Task 2. Mesh Animation

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CM50245: Computer Animation and Games II

March 12, 2015

1 Introduction

Generating a plausible mesh which is a morphing of two given meshes ...

2 Implemented techniques

We present two approaches to solve the mesh morphing problem.

2.1 Linear interpolation

Linear interpolation is a simple and intuitive first approach. The new position of a vertex $\mathbf{v_{it}} = [v_{ix}, v_{iy}, v_{iz}]'$ in an interval $t = \{0, \dots, 1\}$ is given by

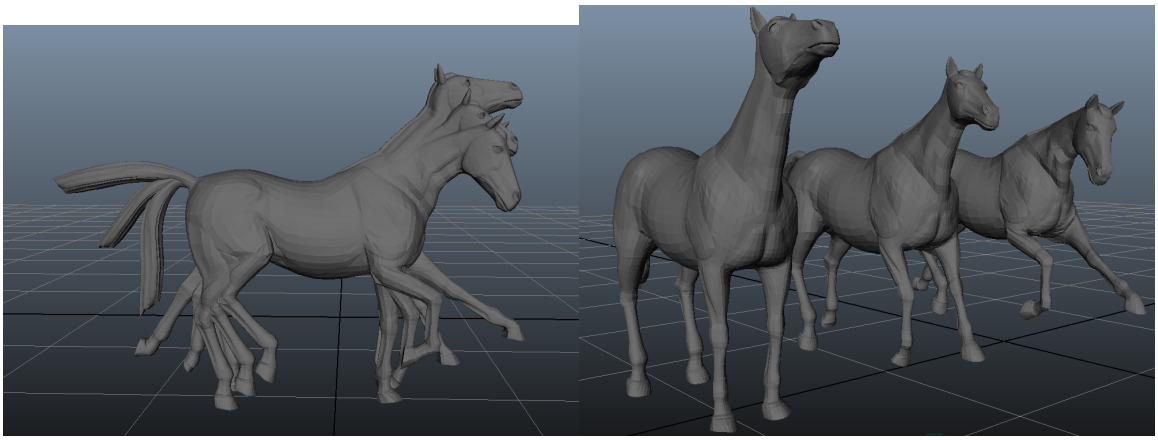
$$\mathbf{v_{it}} = (1-t)\mathbf{p_i} + t\mathbf{q_i} \quad i \in \{1, \dots, n\},$$

where n is the number of vertices, $\mathbf{p_i} = [p_x, p_y, p_z]'$ and $\mathbf{q_i} = [q_x, q_y, q_z]'$ are the corresponding vertices in the source and target meshes respectively. Some meshes generated with this method are shown in Figure 1.

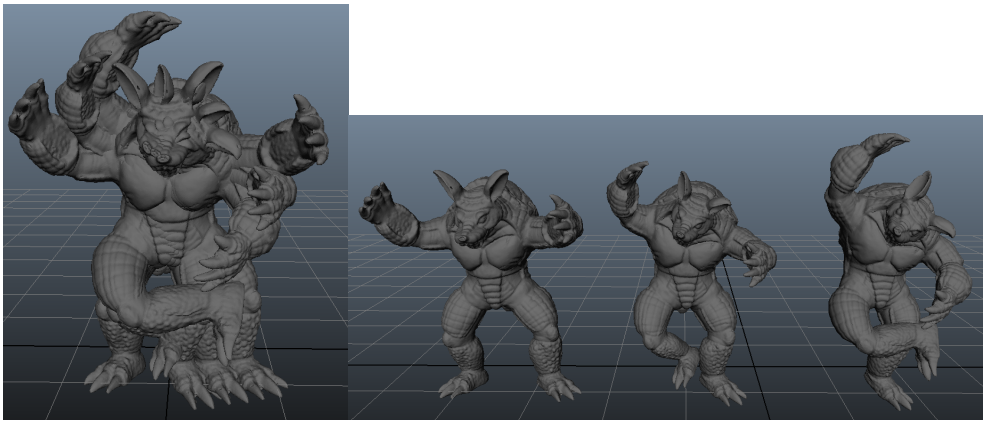
2.2 As rigid as possible interpolation

The previous method produces distorted meshes due to its non-rigid nature. One way to produce more better results is to use a transform-based technique. Lets define an affine transformation from $\mathbf{p_i}$ to $\mathbf{q_i}$ such that:

$$A\mathbf{p_i} + \mathbf{l} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \begin{pmatrix} p_{ix} \\ p_{iy} \\ p_{iz} \end{pmatrix} + \begin{pmatrix} l_x \\ l_y \\ l_z \end{pmatrix} = \mathbf{q_i},$$



(a) fig 3 (b) fig 4



(c) fig 1 (d) fig 2

Figure 1: Horse and armadillo meshes, morphed mesh is in the middle.