

MA 323 Geometric Modelling

HW Assignment # 1

This assignment is due Thursday December 9th, 2004 by 5:00 pm. Please follow the homework guidelines available from the *Guides and Useful Info* Link at the Course Webpage.

1. Constructions in space.
 - (a) (Thought) Does the construction for a piecewise linear curve require the points to be in a plane? Can you construct a piecewise linear curve for spatial points? How?
 - (b) (Thought) Does the construction for a piecewise circular curve require the points to be in a plane? Can you construct a piecewise circular curve for spatial points? How?
2. (Computational) Consider the design problem: find a smooth closed curve that is tangent to each of the line segments in the figure below using seven biarcs. A Maple worksheet for creating a similar figure is on ANGEL. You should use the Maple code for creating biarcs demonstrated in class on Friday.

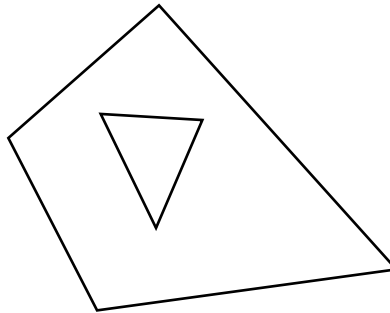


Figure 1: A Design Problem

3. (Algorithmic) Given points p_0, p_1, p_2 and tangent lines l_0 and l_2 at p_0 and p_2 respectively. Construct a piecewise circular curve consisting of
 - (a) three arcs that passes through the given points and has the given tangent lines.
 - (b) four arcs that pass through the given points and has the given tangent lines.

over

4. Given the data in the table below

t	0.0	1.0	2.0	3.5	4.0
x	0.0	1.0	2.0	3.0	3.0
y	0.0	1.0	1.0	2.0	3.0

- (a) Find the piecewise circular curve that interpolates the data using the trigonometric parameterization of a circle with initial tangent line being the y -axis.
- (b) Find the parametric circle of the form $[x_0 + r \cos(\omega t + \phi), y_0 + r \sin(\omega t + \phi)]$ that best fits the data.
- (c) Which model would say is the aesthetically a better curve? Why?