Distributed Embedded Convex Optimization
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1 Overview

This work concerns the use of convex optimization in high-speed, real-time embedded systems. We have created an automatic code generator, CVXGEN, which automatically generates compilable, library-free C code from a high level description of a convex optimization problem. This opens up many new applications for real-time convex optimization, such as signal processing, automatic control, estimation, resource allocation, and decision making.

A related area of investigation has been algorithms for distributed optimization. Distributed optimization allows us to divide up computation of more complicated problems across multiple processing cores for faster computation. We have studied methods such as Alternating Directions Method of Multipliers, which provide a framework for decomposing convex optimization problems. Each subproblem can be solved completely in parallel, and the cores only need to communicate very simple messages during processing. With ever growing size and complexity of databases and information, using distributed optimization is increasingly becoming important to a wide range of problems in control, machine learning, portfolio optimization, network flow and scheduling. This will allow many of these problems (that have traditionally been considered slow) to be solved very fast and in real-time.

2 Stanford Personnel

3 Talks

Stephen Boyd gave many presentations on real-time convex optimization, and embedded optimization, including a plenary lecture at the 2011 Multiconference on Systems and Control in Denver, CO. He also gave many presentations on distributed optimization, including a talk at the Stanford statistics seminar.

References

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