Modeling with Maya

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Maya modeling

- Polygons
- NURBS curve and surface
- Subdivision surface
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+ Texture mapping
Polygons

😊 intuitive

😊 mathematically simple
  - a set of 3D points and a list of connections (faces)

😊 direct from 3D scanner

😊 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. => see menu “Create>Polygon primitives”

• Translate, rotate, scale components
  – vertices, edges, faces, UV (!), vertex-face (!)

• Edit Polygons
  – subdivide or split tool
  – extrude (vertex, edge, face) => try tool parameters

• More :
  – smooth, reduce (Polygons menu),
  – bevel, chamfer
  – etc
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
    • UV are moved, rotated or scaled in 2D
  – try on a cone (checker/cyl) or a sphere (image/planar)
    • base projection is proposed
    • other projections are possible (Polygon UVs>mappings), update using UV sets (RMB) and UV linking…
NURBS

😊 smooth by definition

😊 direct link with texture mapping (2D/2D)

😢 mathematically well-defined but not intuitive
  - 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

😢 Quite difficult to manipulate
NURBS tools with Maya

• Base shape creation
  – curves et surfaces => see menu “create>NURBS primitives”

• Using components
  – curve: control vertex, hull, edit point
  – surface: control vertex, hull
  – components can be inserted
    • Insert Knot curve, and Insert Isoparms for curve
  – display various level of interpolation (‘1’, ’2’, ‘3’ keys) for interactive view

• More complex tools
  – Revolve a curve
  – Loft two curves
  – Cut and Sew patches
  – etc
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 surface

😊 Smooth subdivision of ANY control polygon

😊 No polynomial interpolation

😊 Good rendering properties (aliasing)

😢 No clear mapping between 3D surface and 2D texture
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