Asteroid Optical Navigation
Solution Sketch

ASEN 5044

Fall 2023

This document contains solution examples for the dynamics and measurement models, including both the nonlinear and linearized models. For the linearized case, the state perturbation used is:

$$\Delta\mathbf{X}(t_0) = [1e-5\,\text{km}, 1e-5\,\text{km}, 1e-5\,\text{km}, 1e-7\,\text{km/s}, 1e-7\,\text{km/s}, 1e-7\,\text{km/s}]^\top \tag{1}$$

Results are shown in the figures below.

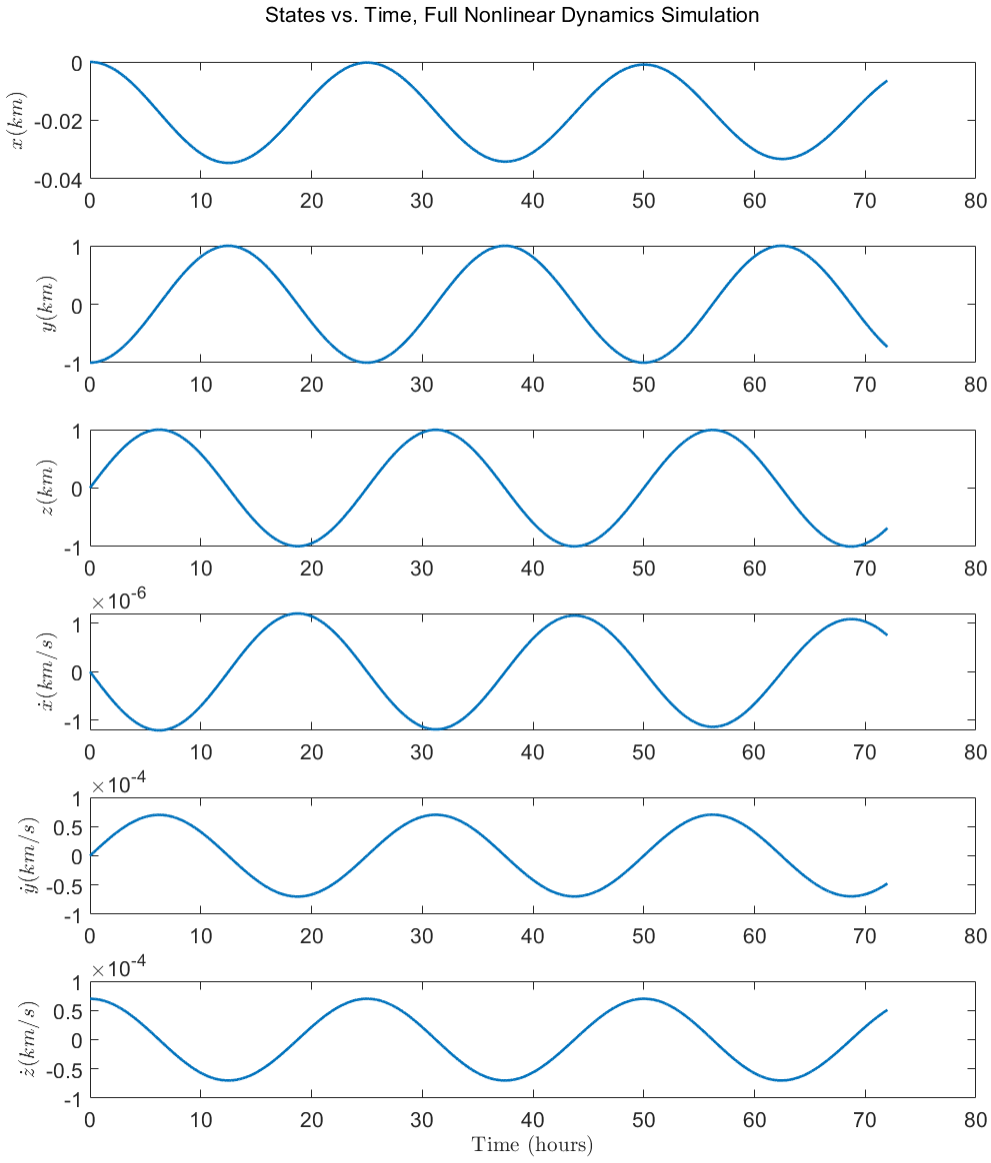

Figure 1: Nonlinear dynamics for the nominal trajectory.

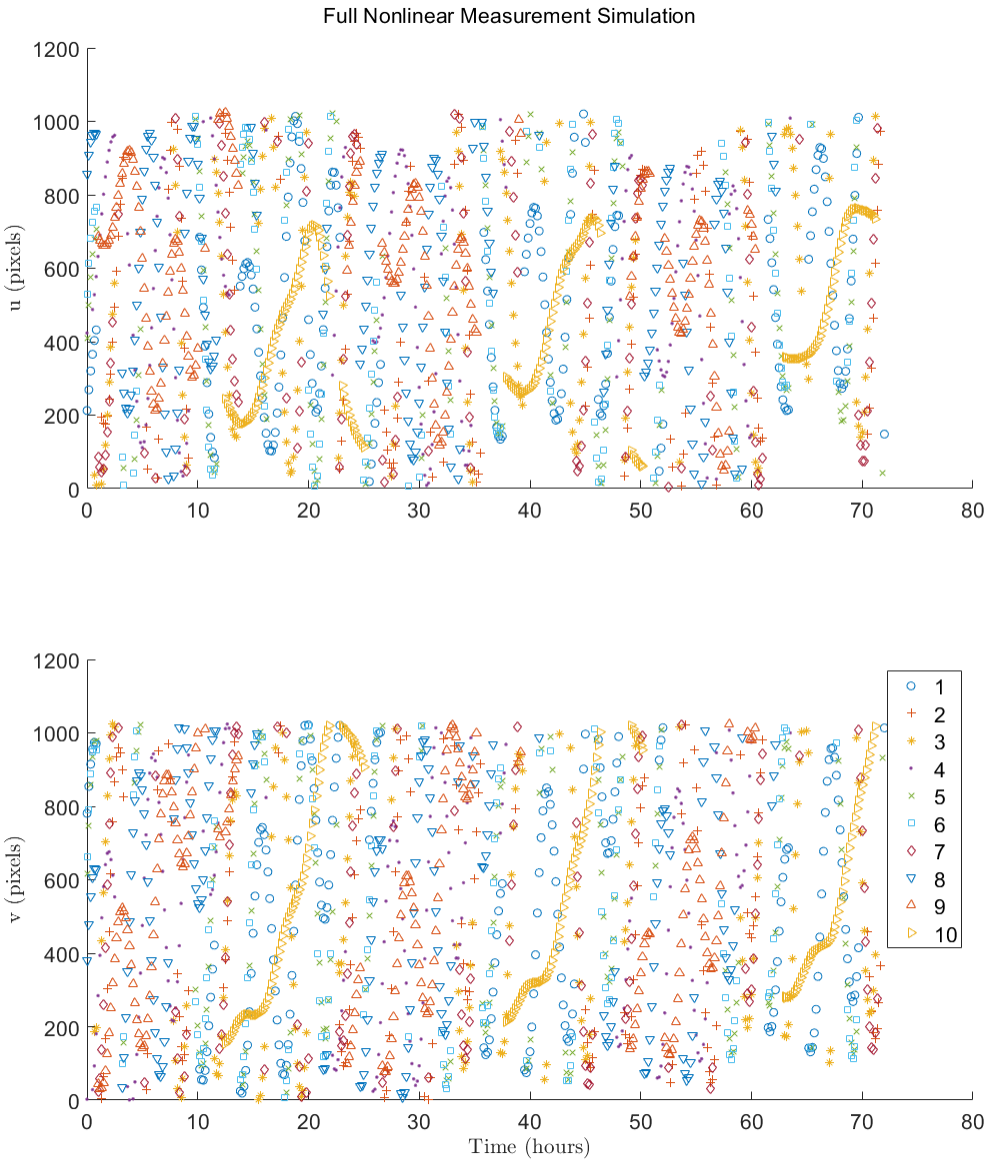

Figure 2: Nonlinear measurements for the first 10 landmarks, i.e., from landmark no. 1 to landmark no. 10.

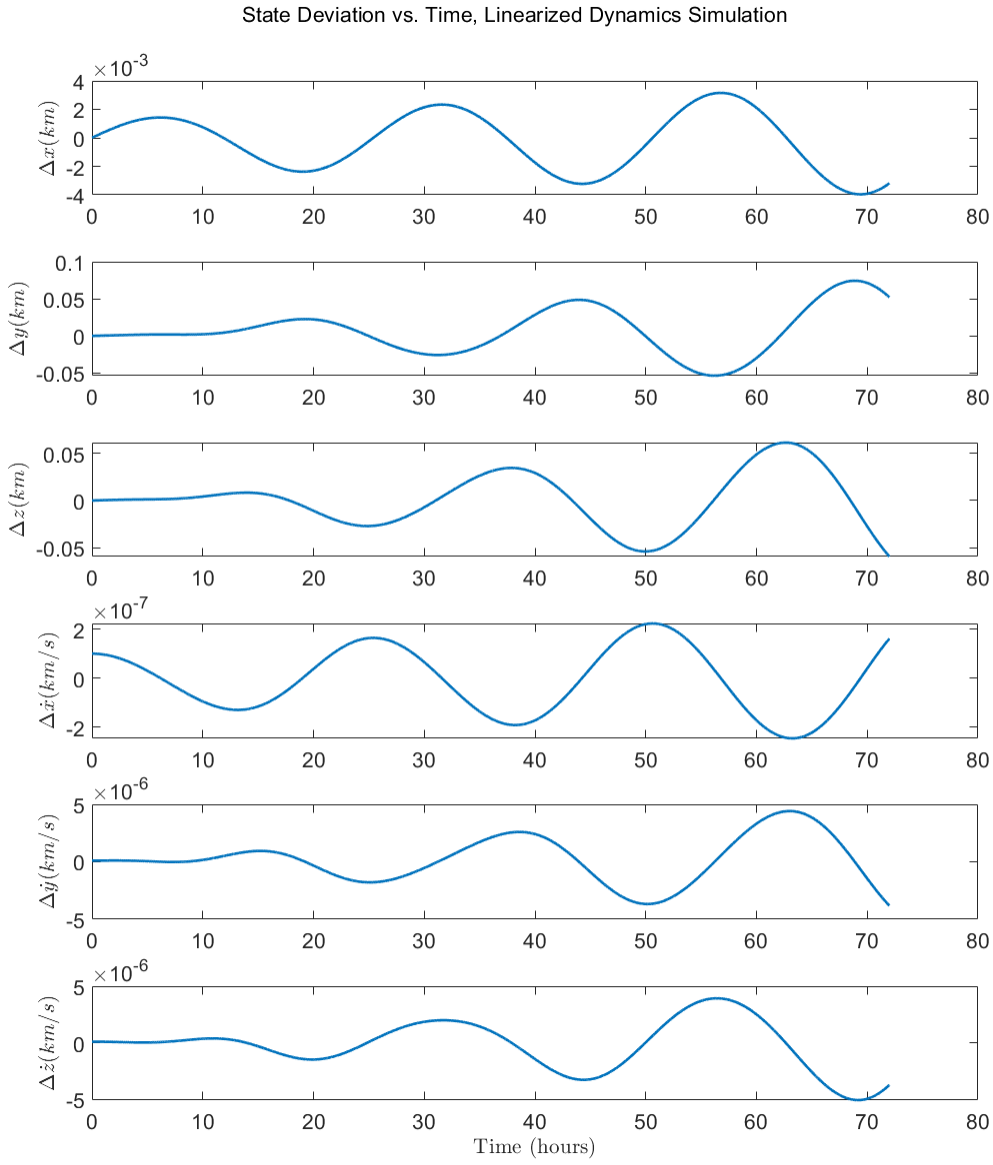

Figure 3: State deviation evolution using $\Delta\mathbf{X}(t_0)$ in Equation 1.

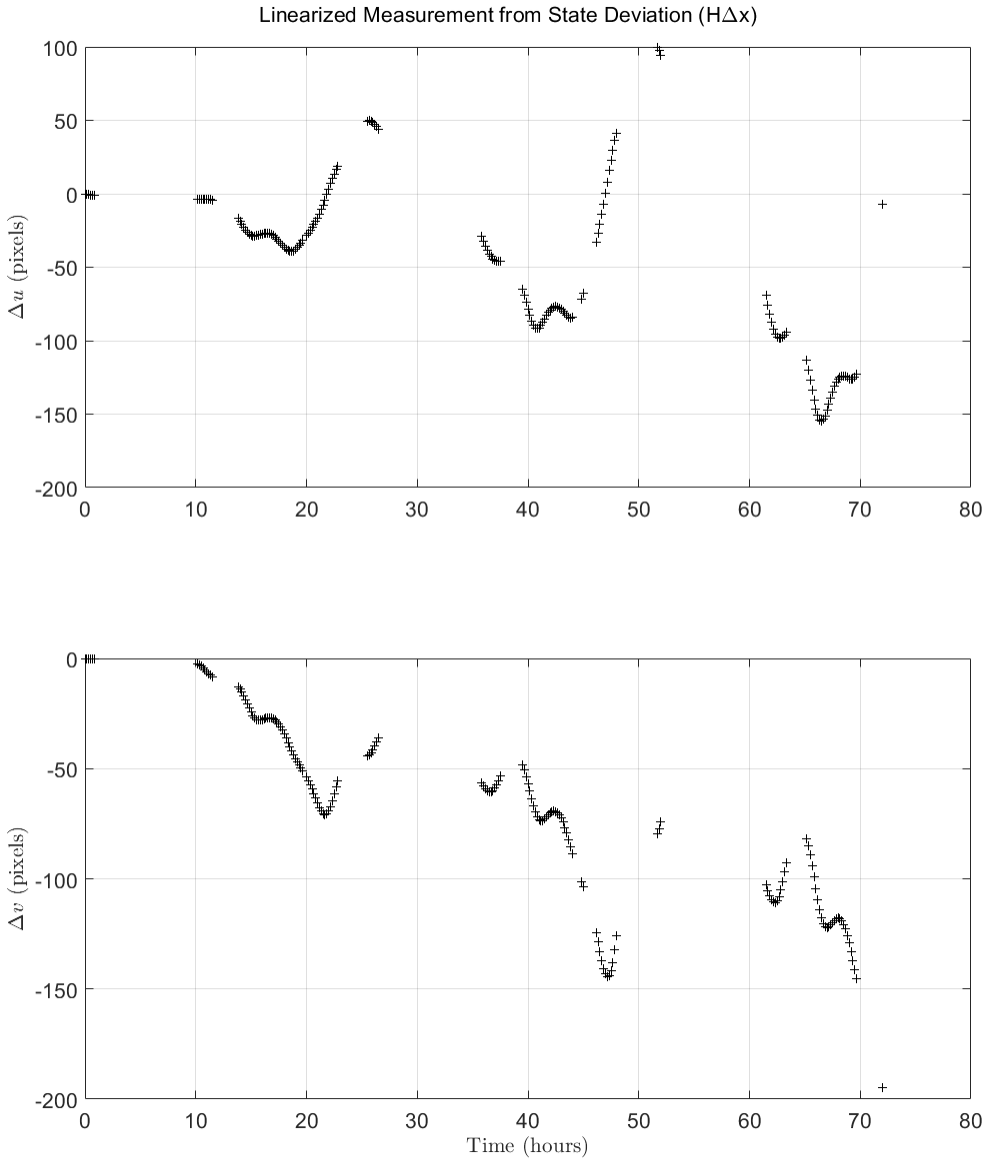

Figure 4: Linearized measurements obtained as $H\Delta\mathbf{X}$, where $\Delta\mathbf{X}$ is the state deviation, shown for landmark no. 1. $\Delta\mathbf{X}(t_0)$ in Equation 1 is used.