Sensitivity Analysis, Model Reduction, and Circadian Oscillators

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Sensitivity analysis is a powerful tool that enables model development, parameter estimation, design optimization and experimental design in a wide range of areas of science and engineering. In this lecture we examine the forward and adjoint methods for sensitivity analysis applied to differential-algebraic equation systems and show how they can be extended to address some interesting problems in the study of the generation of circadian rhythms. Then we show how sensitivity analysis can be used in the development of reduced order models for biochemical systems that preserve important qualitative properties such as the phase response behavior of a circadian oscillation.