

CSE 872: Computer Graphics Homework Assignment #3

Due date: Nov 15th 2011 – 11:59pm

Platform required: Visual C++ / Windows.

Submission procedure: A zip file of the Visual C++ project by email to yttong@msu.edu

Assignment: Implementation of a 2D piecewise-linear curve smoothing.

1. Simple rendering of a 2D polyline.

2. Implement an explicit integration for $\frac{dx}{dt} = -kn$, where k is curvature, and n is the normal vector. That is

$$x_i^{t+\delta t} = x_i^t - \delta t (n_{i-1,i} - n_{i,i+1}) / \left(\frac{|L_{i,i+1}| + |L_{i-1,i}|}{2} \right),$$

$$\text{where } L_{i,i+1} = x_{i+1}^t - x_i^t, \text{ and } n_{i,i+1} = \frac{L_{i,i+1}}{|L_{i,i+1}|}.$$

3. Design an example showing the smoothing effect.

4. Design an example showing the difference between the model taking the length into consideration and the one below

$$x_i^{t+\delta t} = x_i^t - \delta t (n_{i-1,i} - n_{i,i+1}).$$

Hint: Use line segments with very different lengths.

5. Show an example where the explicit integration fails. Hint: take a large enough time step δt .

6. (Optional) Describe/implement an implicit scheme.