Parametric Curve Parameter Estimation Report

Problem Definition

We are given the parametric curve:

$$x(t) = t\cos(\theta) - e^{M|t|}\sin(0.3t)\sin(\theta) + X, \tag{1}$$
$$y(t) = 42 + t\sin(\theta) + e^{M|t|}\sin(0.3t)\cos(\theta). \tag{2}$$

The goal is to estimate the unknown parameters θ, M, and X using observed (x, y) data for $6 < t < 60$.

Estimated Parameters

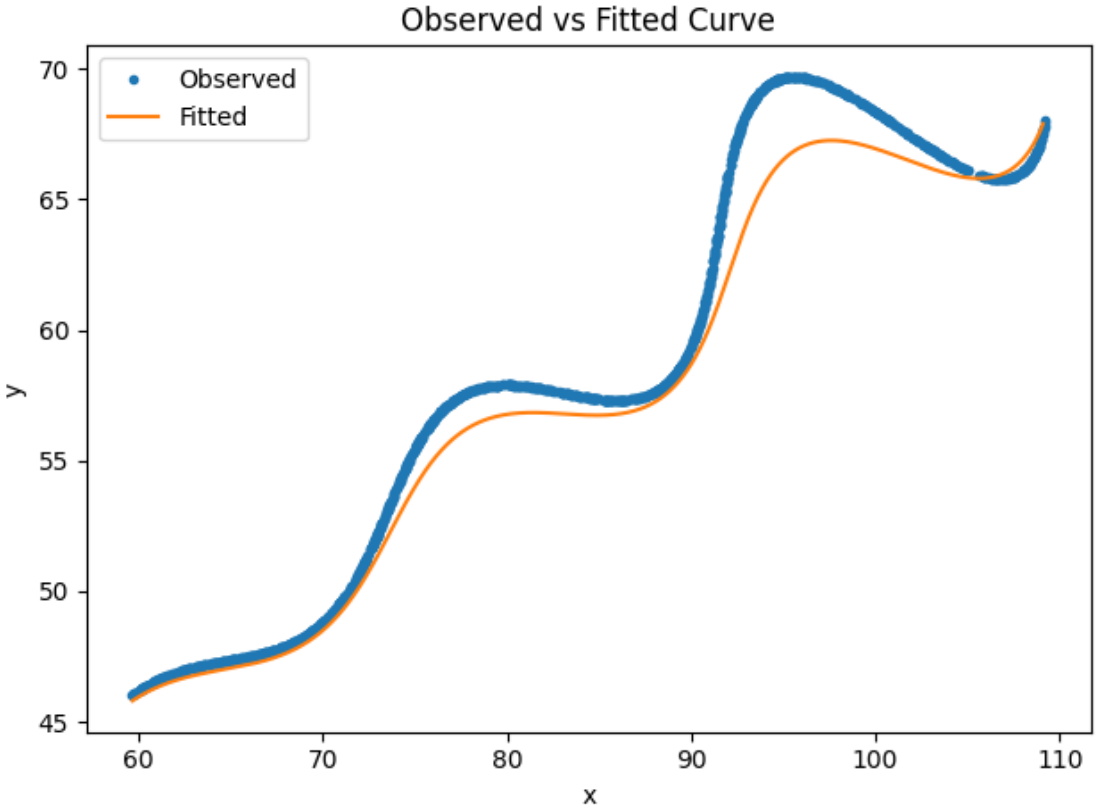
$$\begin{aligned} \theta &= 0.490759 \text{ radians} \approx 28.118419^\circ \\ M &= 0.021389 \\ X &= 54.900351 \end{aligned}$$

Final Parametric Equation

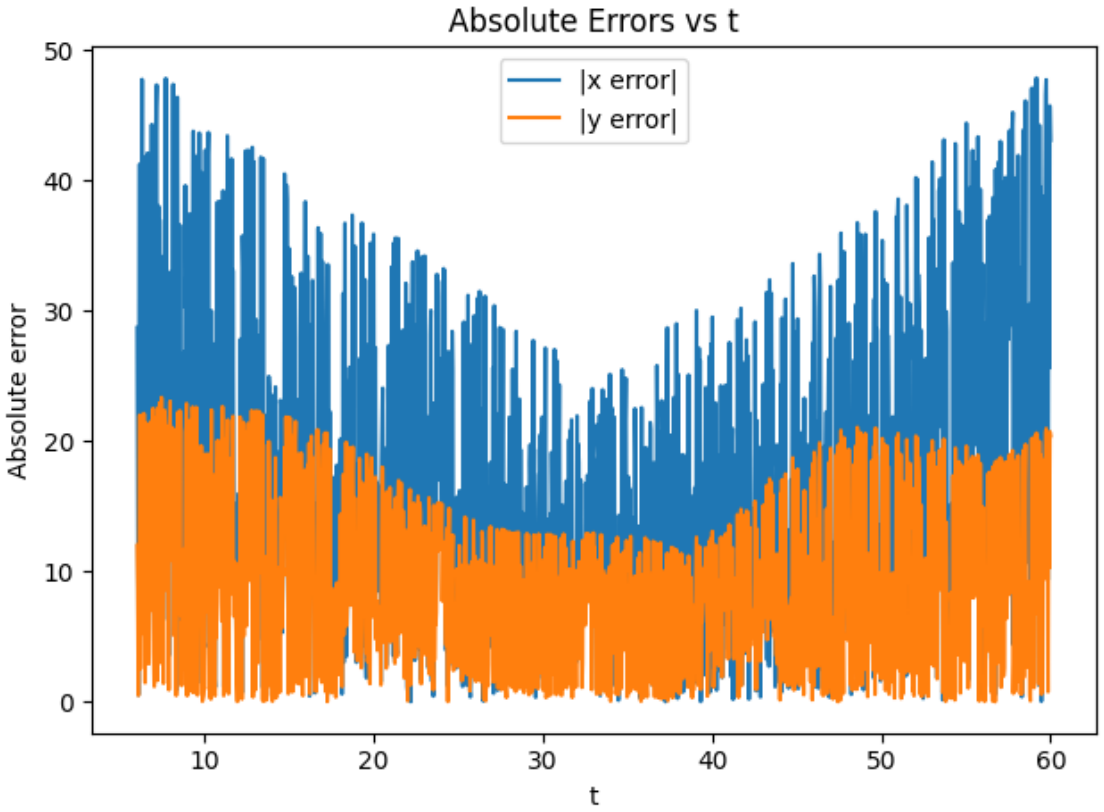
$$\begin{aligned} x(t) &= t\cos(0.490759) - e^{0.021389|t|}\sin(0.3t)\sin(0.490759) + 54.900351, \\ y(t) &= 42 + t\sin(0.490759) + e^{0.021389|t|}\sin(0.3t)\cos(0.490759). \end{aligned}$$

Results and Plots

Observed vs Fitted Curve



Absolute Errors vs t



Cumulative L1 Error