

Autodesk Maya modeling, animation, scripting and C++ programming 2017-18

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Cours ENSIMAG, Ingénierie de l'Animation 3D

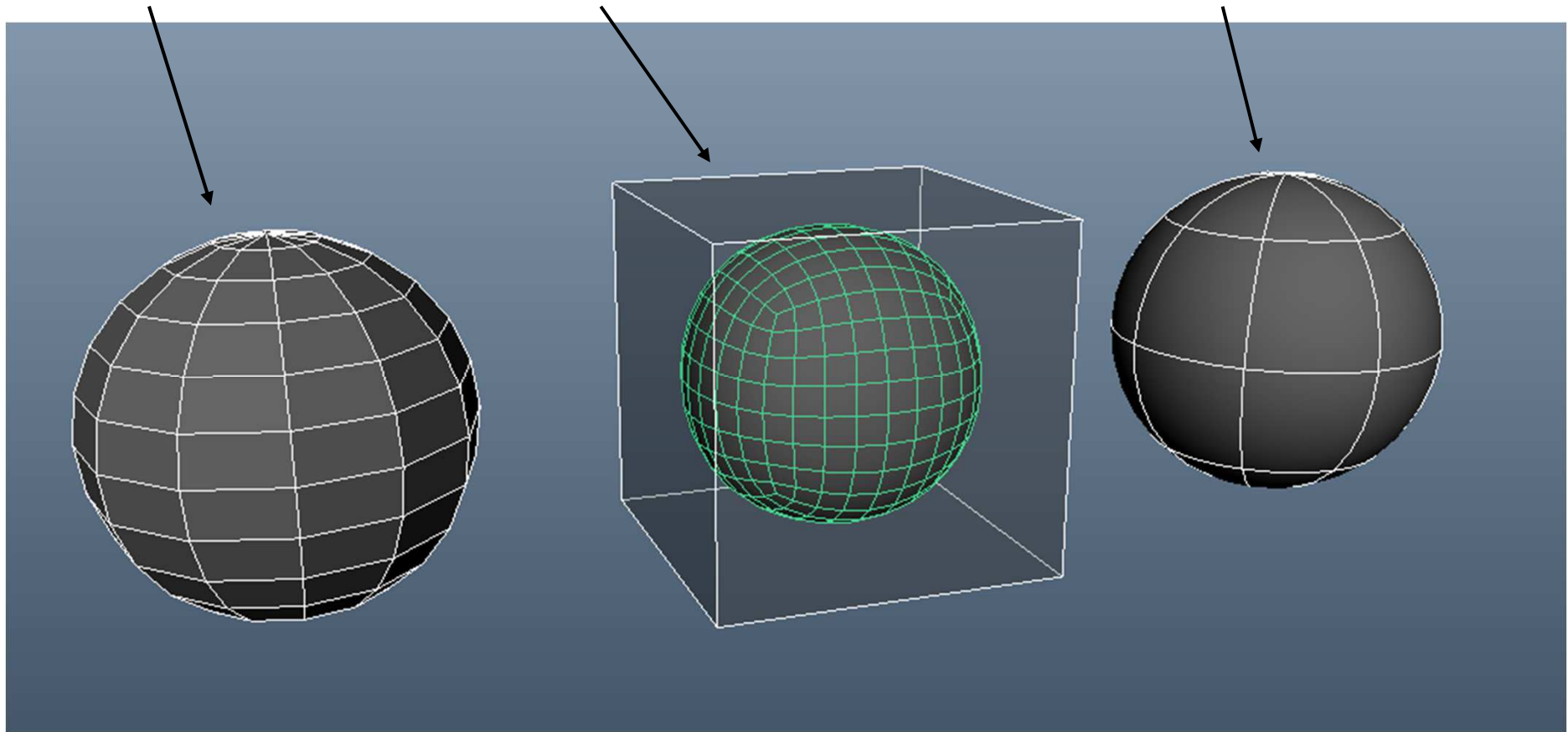
Maya modeling

- Different geometry types

Polygons

Subdivision surfaces

NURBS surfaces and curves



Polygons

- Pros
 - Intuitive (at least for modelers)
 - Mathematically simple
 - a set of 3D points and a list of cycles (faces)
 - Direct from 3D scanner
- Cons
 - Local transformation only
 - tedious editing
 - Complex link with texture
 - require projection schemes from 3D to 2D

Polygons' tools with Maya

- Base shape creation
 - cube, torus, etc. => menu “Create>Polygon Primitives”
- Translate, rotate, scale components
- Edit Polygons
 - subdivide or split tool
 - extrude (vertex, edge, face) => try tools from modeling toolkit
- More:
 - smooth, reduce
 - bevel, chamfer
 - ...

Texturing polygons

- UV editing => “Window>UV texture editor”
 - Choose an image
 - texture is related to a material (2D or 3D)
 - texture coordinates are related to a mesh (placement)
 - Try on a cube
 - UVs can be moved, rotated or scaled in 2D
 - Try on a cone or a sphere
 - Try different projection scheme => menu “UV”

NURBS

- Pros
 - Smooth by definition
 - Direct link with texture mapping (2D/2D)
 - Mathematically well-defined
 - polynomial curves $\mathbf{C}(u) = \sum_i P_i(u) \mathbf{P}_i$
 - bi-polynomial surface $\mathbf{S}(u,v) = \sum_{ij} P_i(u) Q_j(v) \mathbf{P}_{ij}$
- => set of points and polynomial interpolators
- Cons
 - Less intuitive than polygon meshes
 - quite difficult to manipulate

NURBS' tools with Maya

- Base shape creation
 - curves et surfaces => menu "Create>NURBS primitives"
- Using components
 - curve: control vertex, hull, edit point
 - surface: control vertex, hull
 - components (interpolators) can be inserted
 - display various level of interpolation ('1', '2', '3' keys) for interactive view
- More complex tools
 - revolve a curve
 - loft two curves
 - ...

Texturing NURBS surface

- Surface $S(u,v) == \text{Image } I(u,v)$
- Compare poly sphere and NURBS sphere
 - use checker texture and move vertex/CP

Subdivision surfaces

- Pros
 - Smooth subdivision of ANY control polygon
 - No polynomial interpolation
 - Good rendering properties (aliasing)
- Cons
 - Complex modeling and texturing

Painting

- Select object and RMB > Paint
 - Sculpt
 - a brush to modify 3D shape
 - Paint 3D
 - a brush to modify 2D texture

Scene hierarchy

- Objects positioned with respect to each other
 - wheels w.r.t cars, cars w.r.t roads, etc
- Representation
 - internal: 4x4 matrices
 - user: xyz vectors and Euler angles
 - pivots can be edited ('insert' key)
 - move/rotate can be local or global
 - see Node **transform** help reference
- Base command: "Edit>Parent"