Objectives:

• Edit Mode
• Mesh Modeling
• Subdivision
• Head Modeling
Edit Mode

• Operations in **Edit Mode** affect only the **vertices, edges, faces** of an object.

• **Tab** : Switch between **Edit Mode** and **Object Mode**
What is Mesh?

- A mesh is a collection of vertices and polygons that defines the shape of an polyhedral object in 3D.
- Meshes usually consist of triangles and quadrilaterals.
- Vertex, Edges, Faces.
Mesh Modeling (1): Selection

- **Ctrl+Tab**
  - Choose select mode either vertices, edges or faces

![Selection Modes](image-url)
Mesh Modeling (2): Selection

- **Right Click**: Select a vertex (edge / face)
- **Shift + Right Click**: Add/deselect a vertex (edge / face)
- **A**: Select/deselect all vertexes (edges / faces)
- **B**: Drag an area to select the vertexes (edges / faces)

The same keys as object selection!
Mesh Modeling (3): Selection

- **G**: Grab and move the selection
- **R**: Rotate the selection
- **S**: Scale the selection

The same keys as object transformation!
Mesh Modeling (4): New Hotkey

• **E** : Extrude selection

Extrude *Vertexes*  
Extrude *Edges*
Subdivision

• **What** is Subdivision?
  Add extra faces to refine the meshes
Subdivision

• Why Subdivision?

If I want to change the shape of an object...

Too many vertexes to modify

VS

Only 8 vertexes to modify
Subdivision

• **How** Subdivision works?

Generally, it is an averaging process …

The new vertex in the middle is computed by averaging the neighbors
Subdivision in Blender

- Select an object
- In Right Window select **Modifiers**
- Add Modifier **Subdivision Surface**
- Select **View** Value
- Apply
Exercise 1

• Simple mesh modeling with subdivision
• Pawn model
Ten Steps to Build A Pawn

Step: 1

- Add an UVSphere with 8 rings, 8 segments
- Select ortho view
- Select front view
- Add Modifier. Set Subsurf
Ten Steps to Build A Pawn

Step: 2

- Turn off Limit selection to visible
- B select the bottom vertexes
- Delete the bottom
Ten Steps to Build A Pawn
Step: 3

- Select the bottom 8 vertexes
- E extrude ‘Edges’
- Remember to press Z so that edges extrude along z axis
Ten Steps to Build A Pawn

Step: 4

• Press E, then
• Press S to scale the bottom
Ten Steps to Build A Pawn

Step: 5

- E for extrude
- Keep using Z key to constrain the extrusion
Ten Steps to Build A Pawn
Step: 6

• Press **E** for extrude, then
• **S** for scaling
Ten Steps to Build A Pawn

Step: 7

- E for extrude, S for scale
- Keep doing twice
- Don’t forget z key…
Ten Steps to Build A Pawn
Step: 8

- E for extrude again
- Use z key again...
- Extrude the bottom twice
Ten Steps to Build A Pawn
Step: 9

- E then S for scaling
- Use Ctrl key for precise movement, use Shift for finer step movement. Or use them both.
Ten Steps to Build A Pawn

Step: 10

- **W** to open Special menu
- Merge the 8 vertexes into one
Finished?

- Back to Object mode, set smooth

- Render it (F12)
Remember!

- Tab - Switch between Edit Mode and Object Mode
- B - Rectangular selection
- E - Extrude selection
Reference

- http://www.blender.org/
- www.subdivision.org
Head Modeling: Ingredients

• Your ingredients:
  • Head pictures
  • Main operations:
    • Loop Select (Alt + Right Click)
    • Loop Cut (Ctrl + R)
    • Grab (G + X / Y / Z)
Head Modeling: Stage I – Preparation (1)

- Take photos
  - One for front view, one for side view
  - You can use digital camera, cell phone
  - We provide two photos for you to practice in comp4422-lab10-examples.zip

Align the camera position and the head position horizontally.
Head Modeling:
Stage I – Preparation (2)

- Set to Ortho View (NumPad 5)
- Split window in Front View (NumPad 1), and Right View (NumPad 3)
- Load the photos as Background Image
Head Modeling: Stage II – Basic Sketch (1)

- In **Front View**, start with a new plane
- Extrude inward
  - **Select Edges**, Press E, then Esc
  - Press S
Delete the face in the middle
  - Use face select mode (Ctrl + Tab)
  - Select the middle face, press Del
Delete the original face
Head Modeling: Stage II – Basic Sketch (3)

- Extrude the bottom part
  - Select the lower two vertexes
  - Press E, extrude downward
  - Extrude inward, delete the middle face
Head Modeling: Stage II – Basic Sketch (4)

- Move vertexes in Front View
  - Back to vertex select mode
  - Move every vertex individually (Right click and G)
  - Cover the face in front view
Head Modeling: Stage II – Basic Sketch (5)

- Move vertexes in Right View
  - Move every vertex individually (Right click and G), so that...
  - Cover the face in right view
  - Remember to use Y key when use G
Head Modeling: Stage III – Progressive Editing

- Strategy
  - Attach the face feature lines
  - Split–adjust–split…
Head Modeling:
Stage III – Progressive Editing(1)

- **Split**
  - Introduce more vertexes to represent more complex shape

- **Adjust**
  - Adjust the new vertexes first before next split

Split: Edge Cut (Ctrl + R)
Adjust in side view: Grab (G + Y)
Head Modeling: Stage III – Progressive Editing(2)

- Split (Ctrl+R)
- Adjust (G)
- Keep doing Split & Adjust iteratively…

Split: Edge Cut (Ctrl + R)
Adjust in side view: Grab (G + Y)
Head Modeling: Stage III – Progressive Editing(3)

- **Nose**
  - Select a face
  - Extrude (E) in Y direction
  - Extrude inward
  - Delete the unwanted faces
Head Modeling: Stage III – Progressive Editing (4)

- Eyes
  - Use split & adjust
Head Modeling: Stage III – Progressive Editing(5)

- Mouth
  - Use split & adjust
  - But, try to **keep the mesh simple**
Head Modeling: Stage III – Progressive Editing (6)

- **Skull**
  - Use Extrude (E)
  - Extrude-adjust-extrude
  - Cover the whole skull
  - **Keep the mesh simple**
Head Modeling: Stage III – Progressive Editing (7)

- Chin
  - Use Extrude (E)
  - Connect the previous faces (4 vertexes + F)
Head Modeling: Stage III – Progressive Editing

Result at present
Head Modeling:
Stage IV – Detail Editing

- How to?
  - Split-adjust-split
  - Extrude-adjust-extrude
  - Connect the faces (4 vertexes + F)
  - Be patient
Head Modeling: Stage IV – Detail Editing

- Enable Subdivision
Head Modeling: Some Tricks

Mirror modifier

Add modifier > Mirror

In **Object Mode**, grab (G + X) the object to the middle of the face

In **Edit Mode**, select all vertexes (A), then grab (G + X) the object in mirror expansion

Then press **Apply** in mirror modifier
Head Modeling: Some Tricks

Loop select of both sides

Alt + Right Clicks
Shift + Alt + Right Clicks

Select loop from both sides
Head Modeling: Some Tricks

Mesh LoopTools (Artifacts on the boundary)

- File->User Preferences
- Add-ons->Mesh->Enable Mesh LoopTools
- Loop select of both sides
- Click Bridge
Remember

- Loop Cut: Ctrl + R
- Loop Select: Alt + Right Click
- Mesh LoopTools
- **Split – Adjust – Split**
Appendix A: Some Tricks in Head Modeling – Ear

- For Modeling the Ear, you can
  - Use all the available online resources
  - We provide one for you in comp4422-lab10-examples.zip
Appendix A: Some Tricks in Head Modeling – Ear

- Blender supports importing multiple objects with multiple formats
  - Press **Apply** first if you’re using **Subdivision**
  - Import the ear model to your head mode
Appendix A: Some Tricks in Head Modeling – Ear

- Move to the right place, connect to the head
  - Select all the vertexes of the Ear model
  - Press Alt + J, convert all triangles to quadrilaterals
  - Duplicate it use Mirror Modifier
Appendix A: Some Tricks in Head Modeling – Ear

- In Object Mode
  - Select all the Head and ears
  - Press Ctrl + J, join the three object into one mesh model
Appendix A: Some Tricks in Head Modeling – Ear

- Connect the ear and head
  - Enable mesh loop tools
  - Select connection edge loops of ears and head (Shift + Alt + Right click)
- Click Bridge
Reference

• http://www.blender.org/

• http://wiki.blender.org/index.php/Manual/Hotkeys

• http://wiki.cgsociety.org/index.php/Portrait
Download:

http://www.comp.polyu.edu.hk/~csgeorge/comp4422/lab/10
http://www4.comp.polyu.edu.hk/~cscli/comp4422/
Try things out...