**Overview**

- **What?** Powerful, simple method for control of nonlinear systems to achieve decoupling, linearization and disturbance rejection.
- **Why?** Existing techniques are very complex (e.g. feedback linearization) and not widely used in industrial settings.
- **How?** Simple manipulated variable (MV) transformations, also for systems with relative order > 1.
- **Outcome?** Several case studies, including pH control and polymerization. Simple CSTR Case Study is presented here.

**CSTR Case Study**

- System with relative order 2 ($Q$ to $c_A$)
- Simple transforms:
  - Input 1 Calc.: $v = f - A_1 c_A$, where $f = RHS$ of mass balance eqn. ($dc_A/dt$)
  - Input 2 Calc.: $v_2 = g - A_2 T$, where $g = RHS$ of energy balance eqn. ($dT/dt$)
- $A_1$ and $A_2$ serve as tuning parameters.
- Transformed system becomes linear.

**Disturbance of Feed Temperature**

Block diagram below: transformed system = red box.

**Disturbance of Feed Concentration & Set-point Change**

Figure left: comparison of control schemes for disturbance of $\Delta c_A = +0.1 \text{ kmol/m}^3$ or set-point change at $t = 10 \text{ min}$.

**Conclusion & Further Work**

- Superior performance than PI-only control for all disturbances.
- Set-point tracking as good as PI-only control.
- Performance is enhanced in a very simple, powerful change to the system and proven to work without an exact process model.

- **Further work:** Work on multiple-input multiple-output (MIMO) systems with relative order > 1.