Experimental bifurcation analysis—Continuation for noise-contaminated zero problems

Noise contaminated zero problems involve functions that cannot be evaluated directly, but only indirectly via observations. In addition, such observations are affected by a non-deterministic observation error (noise). We investigate the application of numerical bifurcation analysis for studying the solution set of such noise contaminated zero problems, which is highly relevant in the context of equation-free analysis (coarse grained analysis) and bifurcation analysis in experiments, and develop specialized algorithms to address challenges that arise due to the presence of noise. As a working example, we demonstrate and test our algorithms on a mechanical nonlinear oscillator experiment using control based continuation, which we used as a main application and test case for development of the Coco compatible Matlab toolbox Continex that implements our algorithms.

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