Blender Resources and Beginner's Guide

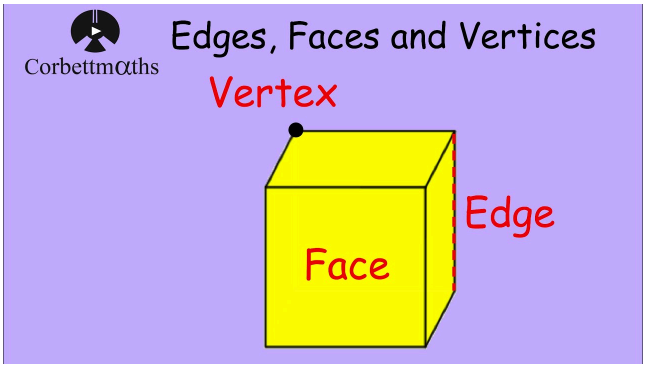
Key Concepts & Basic Definitions

What Is Blender?

- Blender is a free, open-source computer graphics software
- Blender is not just a 3D modeling tool but can also be used in isolation to create
    - Animations
    - 2D images and textures
    - 2D drawings and animation through Grease Pencil
    - VFX
    - Detailed 3D character sculpts
- Blender is a useful alternative to paid software and can help kickstart your journey into Game Art
    - Lots of online resources and an active, helpful community
    - Provides a multitude of avenues through which to explore game art without being constrained by cost
- Disadvantages worth noting
    - High-quality renders using the Cycles render engine require good GPUs and may crash your device otherwise
        - Big projects are RAM-heavy and will put stress on your device
    - Blender is a very versatile software and attempts to target everything - a jack of all trades is a master of none
        - But often better than a master of one!

Modeling

- 3D modeling is the process of creating 3D objects through the manipulation of vertices, faces, and edges
- Vertices, faces, edges

- 

    - In Blender, you can manipulate the specific vertices, edges, and faces of an object through Blender's edit mode
- Manipulating vertices/faces/edges will often result in different geometry
- Blender provides the user with other ways in which to manipulate an object's geometry
    - Geometry Nodes are a node-based system of changing an object's geometry and can be incredibly useful when creating procedural deformations in your object
    - Modifiers can also be used to create procedural changes in your object's geometry
        - Modifiers are unique in that they don't change the topology of your object only the way the object is displayed
            - By applying modifiers you can commit your changes and change the topology of your object

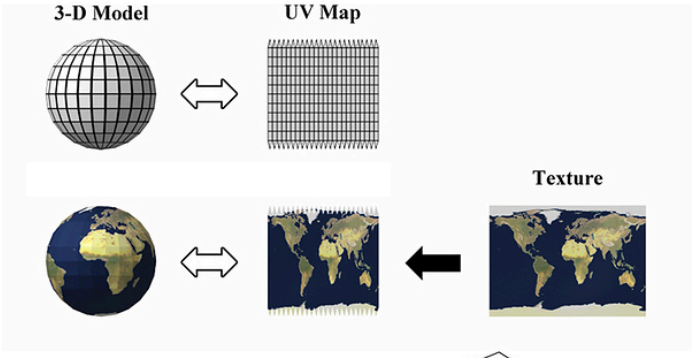
Sculpting

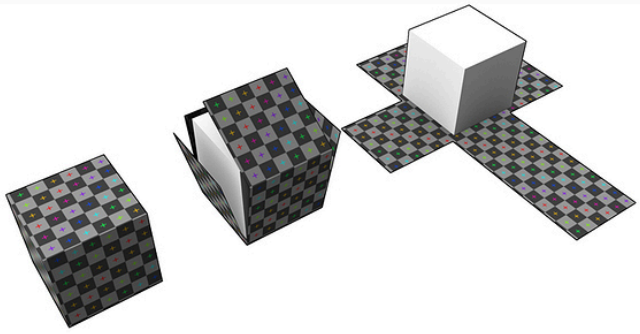
- 3D sculpting, unlike 3D modeling, is a more intuitive way of creating organic, lifelike objects.
    - While 3D modeling provides you with the precision you need to model hard-surface, inanimate objects, sculpting gives you the freedom and control to create the variation necessary for characters and other organic objects
- 3D sculpting is executed through brushes that manipulate the geometry of your object
    - The inflate brush can expand the object's faces
    - The pinch brush can be used to pinch vertices together
    - The grab brush can be used to move vertices
- When 3D sculpting it is necessary to periodically add geometry (vertices, faces, edges) to your mesh to enable the addition of finer details
- Topology refers to the way you organize the vertices, edges, and faces of your 3D mesh

    - It affects the way your object looks and can also add stress to your processor if not properly optimized
- 3D sculpting will often result in unoptimized topology. This means that after you are done with your 3D sculpt you'll have to optimize how your vertices, edges, and faces are arranged
    - This refers to the process of retopology and can be time-consuming and taxing for beginners
    - It is a necessary step however to optimize your models for your games and/or animations

UVs

- UVs are 2D images that correspond to the geometry of your 3D mesh
- The process of UV mapping refers to the projection of these 2D images onto your mesh





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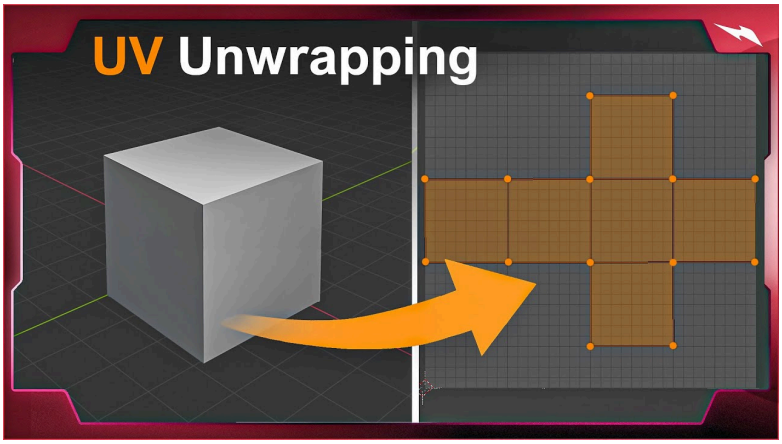
- UVs are essential for texturing your objects. A good UV map is foundational in securing high-quality texture painting
- Optimizing your topology is the first step in creating a good UV map
- UV unwrapping is the process of converting the vertices/faces/edges of your mesh into a 2D form

- 

Shading & Texturing

- Shading and texturing your objects can be done in a variety of ways
  - Blender's shader editor
    - Blender's shader editor is a node-based editing system similar to Unity's shader editor
    - Node-based shader editing can be an efficient way of texturing/shading your model procedurally.
    - This texturing method can be reused across the different 3D meshes in your project.
    - Blender's shader editor also supports the integration of photo-scanned PBR (physically-based rendering) textures to more realistically shade your objects
      - PBR materials are essentially a method of shading and rendering that provides an accurate representation of how different materials react with light
  - Texture painting
    - Blender also supports texture painting, the process of wrapping a 2D texture around a 3D object
    - In Blender, you can use brushes to paint your texture across your 3D model to achieve a more stylized look
    - Texture painting is somewhat less versatile than node-based texturing because it is highly dependent on the topology of an object
    - Painted textures can also be combined with Blender's node-based shader editor

Lighting

- Lighting in Blender is based on different simulated light types that each interact with your scene differently; in all of these light types you can change the wattage, color, transformation properties, and radius
    - Point light
        - Emits light from a small concentrated source
        - Useful for creating a rim light for your object
        - Can also be used for torches and other physical light sources
    - Spot light
        - Emits light in a conical shape that begins brighter and of a small radius before gradually decreasing in brightness and increasing in radius
        - Useful for creating stage lights and other lights that emit directionally from sources like flashlights or headlights
    - Area Light
        - Emits light from a wide source in a square shape
        - Useful for creating the majority of lighting for your scene
        - Can be used to light large segments of your object
    - Sun Light
        - Large, indiscriminate lighting type that will brighten almost the entirety of your scene
        - Used to change the ambiance of your scene and provide a foundation for the rest of your lighting set-up
- HDRIs (high dynamic range image)
    - A digital image used in 3D projects to light scenes based on an image
    - HDRIs are used to light a project realistically
        - Each pixel of an HDRI map is a 32-bit value allowing for a much more encompassing range of brightness than the standard 8-bits

Animation

- 3D animation, unlike 2D, Isn't executed by rendering an image for every frame of the animation
- 3D animation works through keyframes which essentially are used to define start and endpoints for an animation in your timeline
    - Used as anchor points for actions
- Simple 3D animations need nothing more than keyframes defining a first-state and second-state
    - Blender will procedurally fill in the space between them to create a transition between the states defined at each keyframe

- Complex 3D animation including 3D character animation will involve the use of rigs and armatures
    - Armatures are essentially a skeleton for your model and help you define the joints and bones of your mesh
    - Rigs are the weight assignments of these bones on different parts of your mesh and ultimately what you use to control the movement of your model

Rendering

- 3D rendering is the final step in the process of 3D visualization: animation or still
- 3D rendering takes all the information in your scene, inclusive of lighting and textures, and outputs it into a 2D image(s)
- A render engine is what computes the lighting and textures of a 3D project in a more photorealistic way
    - Ray-tracing renderers
        - Adjusting visuals based on calculations of lightrays and based on how the light reacts with the displacement and material of the object
    - Real-time renderers
        - Based on quick approximations of shadows and baked-in lighting to be more memory-saving than the ray-tracing alternative
        - Commonly found in the game industry
            - Unity is a real-time render engine
- Blender's ray-tracing render engine is Cycles
    - It is more heavy on your GPU/processor but can be used to achieve more photorealistic results
- Blender's real-time render engine is EEVEE
    - EEVEE has advanced greatly in recent Blender versions
    - To a great extent, can be utilized for near-photorealistic renders

Recommended YouTube Channels & Videos

For Complete Beginners

- Blender Donut Tutorial - Without a doubt the most important Blender beginner tutorial
    - Walks you through all the basics of Blender
    - Famous starter tutorial and recreated for every major release of Blender
- Blender 4.0 Beginners Tutorial Series - Informative and fun, will teach you things not in the donut tutorial
- Blender for Complete Beginners Tutorial Series

- Blender Tutorial - Creating a Stormy Ocean

Modeling

- Beginner Modelling Tutorial Blender
- 3D Cat - Blender Character Modeling for Beginners | Real-Time Tutorial
- Blender 3D - Create a 3D Isometric BEDROOM in 15 minutes | Beginner T…

Sculpting

- Sculpting in Blender: A Complete Beginner's Guide
- Blender Sculpting Tutorial for Beginners - Stylized Head Sculpt Blender Tut…
- Sculpting in Blender for Beginners (Full Course/Tutorial) #b3d

Texturing

- Blender Texturing for Beginners - Tutorial
- How PROS Texture: 3 Easy Methods! Blender 3D
- Introduction to Procedural Shader Nodes for Complete Beginners (Blender …
- Texture Painting for Beginners 🖌️ (Blender Tutorial)

Lighting

- Lighting for Beginners! 💡 (Blender Tutorial)
- Tutorial: Cinematic Lighting in Blender

Animation and Rigging

- Blender Game Animation Tutorial | Polygon Runway
- Animation for Beginners! (Blender Tutorial)
- Rigging for impatient people - Blender Tutorial

Grease Pencil

- Basic Blender Toon / Cel Shader Tutorial 2D Grease Pencil + 3D Modelling
- Blender 3D Grease Pencil Tutorial - Bakery Shop

Blender YouTube Channels

- https://www.youtube.com/@blenderguru
- https://www.youtube.com/@cgboost
- https://www.youtube.com/@SouthernShotty

- https://www.youtube.com/@RyanKingArt
- https://www.youtube.com/@TheDucky3D
- https://www.youtube.com/@cg_cookie
- https://www.youtube.com/@CGGeek

Recommended Websites

For 3D assets

- https://polyhaven.com/
  - Free 3D models, photo-scanned PBR textures, and HDRIs
- https://ambientcg.com/
  - Copyright-free textures
- https://www.cgtrader.com/
  - Paid and free collection of high-quality 3D models
- https://www.mixamo.com/#/
  - Free website to auto-rig and animate characters or use preset models

For References

- https://www.artstation.com/?sort_by=community&dimension=all
- https://www.pinterest.com/
- https://www.reddit.com/r/blender/

My Tutorial Video For Complete Beginners

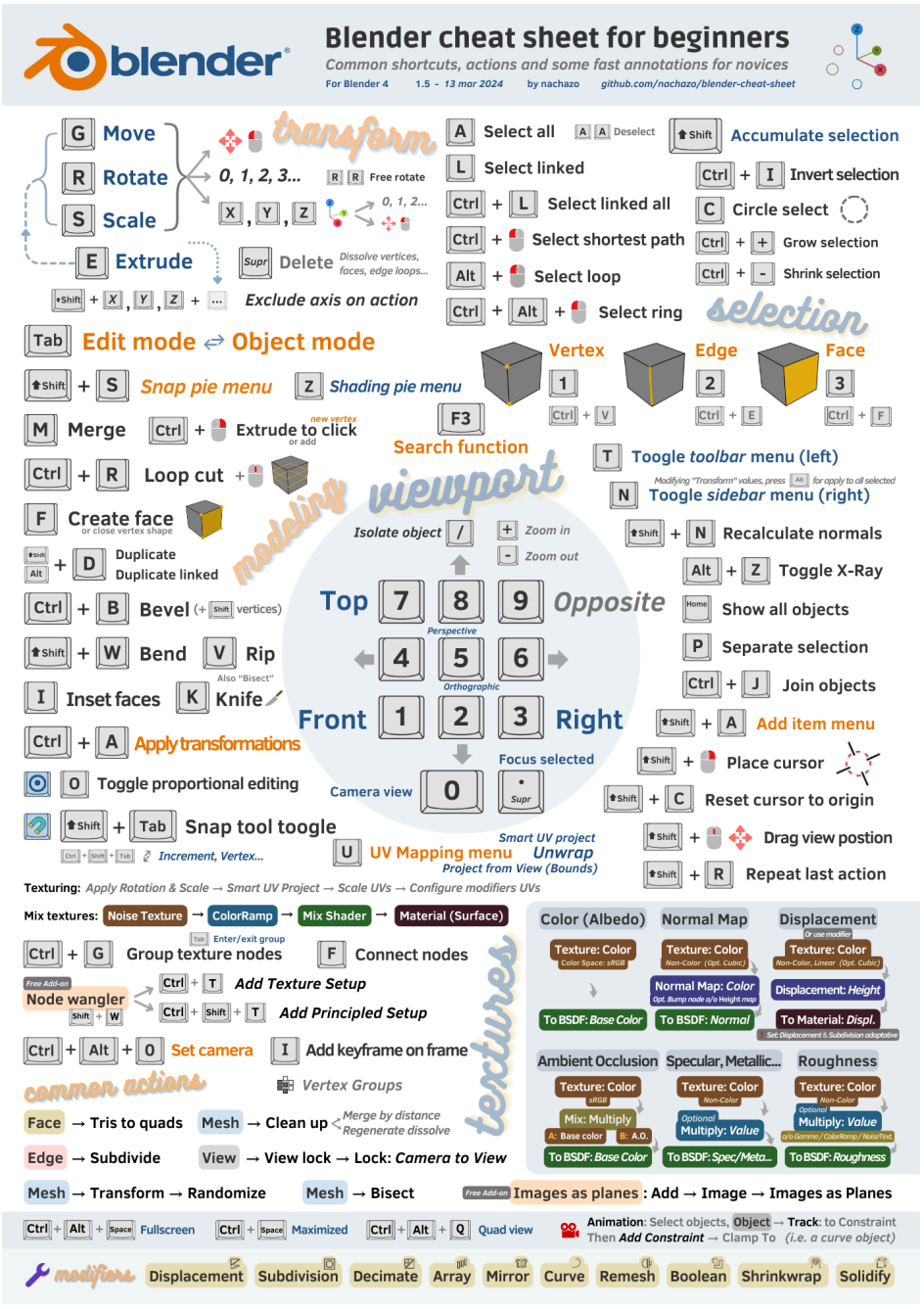
Modeling, Texturing, and Animating a sword in Blender.mp4

Shortcuts

List

- https://quickref.me/blender.html

Visual


blender
Blender cheat sheet for beginners
Common shortcuts, actions and some fast annotations for novices
For Blender 4 1.5 - 13 mar 2024 by nachazo github.com/nachazo/blender-cheat-sheet
transform
G Move
R Rotate
S Scale
0, 1, 2, 3...
Free rotate
X, Y, Z
E Extrude
Delete
Dissolve vertices, faces, edge loops...
Exclude axis on action
A Select all
Deselect
L Select linked
Ctrl + L Select linked all
Ctrl + Select shortest path
Alt + Select loop
Ctrl + Alt + Select ring
Accumulate selection
Ctrl + I Invert selection
C Circle select
Ctrl + + Grow selection
Ctrl + - Shrink selection
selection
Tab Edit mode ⇄ Object mode
Shift + S Snap pie menu
Z Shading pie menu
Vertex
Edge
Face
M Merge
Ctrl + Extrude to click
new vertex or add
Ctrl + R Loop cut
F Create face
or close vertex shape
Shift + Alt + D Duplicate
Duplicate linked
Ctrl + B Bevel (+ Shift vertices)
Shift + W Bend
V Rip
Also "Bisect"
I Inset faces
K Knife
Ctrl + A Apply transformations
O Toggle proportional editing
Shift + Tab Snap tool toogle
Increment, Vertex...
modeling
viewport
F3 Search function
Isolate object /
Zoom in
Zoom out
Top 7 8 9 Opposite
Perspective
4 5 6
Orthographic
Front 1 2 3 Right
Focus selected
Camera view 0
T Toogle toolbar menu (left)
N Toogle sidebar menu (right)
Modifying "Transform" values, press Alt for apply to all selected
Shift + N Recalculate normals
Alt + Z Toggle X-Ray
Home Show all objects
P Separate selection
Ctrl + J Join objects
Shift + A Add item menu
Shift + Place cursor
Shift + C Reset cursor to origin
Shift + Drag view postion
Shift + R Repeat last action
U UV Mapping menu
Smart UV project
Unwrap
Project from View (Bounds)
Texturing: Apply Rotation & Scale → Smart UV Project → Scale UVs → Configure modifiers UVs
Mix textures: Noise Texture → ColorRamp → Mix Shader → Material (Surface)
Ctrl + G Group texture nodes
Enter/exit group
F Connect nodes
Free Add-on Node wangler
Ctrl + T Add Texture Setup
Shift + W
Ctrl + Shift + T Add Principled Setup
Ctrl + Alt + 0 Set camera
I Add keyframe on frame
Vertex Groups
common actions
Face → Tris to quads
Mesh → Clean up
Merge by distance
Regenerate dissolve
Edge → Subdivide
View → View lock → Lock: Camera to View
Mesh → Transform → Randomize
Mesh → Bisect
Free Add-on Images as planes : Add → Image → Images as Planes
textures
Color (Albedo)
Normal Map
Displacement
Texture: Color
Color Space: sRGB
Texture: Color
Non-Color (Opt. Cubic)
Texture: Color
Non-Color, Linear (Opt. Cubic)
Normal Map: Color
Opt. Bump node a/o Height map
Displacement: Height
To BSDF: Base Color
To BSDF: Normal
To Material: Displ.
Set: Displacement & Subdivision adaptative
Ambient Occlusion
Specular, Metallic...
Roughness
Texture: Color
sRGB
Texture: Color
Non-Color
Texture: Color
Non-Color
Mix: Multiply
A: Base color
B: A.O.
Optional
Multiply: Value
Optional
Multiply: Value
To BSDF: Base Color
To BSDF: Spec/Meta...
To BSDF: Roughness
Ctrl + Alt + Space Fullscreen
Ctrl + Space Maximized
Ctrl + Alt + Q Quad view
Animation: Select objects, Object → Track: to Constraint
Then Add Constraint → Clamp To (i.e. a curve object)
modifiers
Displacement
Subdivision
Decimate
Array
Mirror
Curve
Remesh
Boolean
Shrinkwrap
Solidify