FCG Lab04: Modeling with Blender

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What is Blender?

Integrated application (no coding) for creation of 2D and 3D content

- Provides a broad spectrum of tools in one package
  - Modeling
  - Texturing
  - Lighting
  - Animation
- Open-source (GNU/GPL $\rightarrow$ "free as in freedom") [2]
- Cross-Platform (GNU/Linux, OSX, Windows)
- Developed since 1993 by "Not a Number" company, now by the "Blender Foundation" [1, 7]

The Interface I

The default UI is composed of:

Editors parts which have specific function (3D view, Properties Editor, . . .) with its own *Header* at top/bottom

Context buttons give access to options (like tabs) placed in the header

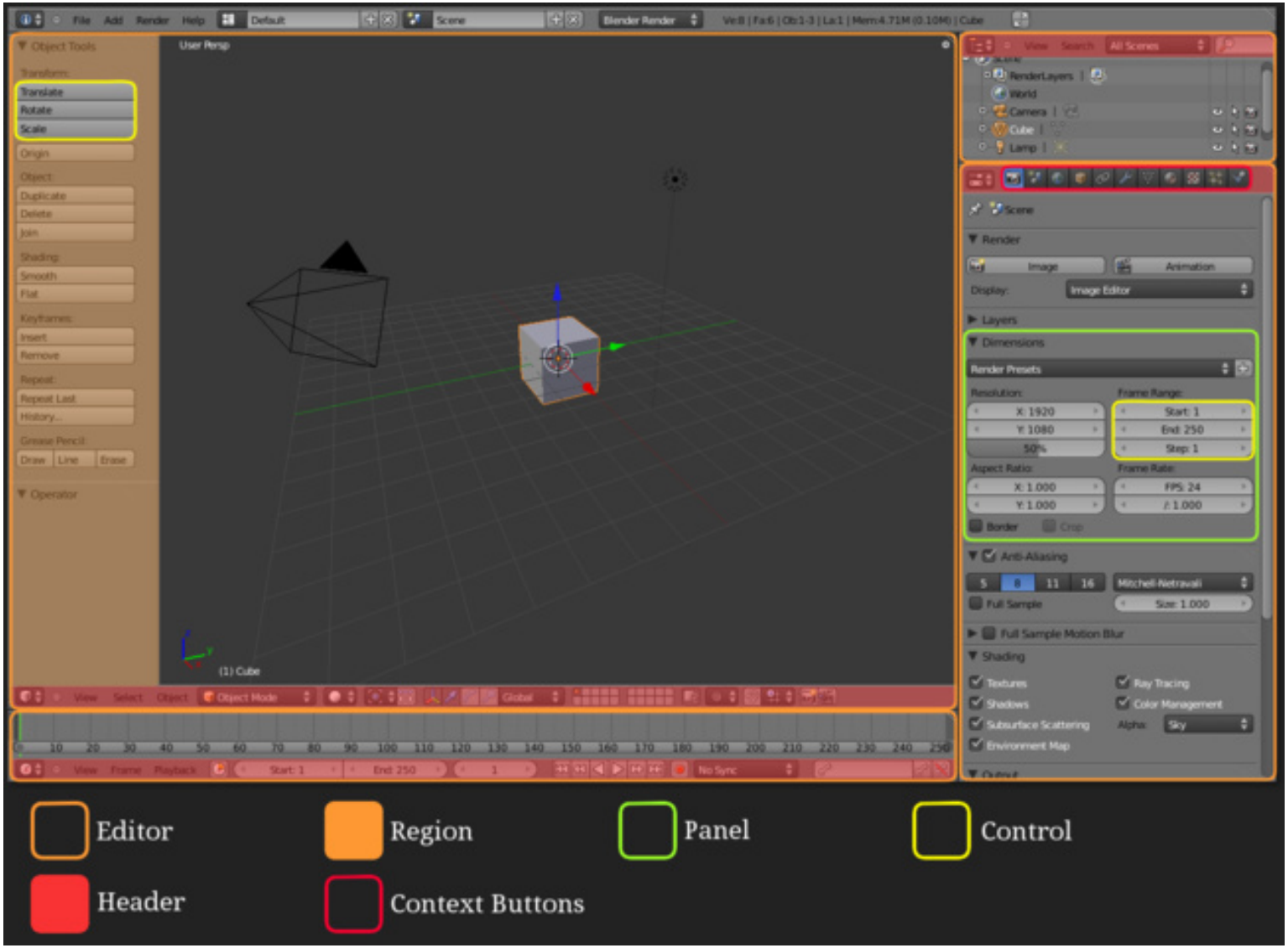
Panels group options (Color panel, dimension panel, . . .) within each editor

Regions grouped panel and option that can be hidden

Controls permit to modify a function, option or value by using:

- Buttons
- Checkboxes
- Sliders
- Menus

The Interface II



Input Configuration

- Blender's interface is designed to be used with (recommended configuration):
  - A three-button mouse with a whell
  - A full keyboard with a numeric keypad
  - NumLock should generally be switched on (Laptop users can *emulate* it in the preferences)
- Blender Hotkey Reference: [4, 3]
- Mouse or Keyboard Problem [5, 6].

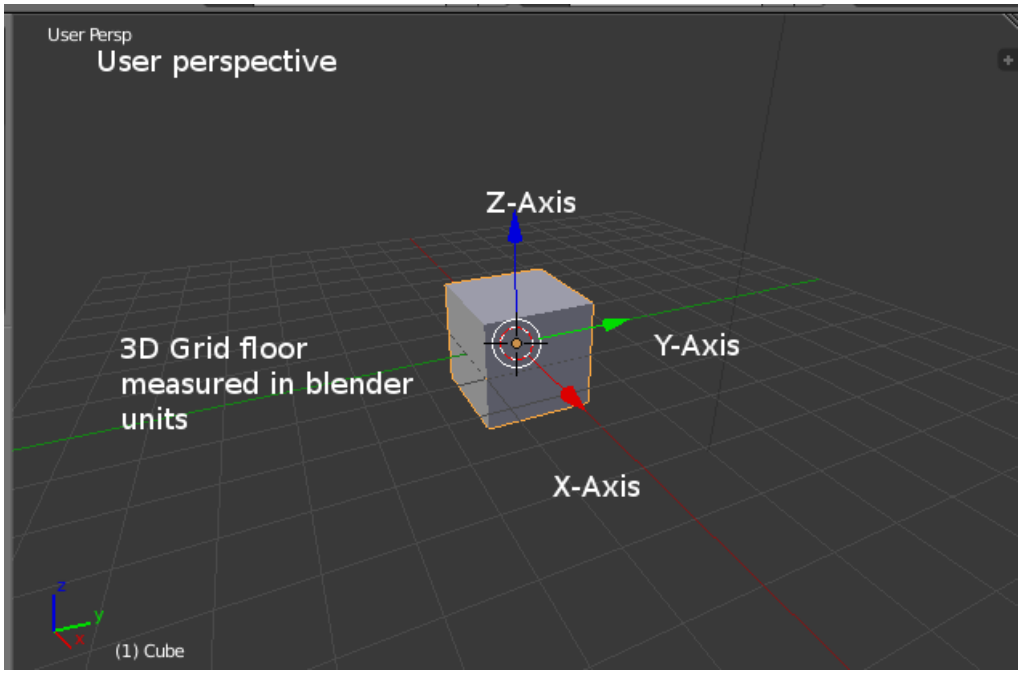
Notations

- The mouse buttons are called
  - *LMB* - left mouse button
  - *MMB* - middle mouse button (click on the wheel)
  - *RMB* - right mouse button
  - *Wheel* - rolling the wheel
- Hotkey letters are shown like they appear on a keyboard
  - *G* - lowercase "g"
  - *Shift*, *Ctrl*, *Alt* - modifier keys
  - *Ctrl* *W* - indicates simultaneous pressing

Introduction

Using Blender you create a 4D world:

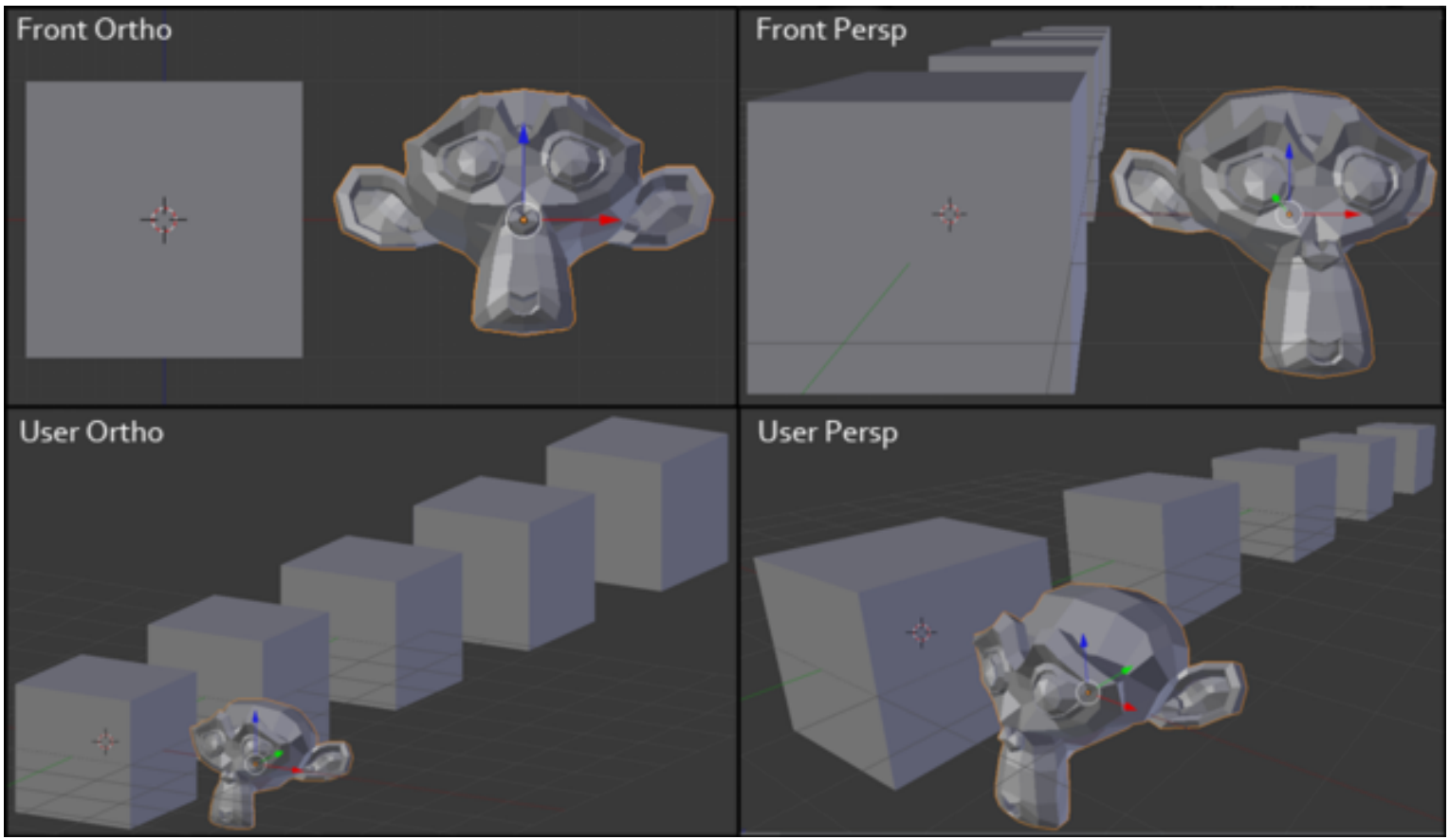
- Left-right – x
- Forward-backward – y
- Up-down – z
- Time sensitive (animated objects)



How to navigate it within a 2D computer screen?

Perspective and Orthographic Views

5 NumPad switch between the views [6]



Manipulating the View

- Default views
  - "front" (x, z) – *1 NumPad*
  - "side" (y, z) – *3 NumPad*
  - "top" (x, z) – *7 NumPad*
- Rotating – *MMB* and drag
- Panning – *Shift* *MMB* and drag
- Zomming – *Wheel*

Transformations

Operations that alter Object/Mesh position or characteristics

- *Grab/Move* – [G] (with axis locking: [G],[X] or [Y] or [Z])
- *Rotate* – [R] (with axis locking: [R],[X] or [Y] or [Z])
- *Scale* – [S] (with axis locking: [R],[X], or [Y] or [Z])

Introduction

Modeling: art and science of creating a surface that mimics a real-world object

Blender provides with you different types of objects:

Meshes	composed of polygonal faces, edges and vertices
Curves	mathematically defined with control handlers
Cameras	virtual camera needed for render the scene
Lamps	light sources in the scene
...	surfaces, text, armatures

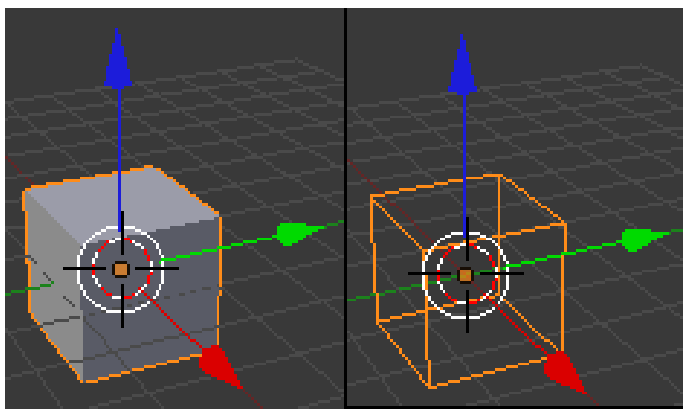
Working with Objects I

Two ways of "access" an object (can be toggled by pressing Tab):

- *Object-mode*: select the whole object
- *Edit-mode*: select the geometry of object (Meshes)

Appearance (can be toggled by pressing Z):

- Solid
- Wireframe



Working with Objects II

Selection (object-mode) determines the target of actions:

- *Point* – *RMB* (to add to selection or deselect use *Shift* *RMB*)
- *Border* – *B* draw a rectangle while holding *LMB* (to deselect use *MMB*)
- *Lasso* – *Ctrl* *LMB* holding *Ctrl* draw around the pivot point of each object you want to select

Once selected an object can be transformed by using:

- Translation
- Rotation
- Scale

Working with Objects III

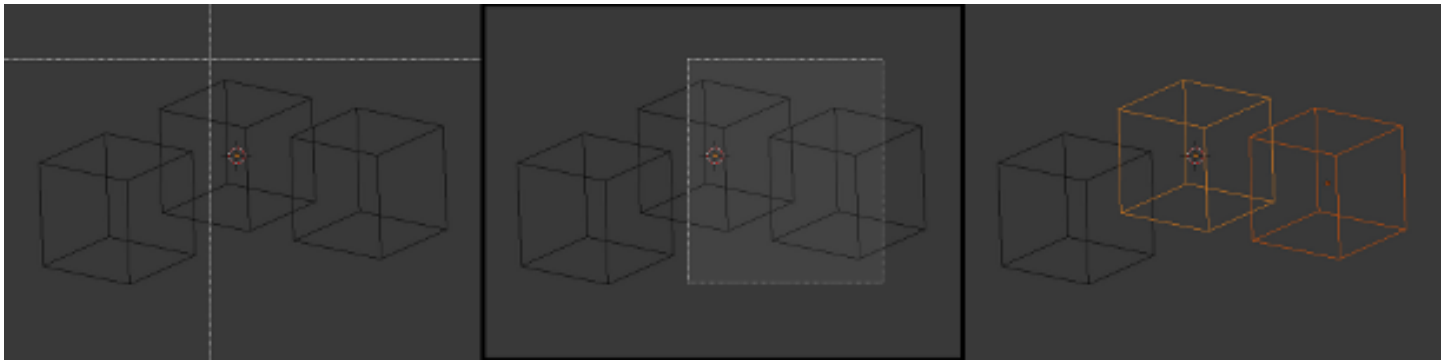


Figure: Border selection

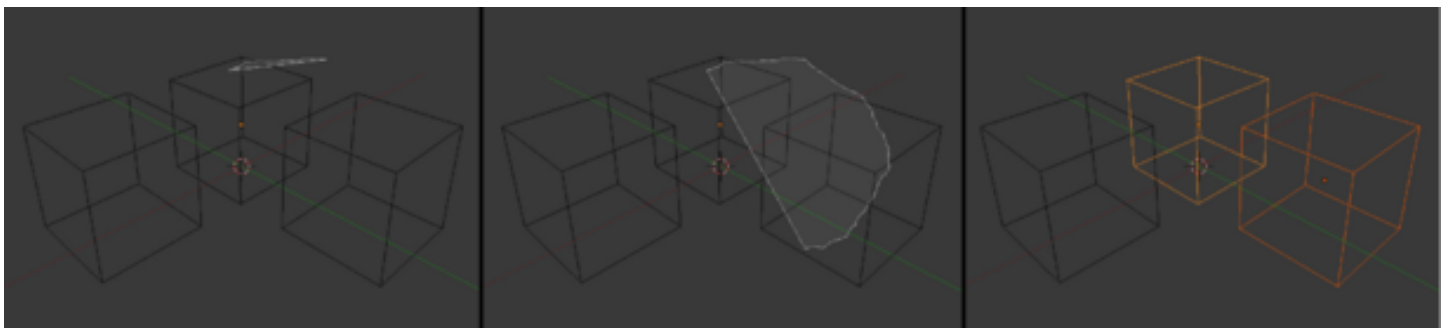
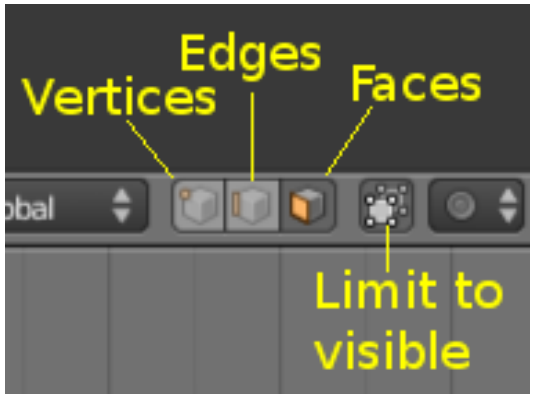


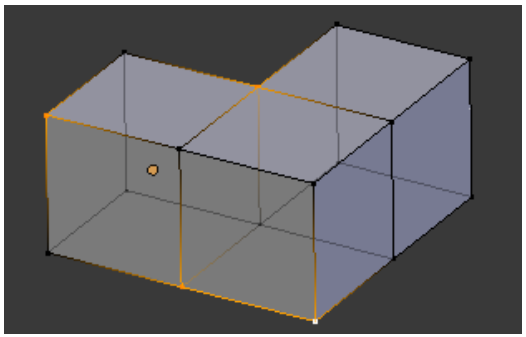
Figure: Lasso selection

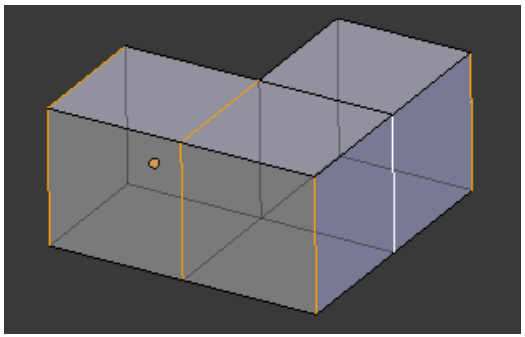
Working with Meshes I

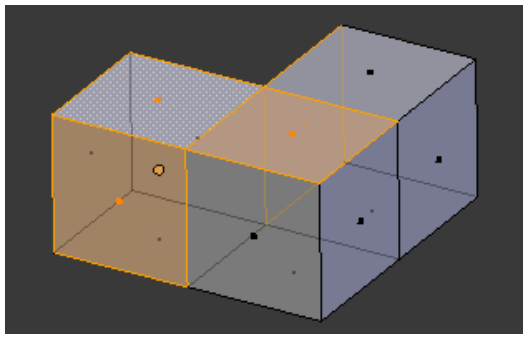
In edit-mode there are different selection modes:

- Vertices
- Edges
- Faces









Working with Meshes II

Many other important tools than common transformation:

- Extrude
- Subdivide
- Loop-cut
- ...

Extrude

It allows to create parallelepiped from rectangle and cylinders from circles

- Most frequently used tool
- Simple and straightforward
- $\boxed{E}$ or $\boxed{Alt}\boxed{E}$ (for extrude individual)

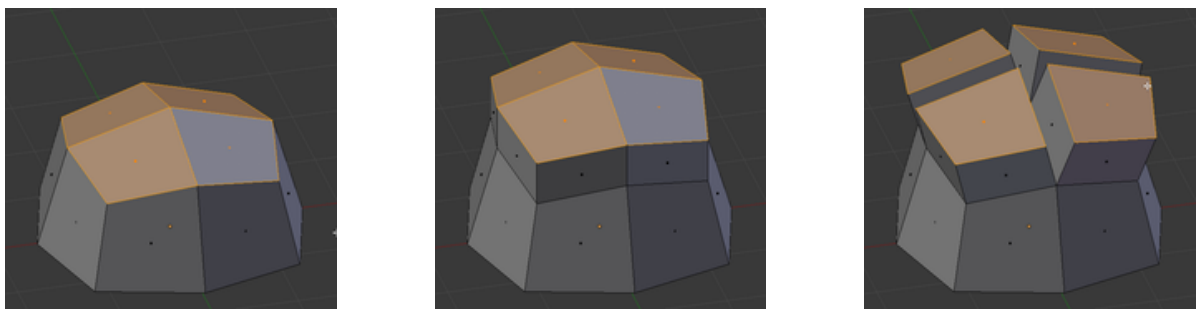


Figure: Selection of multiple faces, extrude and extrude individual

Subdivide

Split selected edges and faces cutting them in half, or more

- Vertices will be added if needed
- W

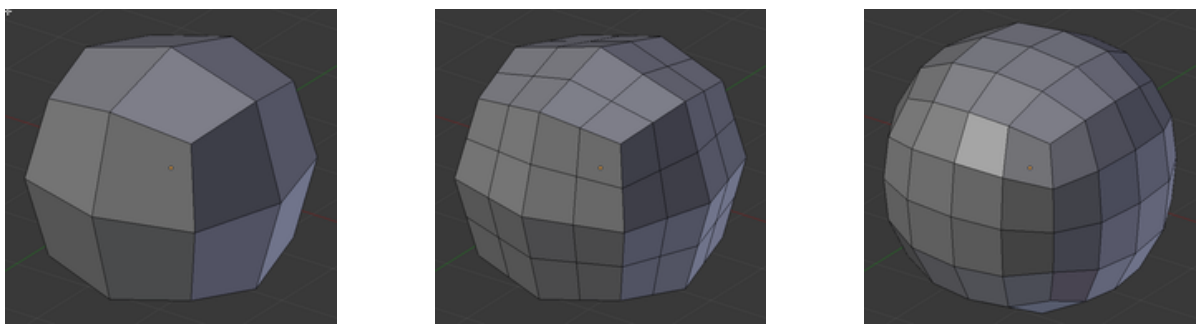


Figure: Mesh before subdividing, subdivided and subdivided with smoothing

Loop-cut

Splits a loop of faces by inserting a new edge loop, achived in two steps

- Move the cursor over a desired edge *LMB*
- Place the cut where you want with *Ctrl* *R* and confirm with *LMB* or click *RMB* to force 50% split
- Adjust the number of cuts by using *Wheel*

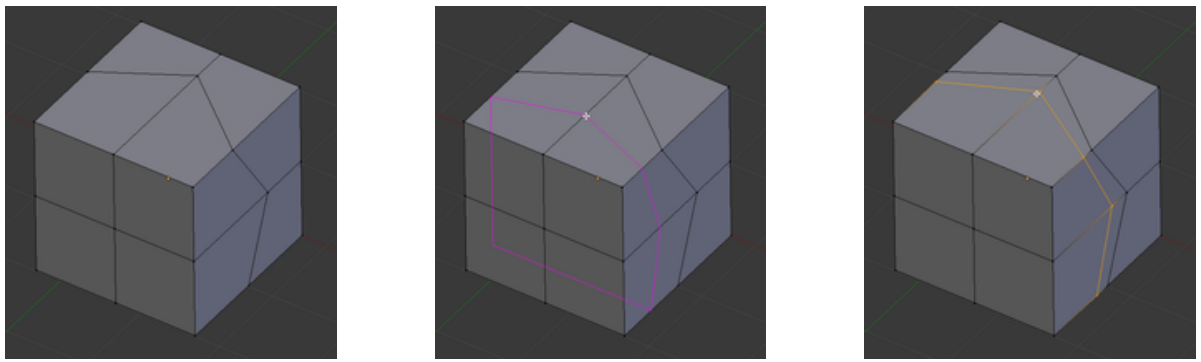


Figure: Mesh before inserting edge-loop, preview location and interactive placement

Introduction

Rigging permit to manipulate object for animation or posing

- Skeleton is attached to a character/mesh
- Deform and pose in different ways
- Doesn't alter the mesh

Specific object: Armature

- It has a center, a position a rotation and a scale factor
- Can be edited in *edit-mode*
- Animation of the whole object is done using the *pose-mode*

Bones

Bones are the base elements of armatures.
They have

- "Start point" (root or head)
- "Body"
- "End point" (tip or tail)

Can be visualized in many ways

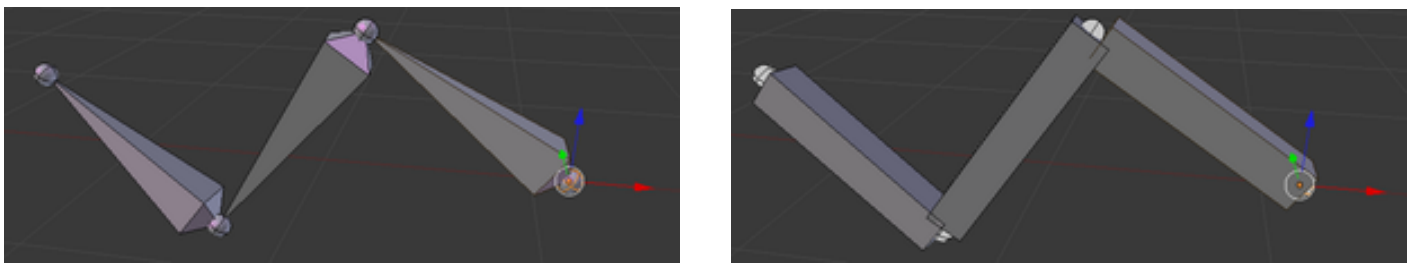


Figure: Octahedral and B-Bone display

Working with Bones

Bones can be added to the scene with:

- Add menu – $\boxed{\textit{Shift}}\boxed{A}$ (no relationship with other bones)
- Extrusion – $\boxed{E}$ or $\boxed{\textit{Shift}}\boxed{E}$, will be child of its tip owner and connected to it

can be locked preventing to be transformed in *edit-mode* $\boxed{\textit{Shift}}\boxed{W}$.

X-Axis Mirror Editing (can be enabled in armature options panel)

Skinning and Posing

Connecting the armature to a mesh such it can deform its shape:

- A child object is parented to the whole armature
- Each bone controls a part of the objects geometry
- $\boxed{Ctrl}\boxed{P}$ set parent to (Automatic Weights)

Selecting *pose-mode* bones can be transformed obtaining the desired position

- Rotation of the bones

Animation

Making an object move or change shape over time.

- Moving as a whole object (change position/orientation/size)
- Deforming (animating vertices or control point)
- Animation via armature (deform an object moving its bones)

Object animation is done by using

- Key frames
- Animation Curves
- Path

Keyframes

Basis of the animation, defines value of data at specific frame

- Each keyframe specify the desired configuration (for example each bone position in a character)
- Animation if achieved interpolating the data between keyframe
- Possibility to auto-record keyframes or insert them with I

- Blender 2.6x documentation.
  http://wiki.blender.org/index.php/Doc:2.6/Manual.
- Blender download.
  http://www.blender.org/download/.
- Blender hotkey reference: Mesh edit mode.
  http://wiki.blender.org/uploads/7/7c/BlenderHotkeysEditMode.png.
- Blender hotkey reference: Object mode.
  http://wiki.blender.org/uploads/8/82/BlenderHotkeysObjectMode.png.
- For who has problems with mouse buttons.
  http://wiki.blender.org/index.php/Doc:2.6/Manual/Interface/Keyboard_and_Mouse.

- For who has problems with the numpad (e.g who doesn't have it).
  `http://wiki.blender.org/index.php/Doc:2.6/Manual/Preferences/Input#Numpad_emulation`.
- A lot of material (tutorials,manuals,help,faq): Help page of the official website.
  `http://www.blender.org/support/`.