Program #4 (4190.410)
(Texturing and Deformation)

Due: November 29, 2005

In this programming assignment, you will implement an interactive program that deforms the surface of revolution generated from the previous assignment and applies a texture map to the surface.

A segment $\overline{\mathbf{y}_0 \mathbf{y}_1}$ on the y-axis can be represented as a Bézier curve of degree n as follows:

$$A(t) = (x(t), y(t), z(t)) = \sum_{i=0}^{n} \left(0, y_0 + (y_1 - y_0)\frac{i}{n}, 0 \right) B_i(t), \quad \text{for } 0 \leq t \leq 1,$$

where $\mathbf{y}_i = (0, y_i, 0)$'s are the two end points of $A(t)$ and $B_i(t) = \binom{n}{i}(1-t)^{n-i}t^i$.

As you interactively edit the axis curve $A(t)$, the surface of revolution (with a 2D texture) should deform in a way that each cross-sectional circle has its center at $A(\frac{y(t)-y_0}{y_1-y_0})$ and is contained in a plane with a normal vector $A'(\frac{y(t)-y_0}{y_1-y_0})$.