Real-time Embedded Convex Optimization

Stephen P. Boyd

Electrical Engineering Department,
Stanford University, 94305 Stanford, CA, USA
E-mail: boyd@stanford.edu.

Abstract: This talk concerns the use of convex optimization, embedded as part of a larger system that executes automatically with newly arriving data or changing conditions, in areas such as automatic control, signal processing, real-time estimation, real-time resource allocation and decision making, and fast automated trading. Such systems are already in use in applications such as model predictive control or supply chain optimization, with sample times measured in minutes (or longer); our focus is on systems with much faster dynamics, with execution times measured in milliseconds or microseconds for small and medium size problems. We describe a preliminary implementation of an automatic code generation system, which scans a description of the problem family and performs much of the analysis and optimization of the algorithm, such as choosing variable orderings used with sparse factorizations, at code generation time; compiling the generated source code yields an extremely efficient custom solver for the problem family.