C code generation applied to nonlinear model predictive control for an artificial pancreas - DTU Orbit (17/12/2018)

This paper presents a method to generate C code from MATLAB code applied to a nonlinear model predictive control (NMPC) algorithm. The C code generation uses the MATLAB Coder Toolbox. It can drastically reduce the time required for development compared to a manual porting of code from MATLAB to C, while ensuring a reliable and fairly optimized code. We present an application of code generation to the numerical solution of nonlinear optimal control problems (OCP). The OCP uses a sequential quadratic programming algorithm with multiple shooting and sensitivity computation. We consider the problem of glucose regulation for people with type 1 diabetes as a case study. The average computation time when using generated C code is 0.21 s (MATLAB: 1.5 s), and the maximum computation time when using generated C code is 0.97 s (MATLAB: 5.7 s). Compared to the MATLAB implementation, generated C code can run in average more than 7 times faster.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Scientific Computing
Contributors: Boiroux, D., Jørgensen, J. B.
Pages: 327-332
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 2017 21st International Conference on Process Control
Publisher: IEEE
ISBN (Print): 978-1-5386-4011-1
(2017 21st International Conference on Process Control (pc)).
Keywords: MATLAB, Sensitivity, Optimization, Diabetes, Sugar, Approximation algorithms, Mathematical model
DOI: 10.1109/PC.2017.7976235
Source: FindIt
Source-ID: 2372401149
Research output: Research - peer-review › Article in proceedings – Annual report year: 2017