Center for Aerospace Structures Seminar

A general framework for mathematical optimization

by

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Mathematical optimization is encounter in many scientific and engineering fields. The task of optimizing a given function by finding the set of input parameters given a feasible set, *i.e.* constraint set, can be often daunting due to the complex nature of mathematical optimization problems. Advanced optimization tools are often required to find the optimal and feasible set of input parameters that achieve desired performance. However, most mathematical optimization tools are suited for problems with moderate size input and constraint sets. Furthermore, for large-scale mathematical optimization problems, algorithms' performance decays due to the ineffective management and storage of internal data structures.

This work presents a general framework for mathematical optimization that enabled the development of a stand-alone C++ matrix-free mathematical optimization tool. This stand-alone tool provides a range of numerical methods suited for gradient- and nongradient-based optimization, linear and nonlinear mathematical programming, and unconstrained and constrained optimization. The matrix-free design enables the effective management and storage of internal data structures and facilitates the solution of large-scale mathematical optimization problems. Further, the linear algebra interface is designed to enhance performance by providing a wrapper suited for arbitrary application of external data structures. Thus, parallelization of internal linear algebra operations is easily achieved through this linear algebra interface.

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Onizuka Conference Room

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