

# Optimization and Differential Equations

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Optimization and Differential Equations are two separate areas with a rich and still growing body of theory, numerical techniques, and applications. Once a physical system can be modeled and simulated it is often desired to optimize performance which leads to the combination of the two areas. In many cases this mingling is straightforward. In other cases it leads to new behavior which requires modification of the usual theory and algorithms.

The first part of this talk will survey several of the ways that these two areas meet and intermingle. To limit the scope we shall focus on problems in optimal control. In the second portion of the talk we shall give some examples where the interaction between optimization and numerical methods for differential equations required modifications of the existing theory. In particular, we shall see that when optimization is present, the choice of numerical optimization technique can require alterations of the classical numerical theory for differential equations.