PID vs LQR Control Technique

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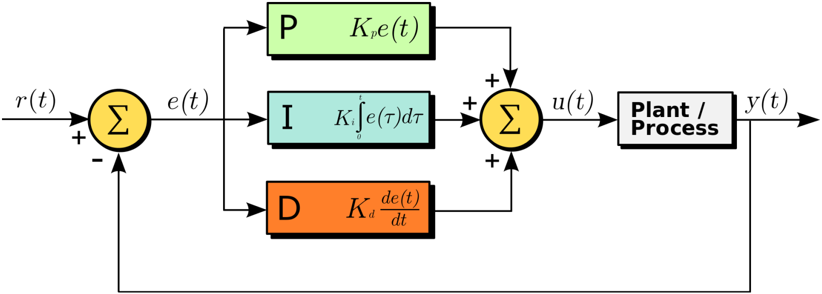
Agenda for Discussion

1. PID control technique
2. Advantages of PID
3. PID Limitations
4. State Space Modelling

PID Control Technique



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[1] By Arturo Urquizo - http://commons.wikimedia.org/wiki/File:PID.svg

Advantages PID

- The System is treated as Black Box.
- Allows observtion based tuning, even without the knowledge of exact dynamics.
- You need only the measurement of the variable you want to control.
- PID is most widely used controller in the industrial processes.

PID Limitations

- The System is treated as Black Box (Ironical !! isn't it ??).
- The System is assumed to be Controllable/Stabilizable.
- The controller designed is not an optimal controller always.
- Three variables need to be tuned for each control variable/objective.
- The variables are interlinked and change in any one will affect all the desired specs.
- The tuning is mostly hit and trial.

Solution ??

State Space Modelling

The general state space representation of a continuous time invariant linear dynamical system is

$$\dot{x}(t) = Ax(t) + Bu(t),$$
$$y(t) = Cx(t) + Du(t),$$

where $x(t) \in \mathcal{R}^n$ and $u(t) \in \mathcal{R}^m$, $y(t) \in \mathcal{R}^p$, $A \in \mathcal{R}^{n\times n}$, $B \in \mathcal{R}^{n\times m}$, $C \in \mathcal{R}^{p\times n}$ and $D \in \mathcal{R}^{p\times m}$

States: Minimum no. of variable required at time $t = 0$ combined with input information to completely define the system behavior for time $t \geq 0$ is known as states.

A typical non linear system in its state space form is represented as

$$\dot{x}(t) = f(t, x(t), u(t)),$$
$$y(t) = h(t, x(t), u(t))$$

How to get system model??

Thank You

Thank You!