Programming #2 (4190.562)

Due: April 9, 2018

Given a planar cubic Bézier curve $C(t) = \sum_{i=0}^{3} \mathbf{b}_i B_i^3(t)$, $0 \leq t \leq 1$, consider the swept region of an ellipse: $E = (a\cos 2\pi s, b\sin 2\pi s)$, $0 \leq s \leq 1$, along the trajectory curve $C(t)$. Compute the envelope curve $\mathcal{E}$ of the moving ellipse E along the trajectory curve $C(t)$. Compute the self-intersection points of the envelope curve $\mathcal{E}$.

Now rotate the ellipse E by an angle θ so that

$$E_\theta = R_\theta(E) = (a\cos 2\pi s\cos\theta - b\sin 2\pi s\sin\theta, a\cos 2\pi s\sin\theta + b\sin 2\pi s\cos\theta).$$

Compute the envelope curve $\mathcal{E}_\theta$ of the moving ellipse E_θ along the trajectory curve $C(t)$. Compute the self-intersection points of the envelope curve $\mathcal{E}_\theta$.