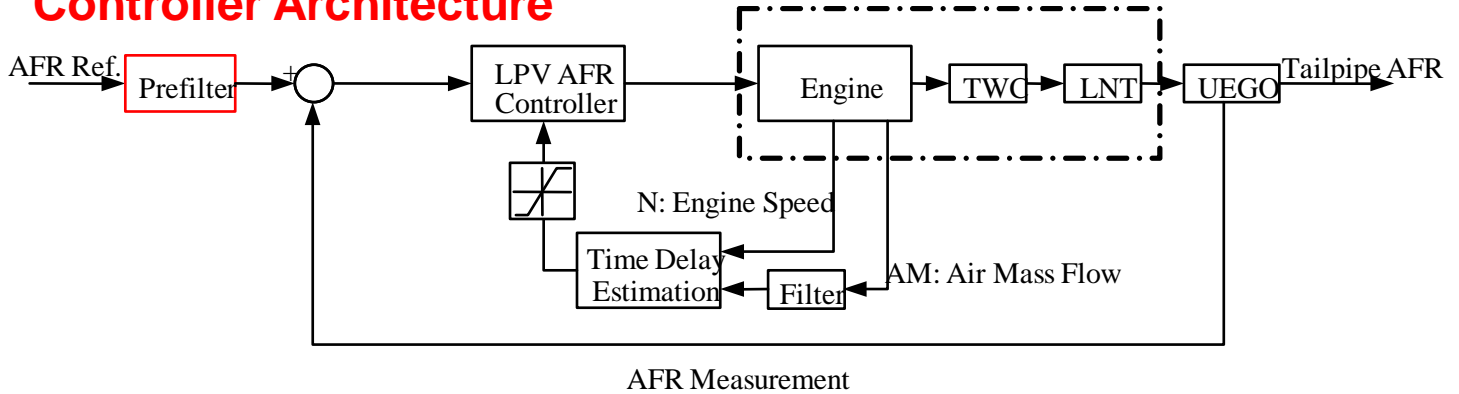


# Lean NO<sub>x</sub> Trap Gain Scheduled Control

## Research Summary:

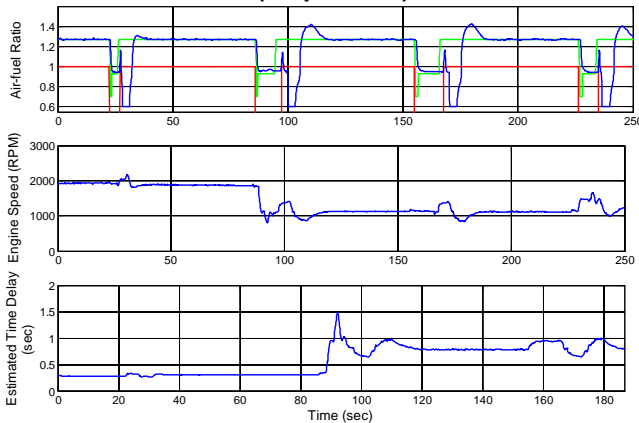
Demonstrated is the linear parameter varying (LPV) control for Lean Operation in SI engines. **The objective is to maximize A/F ratio regulating performance despite variations in engine speed and transport delay.** The control solution provides the systematic design of a low complexity gain scheduled controller using LPV methods.

## Controller Architecture

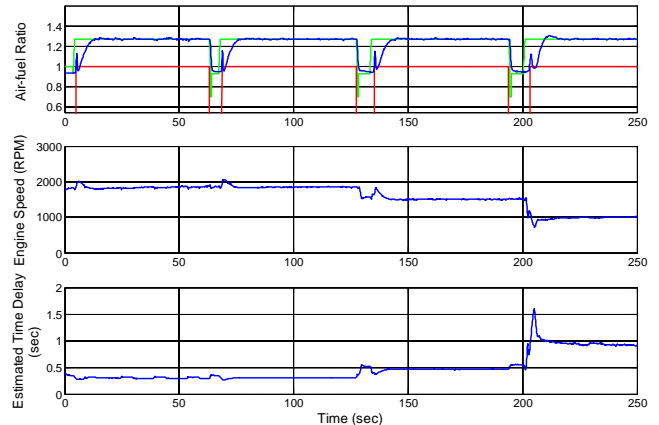


## Results

**Ford Controller  
(no prefilter)**



**UH Controller  
(no prefilter)**



## UH LPV Controller

$$K(s) = K_g \frac{\left( \frac{s}{T_z} + 1 \right)}{\left( \frac{s}{T_p} + 1 \right)}$$

$$\tau = \left[ \frac{120}{n} + \frac{1.831}{\dot{m}_a} \right] (\text{sec})$$

$$T_z = 2.0010 \left( \frac{1}{\tau} \right) - 0.0005$$

$$T_p = 0.1030\tau^3 - 0.6736\tau^2 + 1.5683\tau + 0.1984$$

$$K_g = 0.1807 \left( \frac{1}{\tau} \right)^3 - 0.6701 \left( \frac{1}{\tau} \right)^2 + 0.8173 \left( \frac{1}{\tau} \right) - 0.0133$$

## Prefilter & Robust Control

