MPC Related Computational Capabilities of ARMv7A Processors

In recent years, the mass market of mobile devices has pushed the demand for increasingly fast but cheap processors. ARM, the world leader in this sector, has developed the Cortex-A series of processors with focus on computationally intensive applications. If properly programmed, these processors are powerful enough to solve the complex optimization problems arising in MPC in real-time, while keeping the traditional low-cost and low-power consumption. This makes these processors ideal candidates for use in embedded MPC. In this paper, we investigate the floating-point capabilities of Cortex A7, A9 and A15 and show how to exploit the unique features of each processor to obtain the best performance, in the context of a novel implementation method for the linear-algebra routines used in MPC solvers. This method adapts high-performance computing techniques to the needs of embedded MPC. In particular, we investigate the performance of matrix-matrix and matrix-vector multiplications, which are the backbones of second- and first-order methods for convex optimization. Finally, we test the performance of MPC solvers implemented using these optimized linear-algebra routines.

General information
Publication status: Published
Organisations: Department of Applied Mathematics and Computer Science, Scientific Computing, Center for Energy Resources Engineering
Contributors: Frison, G., Jørgensen, J. B.
Pages: 3414-3421
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the European Control Conference (ECC 2015)
Publisher: IEEE
ISBN (Print): 978-3-9524269-3-7
DOI: 10.1109/ECC.2015.7331062
Source: PublicationPreSubmission
Source ID: 113792329
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2015 › Research › peer-review