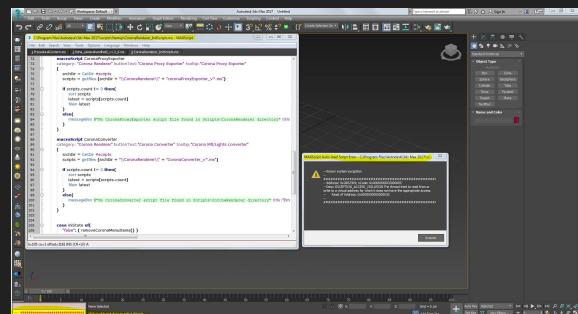


Advice

“Communication between artists and programmers is the key to success”

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.



Installation

- Access Autodesk 3DSMax webpage:
 - Select version: 3DSMax 2020
 - Select Student license
 - Classic theme recommended

Link: <https://www.autodesk.com/education/free-software/3ds-max>

3DS Max: Basic UI Interface

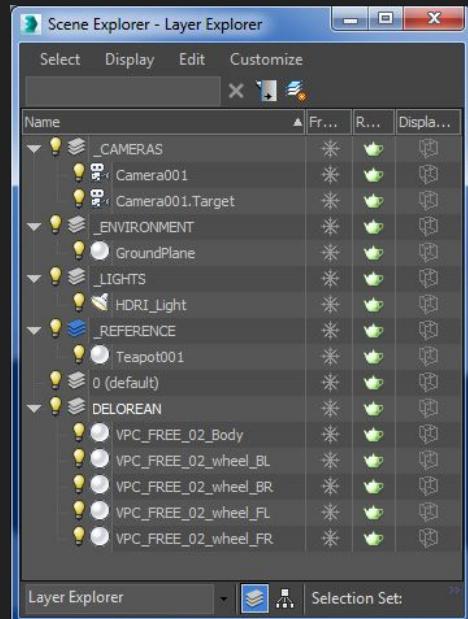
- Viewport layout
 - Main toolbar (shortcuts)
 - Command panel & ribbon (edition)
 - Quad Menu (tool shortcuts)
 - Scene explorer



You can customize your UI to your needs. (workspaces)

3DS Max: Basic UI Interface 1

- Main Menu:
 - Contains main functionality tabs
 - All menu present in 3DSMax
- 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)
- Ribbon Menu
 - Mainly focused on modelling functionality



3DS Max: Basic UI Interface 2

The main toolbar panel:

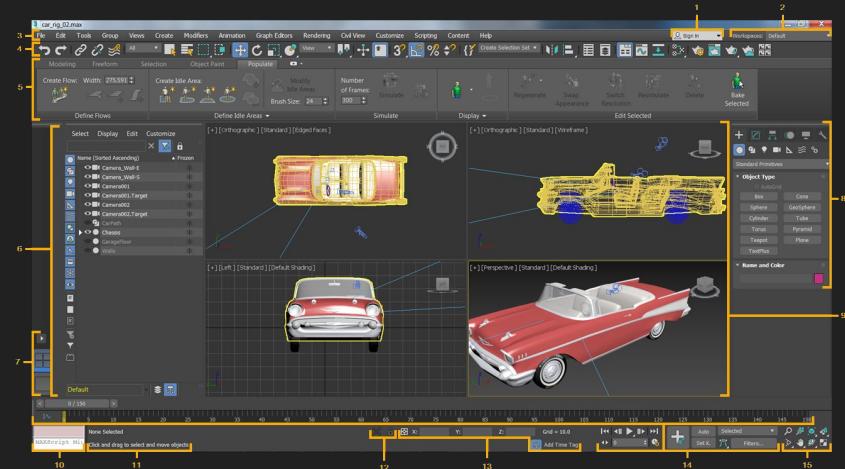


- It allow us to work with quick access actions
 - Link tools
 - Space warps (used for force field effects)
 - Selection tools
 - Transformation tools
 - Coordinate system tools
 - Snapping tools
 - Editor windows
 - Rendering setup
 -

3DS Max: Basic UI Interface 3

Viewport:

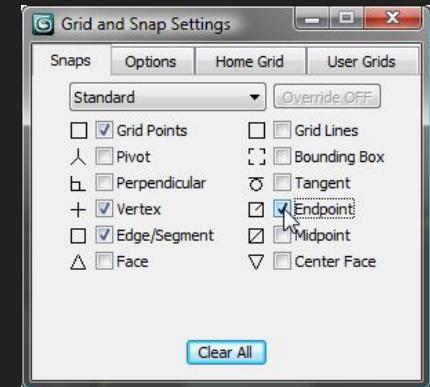
- Four side viewport: top, bottom, left, 3d
- We can setup different cameras (ortho, persp..)
- Can be configured to different resolutions
- Display settings can be changed (quality...)
- Different rendering settings



Viewport Layouts: The layout of the viewport can be configured under the layout panel.

3DS Max: Snaps

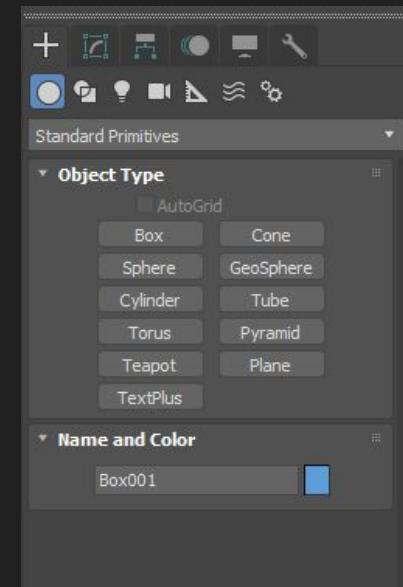
- Cursor sticks to desired positions given a configuration settings
- Allows us to place geometry on exact places
 - We can snap to grid points, very useful when we want to place objects symmetrically in the scene.
 - Other snapping settings might help us to place geometry into vertices, pivots and other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



3DS Max: Basic UI Interface 4

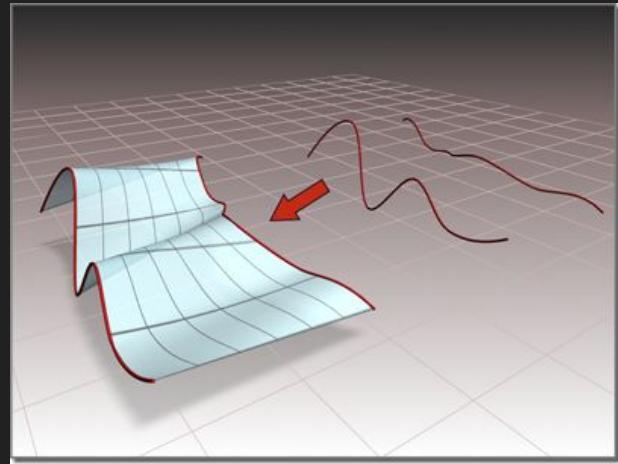
Command panel: Allows us to create, modify, transform and modify custom properties of the selected objects.

- 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



3DS Max: Creating and editing geometry

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

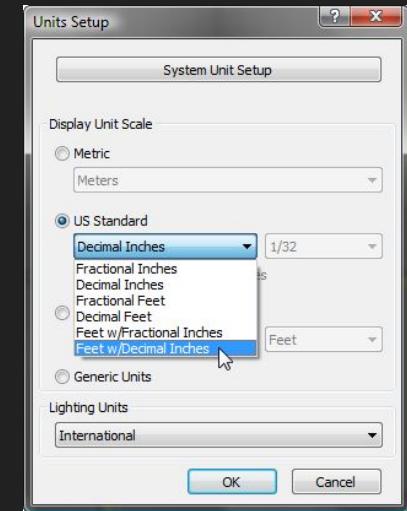


3DS Max: Units

- 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.

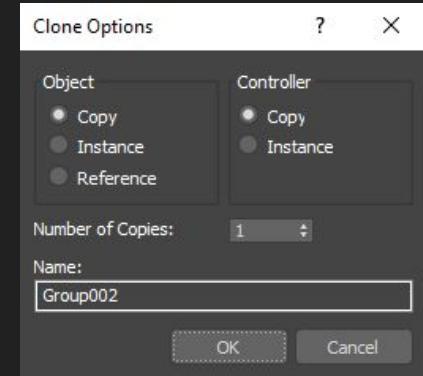
We will work in **meters!**

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



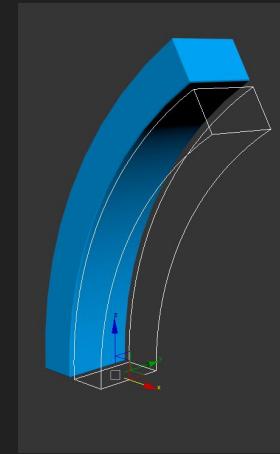
3DS Max: Copy/instance/reference

- 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
- You can also duplicate objs in arrays!



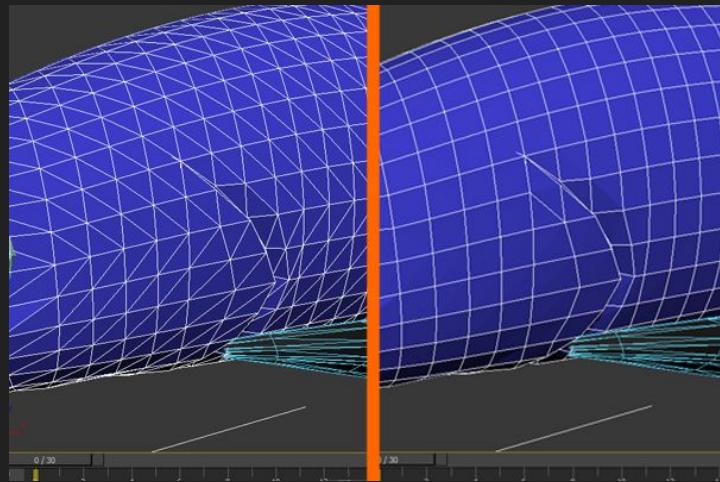
3DS Max: Modifiers

- 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....



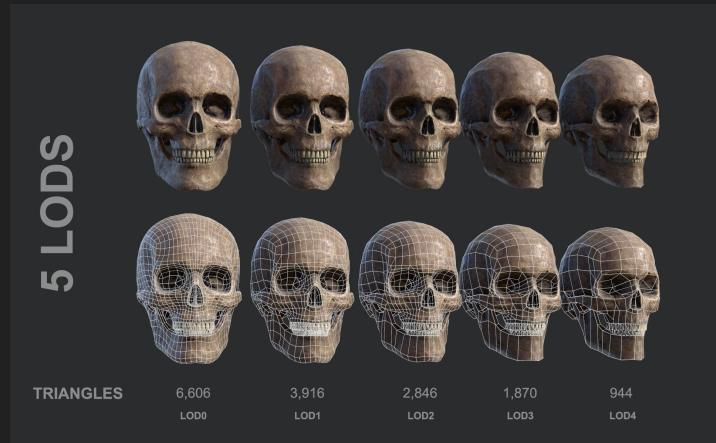
3DS Max: Modifiers

- 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 the last step on modelling, as it frees up memory.



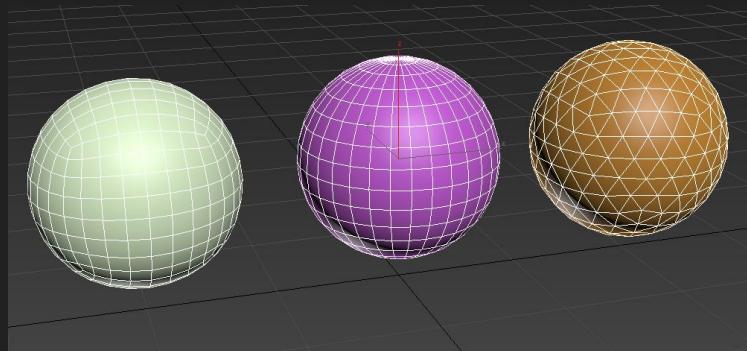
3DS Max: High poly vs Low poly

- 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.



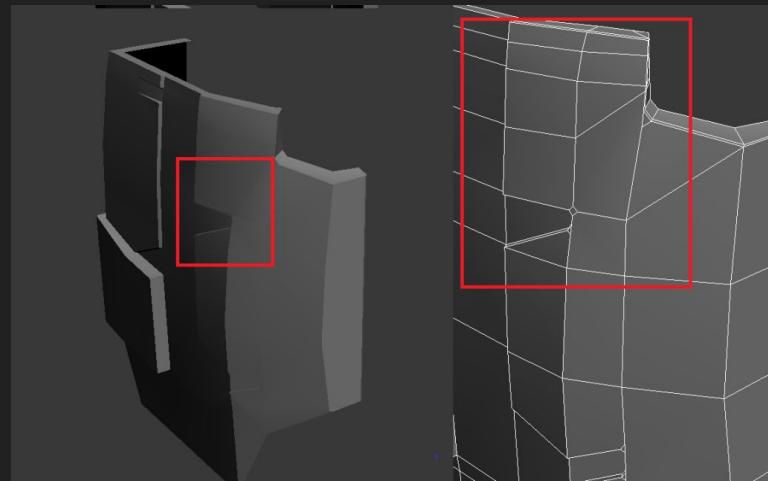
3DS Max: Geometry edition

- Primitives are only handful in a limited number of cases, in other we want to edit our geometry.
- Three types of geometry edition:
 - Editable Mesh: Works with triangles only
 - Editable Poly: Works with any number of vertices per face (quads normally)
 - Surface Patch: Smooth flow surface (bezier controller)



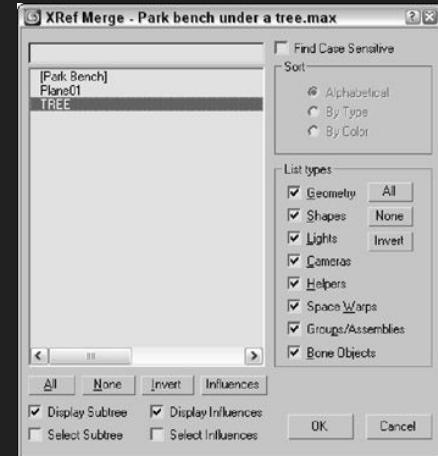
3DS Max: smoothing groups

- 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: Prefabs [xrefs]

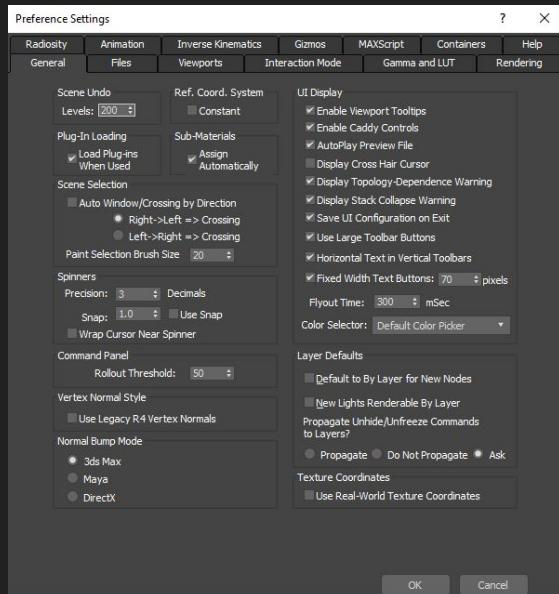
- Work as external referenced objects.
- We will use them to place prefabs in our scene.
- Any change on the original xref will be reflected in the scene reference to that xref.
- Very useful when working as a team.



3DS Max: Preparing our scene

Before continuing, prepare your 3Dsmax preferences!

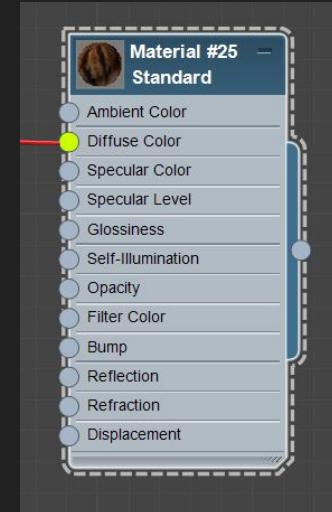
- Autosave always enabled, with incremental saving
- Undo settings. **At least 200** backup actions
- Be sure that the **auto-backup** option is checked,
Max crashes a lot!
- Remember to properly set the units! Different scenes
With different units may lead to undesired behavior.



3DS Max: Materials

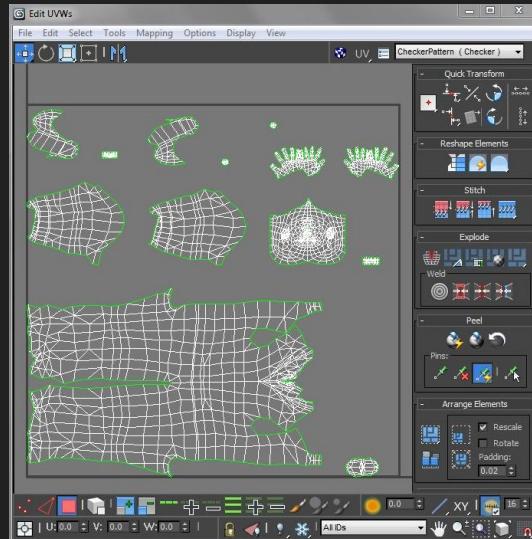
- Materials: Sets the parameters to be applied to a surface
These parameters determine how this surface will react to light.
 - Use textures for each channel
 - Same object, different materials (multi/sub-obj)
 - Each face needs a material id to be set.

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



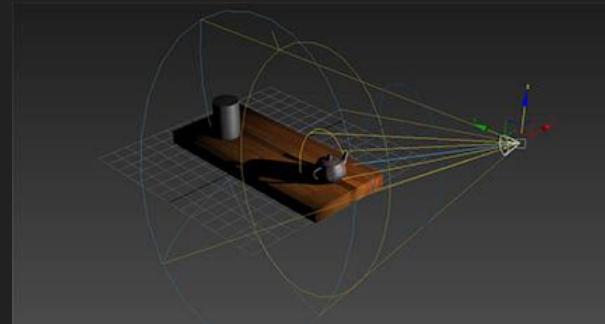
3DS Max: Lighting

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:

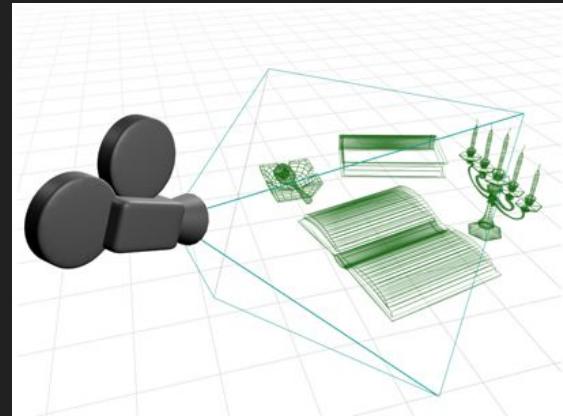
- Directional lights (target)
- Omni lights (target)
- Spot lights (target)
- Ambient lights



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

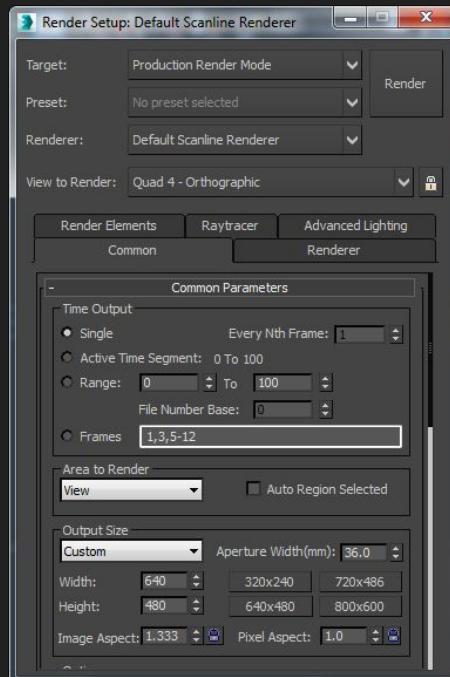
Cameras

- Camera: presenting an scene from a given point of view
 - Focal length
 - Field of view
 - Near/Far range
 - Projection
- Three types of cameras
 - Physical Camera: targets an object, photorealistic
 - Target Camera: targets an object as focus
 - Free Camera: has a given view direction



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



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
 - Model de mailbox with the techniques given at class.



Resources for 3DS Max Basics

- <https://area.autodesk.com/all/tutorials/3ds-max/>
- <https://area.autodesk.com/tutorials/series/getting-started-in-3ds-max-2018/>
- https://en.wikibooks.org/wiki/Autodesk_3ds_Max/Shortcuts
- <https://3dtotal.com/tutorials/3ds-max>
- <https://www.cgpeers.com/login.php>

Extra tessellation

- <https://techreport.com/review/21404/crysis-2-tessellation-too-much-of-a-good-thing/>