Part II

OVERVIEW OF INDUSTRIAL MPC TECHNIQUES
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Chapter 1

INTRODUCTION TO MODEL PREDICTIVE CONTROL

1.1 BACKGROUND FOR MPC DEVELOPMENT

Two main driving forces for a new process control paradigm in the late 70’s ~ early 80’s:

- Energy crisis + global competition + environmental reg.
  \[ \downarrow \]
  - process integration
  - reduced design / safety margin
  - real-time optimization
  - tighter quality control
  \[ \downarrow \]
  \textit{higher demand on process control.}

- (Remarkable) advances in microprocessor technology.
Industry’s response ⇒ MPC

1.2 WHAT’S MPC

It’s a computer control system.
It's a computer control system consisting of an observer & an optimizer.

The optimization is based on prediction of future behavior of y.

MPC (software packages) is sold under different names:

- DMC (Dynamic Matrix Control, now AspenTech)
- IDCOM (Setpoint, now AspenTech)
- SMCA (Setpoint, now AspenTech)
- RMPCT (Honeywell)
- PCT (Profimatics)
It’s major features are

- model based
- \textit{explicit} prediction of future system behavior
- \textit{explicit} consideration of constraints
- use of on-line mathematical programming
- receding horizon control: repeated computation of open-loop optimal trajectory with feedback update $\Rightarrow$ implicit \textit{feedback} control.

1.3 WHY MPC?

Difficult elements for process control:

- delay, inverse response
- interaction