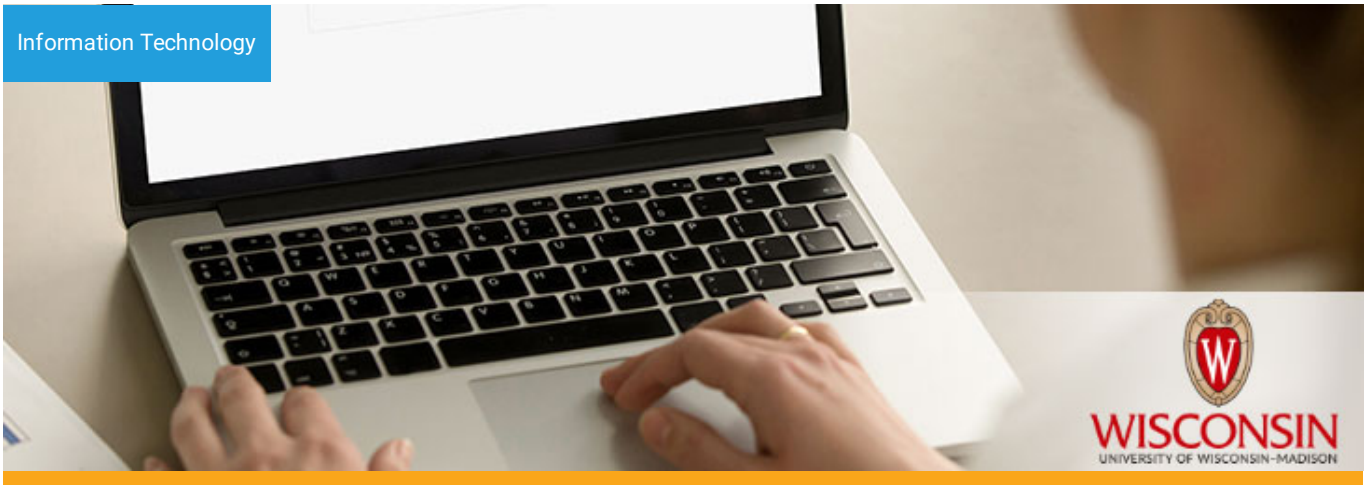
Information Technology



SISO Model Predictive Controller

View U.S. Patent No. 7,400,933 in PDF format.

WARF: P04113US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a fast, easily tuned controller specifically tailored to SISO processes.

Overview

Currently, most single-input, single-output (SISO) systems use a proportional, integral, derivative (PID) controller. The PID controller is simple, fast, and easily implemented on simple computing hardware; however, it is also difficult to tune; falls short in setpoint tracking accuracy and disturbance rejection; lacks robustness when the system and system model are mismatched; and has difficulty handling system constraints.

Most large-scale processes with multiple-inputs, multiple-outputs (MIMO) systems use model-based control methods such as linear quadratic (LQ) control or model predictive control (MPC). Model-based control methods explicitly optimize the process, can handle complex multivariable processes and account for constraints; however, they are slow, difficult to implement on simple computing hardware and hard to tune.

The Invention

UW-Madison researchers have developed a fast, easily tuned controller specifically tailored to SISO processes. The controller combines the best features of model-based control methods and PID controllers and performs better than PID controllers on all SISO processes.

This offset-free, constrained, linear quadratic (CLQ) controller has three modules: a state and disturbance estimator, a target calculation and a constrained dynamic optimization. Each of the modules is implemented efficiently so that the overall CLQ algorithm has little computational cost and can be applied using simple hardware and software.

Applications

- Controling SISO processes

Key Benefits

- Fast execution – makes control decisions quickly
- Easily tuned
- Can be implemented on simple computing hardware
- Optimizes control behavior
- Superior to PID controllers on all SISO processes
- Especially exceeds performance of PID controllers for systems with large time delays; setpoints that are or become unreachable due to constraints on the manipulated variable; complex, high-order dynamics; or significant measurement and process noise

Tech Fields

- Information Technology : Computing methods, software & machine learning
- Information Technology : Hardware

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842