Week 11: Complex 3D Assets

DIGITAL ASSET DEVELOPMENT

Contents

- Skeletons and characters
- 3D interchange formats

3D Meshes

- As discussed last week, a mesh is a connected set of 3D points (vertices)
- This is actually the simplest definition
- If the mesh is to alter its shape, some mechanism for this must be present
  - Blend shapes
  - Segmented hierarchy
  - Bones
  - Dynamics (ie. physics)

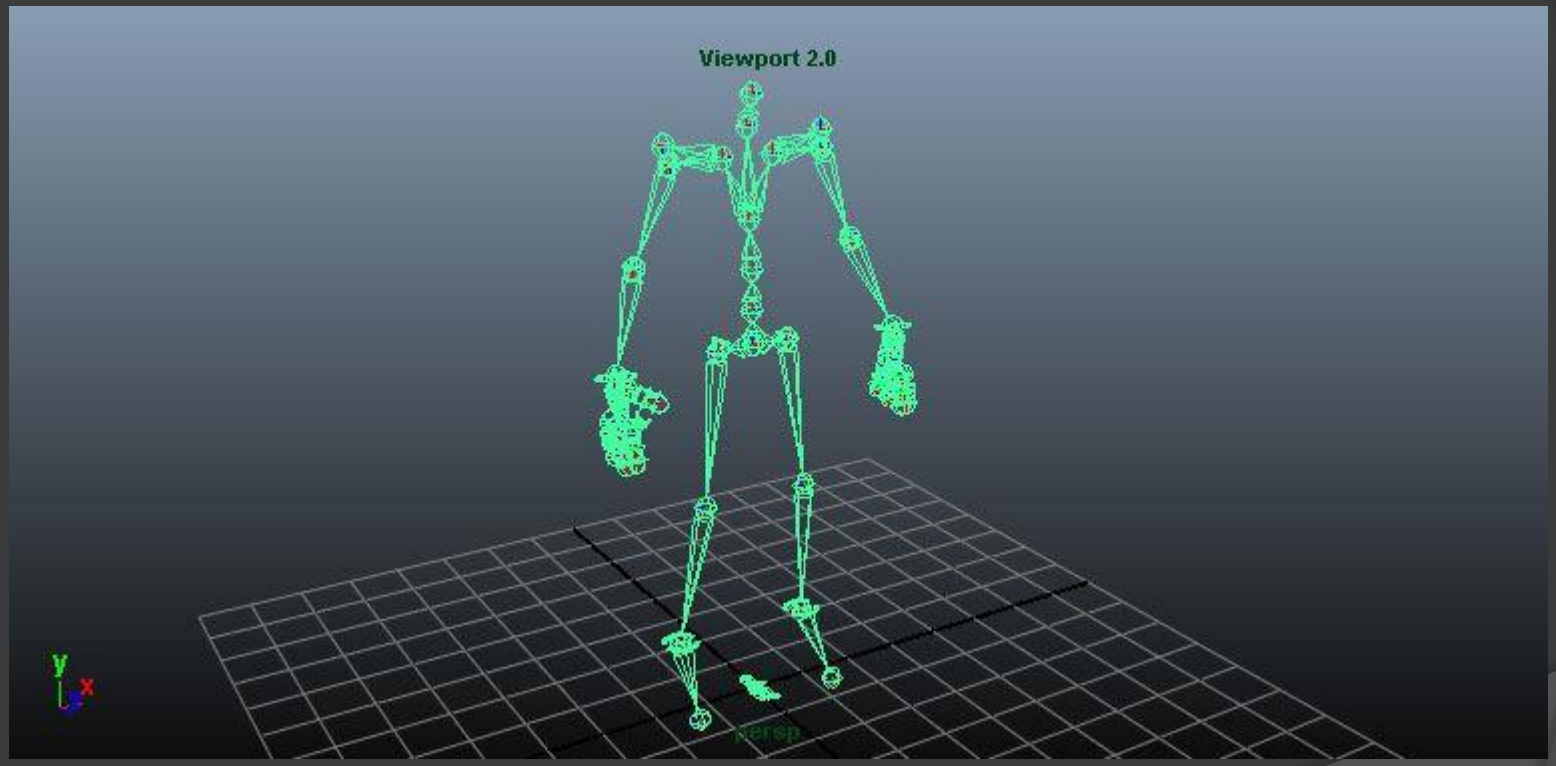
Animating a Mesh

- Blend shapes allow relatively subtle changes to be made to a mesh
  - Facial animation often uses this method
- Segmented hierarchy allows different parts of a mesh to move separately
  - Hierarchy specifies a parent/child relation
- Bones do a similar job, but allow greater control over the mesh movement
- A bone hierarchy is called a skeleton

Skeletons and Characters

- Characters are generally rigged using the skeleton approach
- The bone hierarchy defines how limbs and other elements are moved
- It is important that bones are named according to a clear convention
- Game characters usually have forward and inverse kinematics enabled
  - FK and IK mode

Example Skeleton



Skeletal Meshes

- A skeletal mesh asset represents a variety of information
  - The overall “at rest” mesh shape
  - The skeleton hierarchy
  - The relationship between the skeleton and the mesh (weight map)
  - Any limits on joint movement (eg. knee)
- Game engines typically use specialised tools for configuring such assets

3D Data Formats

- 3D assets combine a range of data types
  - Meshes, materials, animation data,...
- These are saved in an authoring format such as Maya binary (.*mb*)
- Such data is generally only readable from within the same development tool
- To move data between applications, we need an interchange format

3D Interchange Formats

- Interchange formats are essential in many industries
- They provide a means of:
  - Moving data between teams (eg. from the rigging team to the project animators)
  - Allowing interoperability between tools
  - Enabling collaboration between studios
- In 3D, important interchange formats include COLLADA and FBX

COLLADA

- Short for Collaborative Design Activity
- Open source format used as a standard for 3D data exchange
  - XML-based
  - .dae file extension (digital asset exchange)
- Used in a wide range of applications
  - All mainstream 3D tools
  - Many game engines
  - Other tools, including Photoshop

FBX

- Name derives from Filmbox (software for processing motion capture data)
- Proprietary format, owned by Autodesk
  - Less “open” than COLLADA
  - Especially well used within the games industry (part of Autodesk Gameware)
  - Can be stored in binary or ASCII form (rather like Maya files)
- Preferred option for 3D assets in UE

FBX Files

- FBX files store the contents of a 3D object or scene
  - Meshes, lights, cameras, materials,...
  - Can be viewed as a list of instructions for building the 3D asset
- When importing an FBX file, data that is irrelevant to the task can be ignored
- For example, render settings may be ignored by a game engine

Importing FBX Data

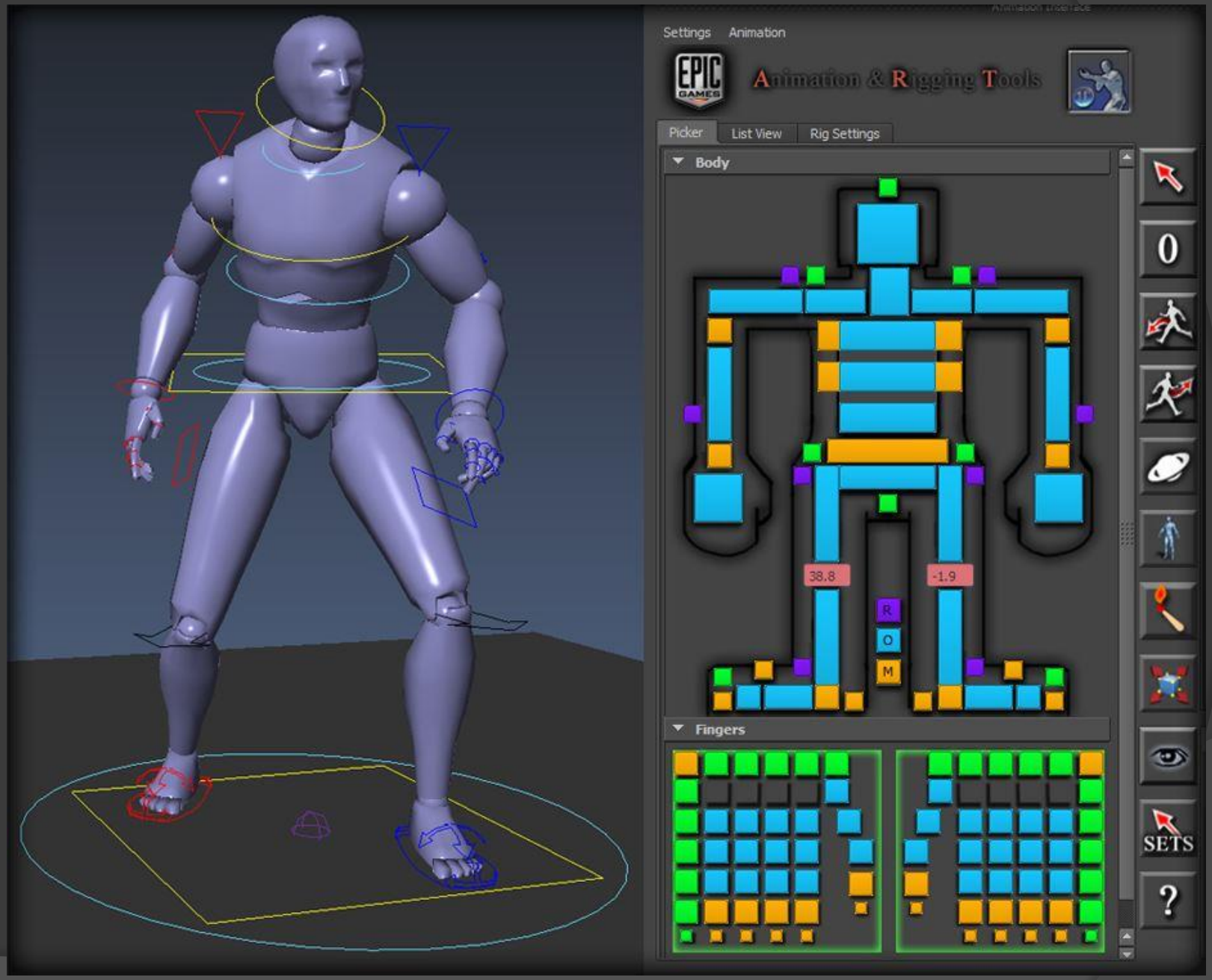
- In UE, FBX import is very simple
- The importer can generally identify the asset type and offer suitable options
  - For skeletal meshes, it is possible to target an existing skeleton
  - Skeletal animation assets (eg. run cycle) must be attached to a skeleton on import
  - The importer checks that the skeleton and animation assets are compatible

Skeletal Meshes in UE

- Skeletons in UE work much as in other 3D applications
- The bone hierarchy is more flexible than in many other cases
  - Extra bones that don't alter the existing hierarchy can be added
  - However, we cannot change relationships between existing bones
  - We can add fingers to a hand (for example), but can't add extra joints within the spine

Animation Tools in UE

- We can’t create animation data in UE
- Mesh and animation data is imported (using the FBX import method)
- Animation is configured using Persona
  - Allows animations to be tweaked and edited
  - Can also blend animations and link them together in sequences
- UE also includes a toolset for animation and rigging in Maya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Animation
Animation & Rigging Tools
Picker
List View
Rig Settings
Body
38.8
-1.9
R
O
M
Fingers
SETS