Autodesk Maya modeling, animation, scripting and C++ programming 2016-17

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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 tool parameters

• 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 “Create UVs”
NURBS

• Pros
  • Smooth by definition
  • Direct link with texture mapping (2D/2D)
  • Mathematically well-defined
    • polynomial curves $C(u)=\Sigma i Pi(u)P_i$
    • bi-polynomial surface $S(u,v)=\Sigma i j Pi(u)Qj(v)P_{ij}$
    => 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
  • cut and sew patches
  • ...
Texturing NURBS surface

• Surface $S(u,v) = I(u,v)$
• 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
  • 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”