



## Iterative Methods for MPC on Graphical Processing Units

**Gade-Nielsen, Nicolai Fog; Jørgensen, John Bagterp; Dammann, Bernd**

*Published in:*  
Proceedings of the 17th Nordic Process Control Workshop

*Publication date:*  
2012

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Gade-Nielsen, N. F., Jørgensen, J. B., & Dammann, B. (2012). Iterative Methods for MPC on Graphical Processing Units. In J. B. Jørgensen, J. K. Huusom, & G. Sin (Eds.), Proceedings of the 17th Nordic Process Control Workshop (pp. 161). Kogens Lyngby: Technical University of Denmark (DTU).

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## Iterative Methods for MPC on Graphical Processing Units

Nicolai Fog Gade-Nielsen\*, John Bagterp Jørgensen\*  
Bernd Dammann\*

\* *DTU Informatics, Technical University of Denmark*  
(*{nfga, jbj}@imm.dtu.dk*)

---

### Abstract:

The high floating point performance and memory bandwidth of Graphical Processing Units (GPUs) makes them ideal for a large number of computations which often arises in scientific computing, such as matrix operations. GPUs achieve this performance by utilizing massive parallelism, which requires reevaluating existing algorithms with respect to this new architecture. This is of particular interest to large-scale constrained optimization problems with real-time requirements.

The aim of this study is to investigate different methods for solving large-scale optimization problems with focus on their applicability for GPUs. We examine published techniques for iterative methods in interior points methods (IPMs) by applying them to simple test cases, such as a system of masses connected by springs. Iterative methods allows us deal with the ill-conditioning occurring in the later iterations of the IPM as well as to avoid the use of dense matrices, which may be too large for the limited memory capacity of current graphics cards.

*Keywords:* Model based control, Predictive control, Optimization, Iterative methods, Graphical Processing Unit

---