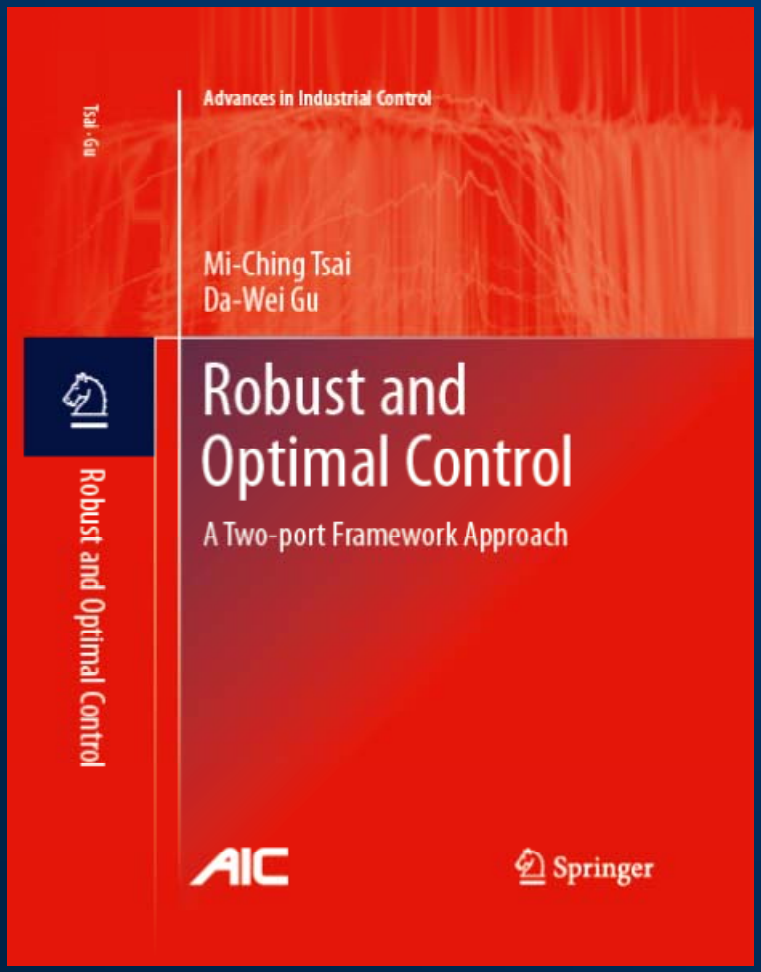


Robust and Optimal Control

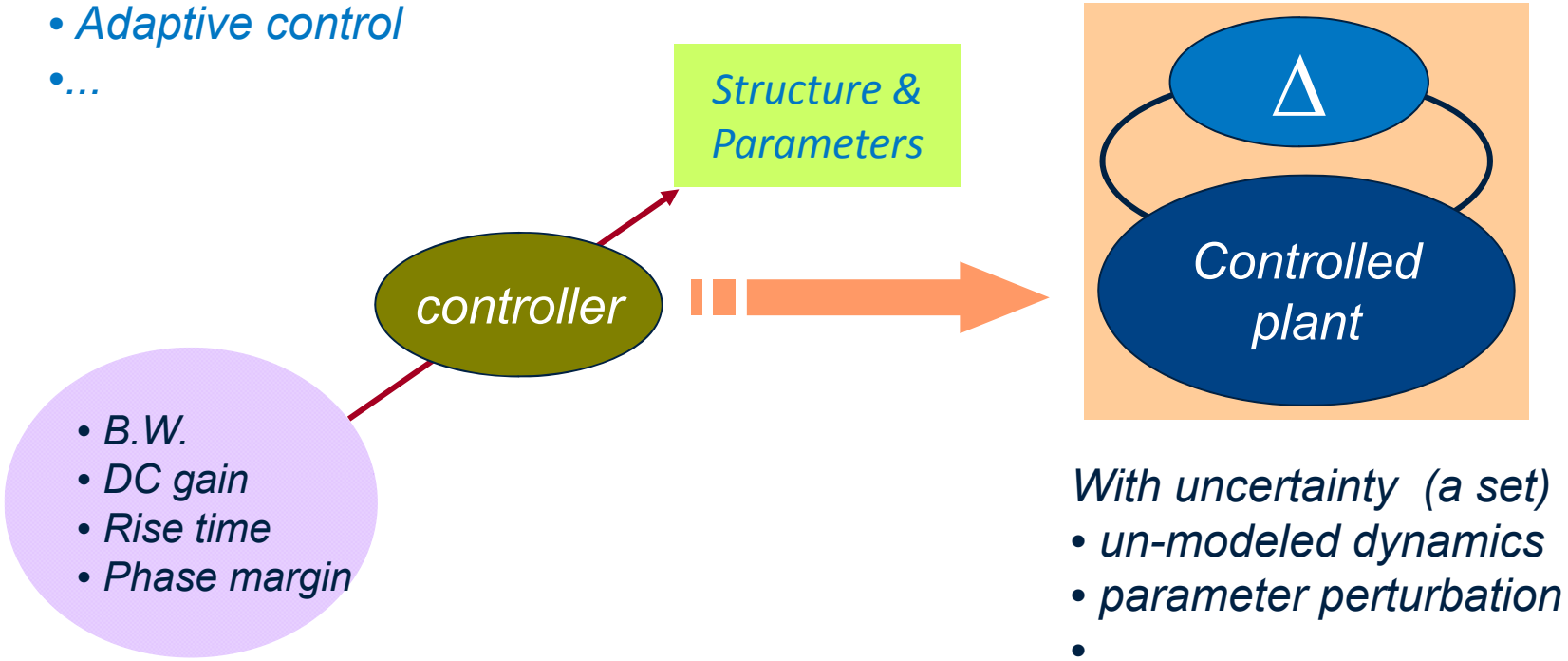
A Two-port Framework Approach

CSD approach to Stabilizing Controllers

A Introduction to Robust Control Synthesis

Control Design

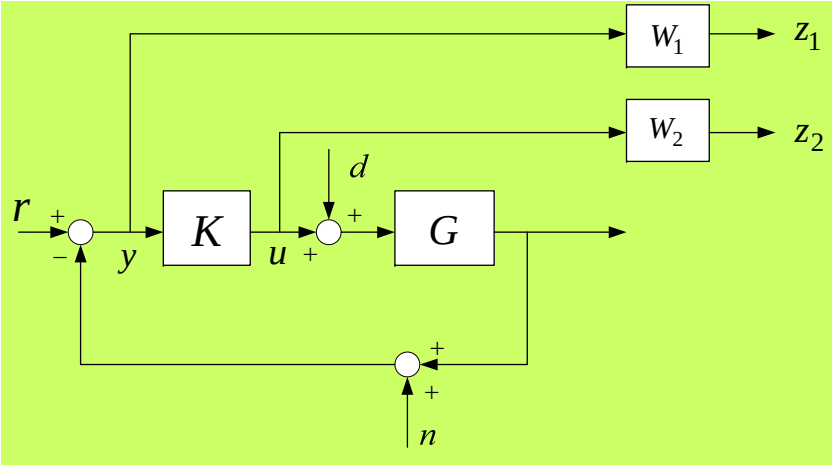
- *Robust control*
- *Adaptive control*
- *...*

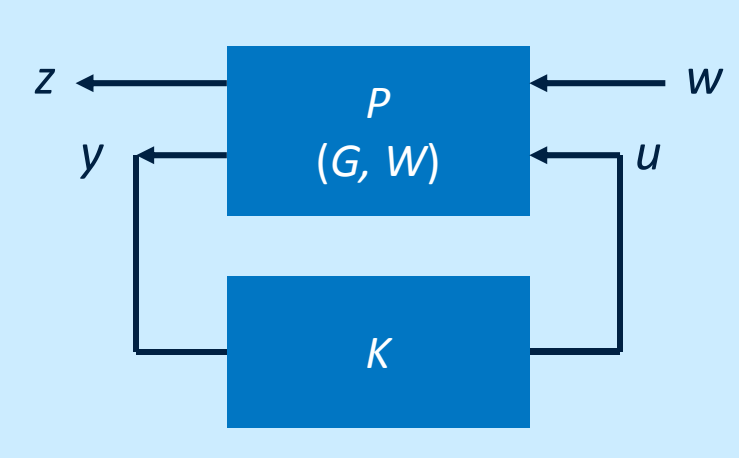


With uncertainty (a set)
- *un-modeled dynamics*
- *parameter perturbation*
- *...*

- *H_∞ control: to minimize the infinity-norm* $\|G\|_\infty = \sup_\omega \bar{\sigma}\left(G(j\omega)\right)$

Issues on Control Synthesis and Design





MIMO system / Multiple objectives.

$$T_{zw} = LFT_l(P,K)$$
$$= P_{11} + P_{12}K(I - P_{22}K)^{-1}P_{21}$$

Control Synthesis

To find a *K* such that the performance index can be guaranteed.

Performance Index ?

- *B.W.*
- *DC gain*
- *Rise time*
- *Phase margin*

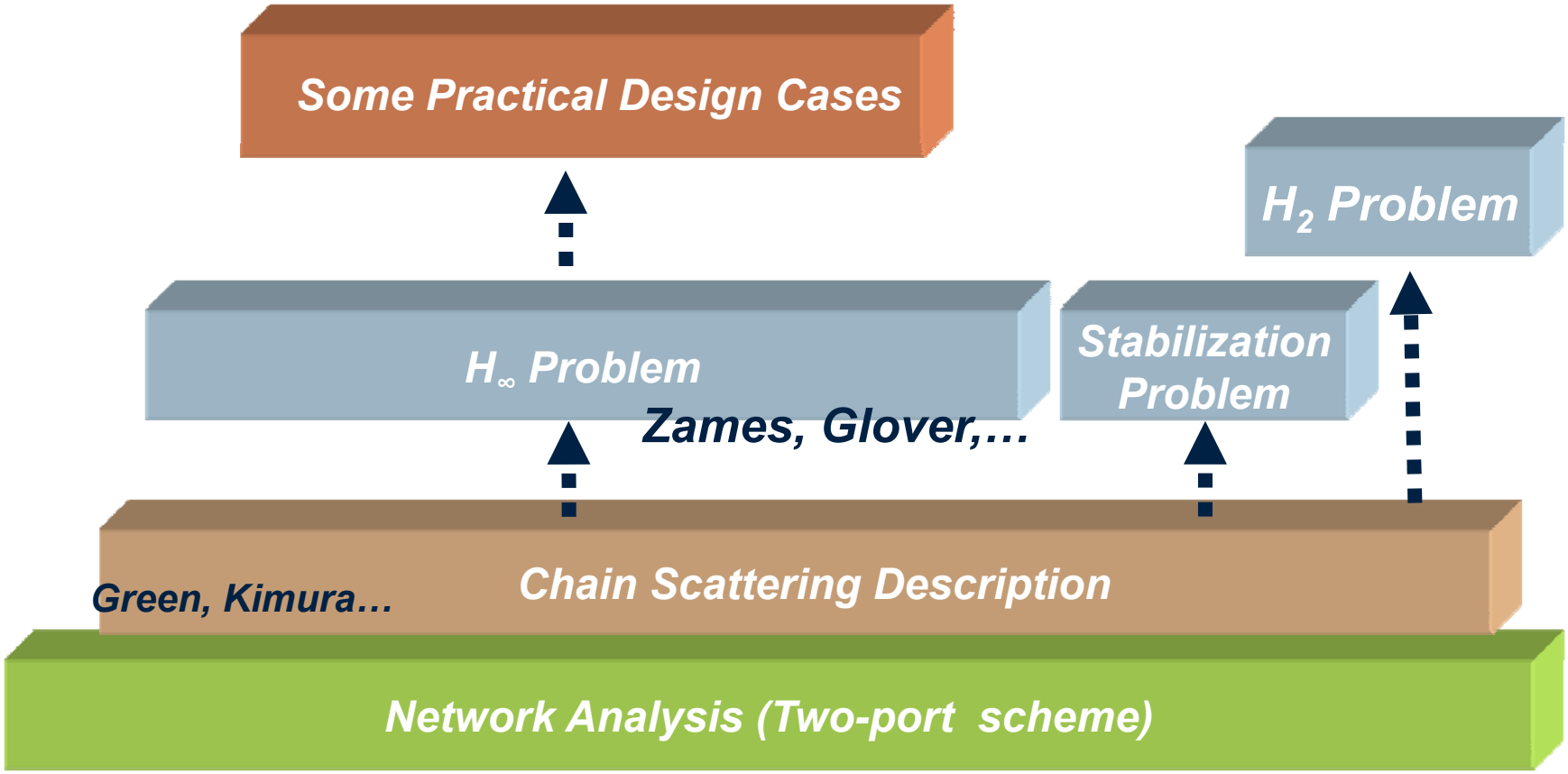
Note:

1. P is a generalized plant. (SCC plant)

2. P may contain weighting functions and controlled plant.

3. P's order = Controller order

An Overview


Some Practical Design Cases
H_2 Problem
H_∞ Problem
Stabilization Problem
Zames, Glover,…
Green, Kimura…
Chain Scattering Description
Network Analysis (Two-port scheme)