

Project #3
Helix approximation
due: 11-18

A helix is given by

$$\mathbf{x}(u) = \begin{bmatrix} \cos u \\ \sin u \\ u \end{bmatrix}.$$

Consider a piece of this helix corresponding to $0 \leq u \leq 6\pi$. Compute 1000 points (equally spaced in u) on this curve segment. Add random noise in x, y, z of max. magnitude 0.2 to the data points. Then, using cubic B-splines with uniform knots (and triple end knots), compute a least squares approximation. Initially, try 4 cubic segments. Increase the number until you are happy with the result.

Criteria for happiness: a good fit (the distance of the curve from the data points is small) or a good curvature plot (not wiggly).

Hand in: two views of the input helix with your data points, then two views of your approximants, together with curvature plots, and an error measure for the approximation fit.