State Estimation - Assignment 1.1

Parham Jafary

May 26, 2023

Abstract

Basically, we are plotting the results for 4 different covariance matrices, the results are shown below.

(a) $\sigma_{\theta\theta} = 0.005$

(b) $\sigma_{\theta\theta} = 0.1$

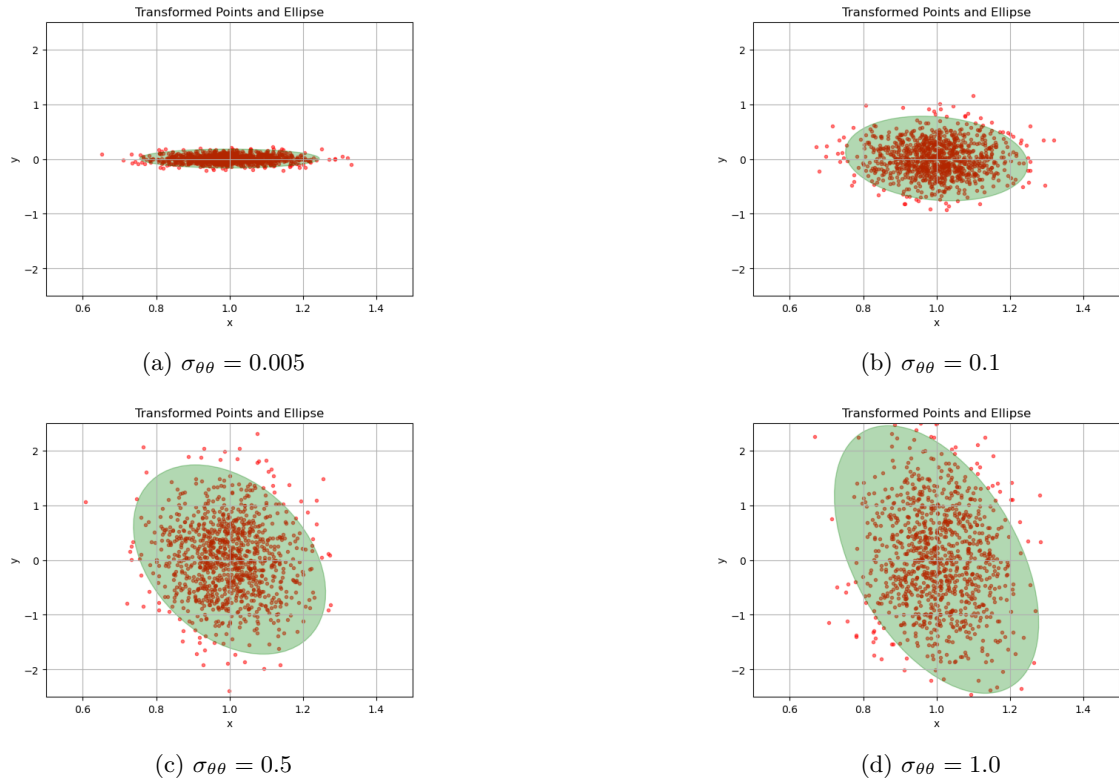(c) $\sigma_{\theta\theta} = 0.5$

(d) $\sigma_{\theta\theta} = 1.0$

Figure 1: Uncertainty ellipse and data after transformation

At each step, the variance $\sigma_{\theta\theta}^2$ is increasing and the distribution corresponding to that variance also increases, as illustrated in the figures. the ellipse's width and height depend on the eigenvalues of the covariance matrix. Since our covariance matrix is diagonal, the two eigenvalues are $\sigma_{\rho\rho}^2$ and $\sigma_{\theta\theta}^2$ and by increasing the eigenvalue we expect the ellipse's height to increase, which is verified through the figures a-d. From another point of view we can say that by increasing the variance of θ , we are increasing some sort of correlation between the transformed x, y that results to the enlarging and rotating the ellipse.