

# **Modeling and Control System Synthesis of Tunneling Accelerometer by MatLab Simulation**

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## **Abstract**

In this paper, the function model of the tunneling accelerometer is constructed by MatLab Simulink. On small input signal approximation, the tunneling current and electrostatic actuator nonlinear blocks are analyzed and linearized. From the derived relation between open and close loop transfer functions, a simple but effective way to design control system is synthesized. By choosing a control system, the accelerometer bandwidth is broadened and the damping is enhanced. The system stability, root locus, step response, gain and phase margin, and pole-zero distribution are all plotted and discussed. With the designed control and feedback systems, a close loop system is stable on both parameter disturbance and frequency response. Compared with the real system at 50 ng/ $\sqrt{\text{Hz}}$  noise level, tunneling accelerometer characteristics, such as exponential relationship between tunneling current and displacement change, time history record, dynamics and frequency response are also presented.