

EENG307: Time Response of First Order Systems¹

Lecture 10

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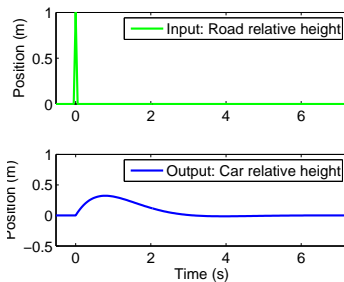
² Developed and edited by Tyrone Vincent and Kathryn Johnson, Colorado School of Mines, with contributions from Salman Mohagheghi, Chris Coulston, Kevin Moore, CSM and Matt Kupilik, University of Alaska, Anchorage

Suspension Impulse Response

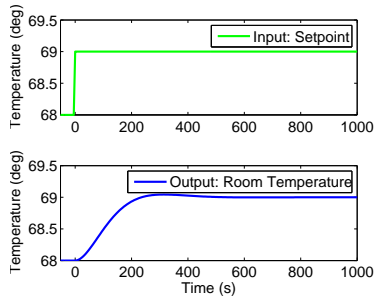


source:

http://upload.wikimedia.org/wikipedia/commons/5/5b/Porsche_911SC_Slantnose_1982_2.jpg



Temperature Regulator Response

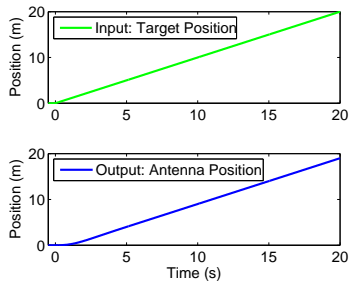


Tracking Response

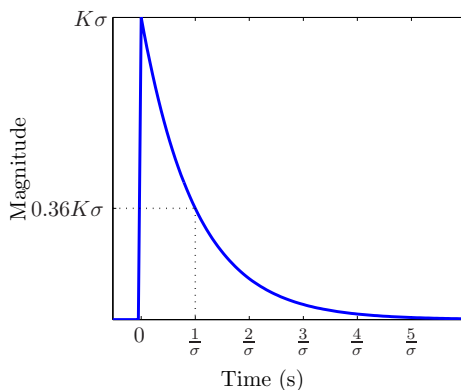


Source:

http://commons.wikimedia.org/wiki/File:C-band_Radar-dish_Antenna.jpg



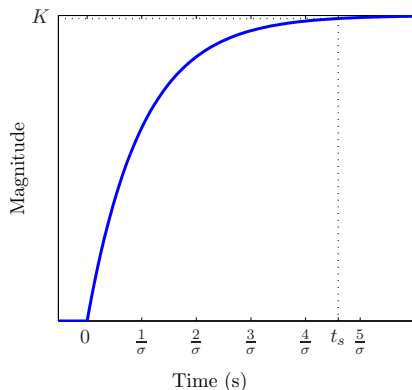
Impulse Response Plot



Definition

The *time constant* of a first order system is $\tau = \frac{1}{\sigma}$, and is the time for the impulse response - the magnitude of the output signal in response to an impulse input - to decay by 64%.

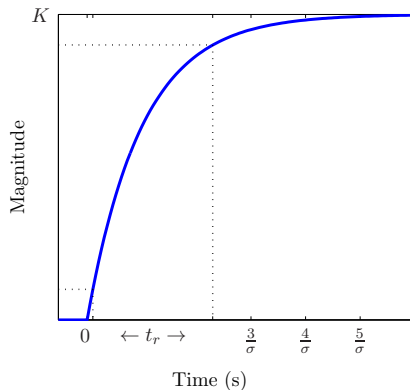
Step Response Settling Time



Definition

The step response *settling time* is the time for the step response - the magnitude of the output signal in response to a step input - to go reach within 1% of the final value, and for a first order system $t_s = \frac{4.6}{\sigma}$

Step Response Rise Time



Definition

The step response *rise time* is the time for the step response to go from 10% to 90% of its final value, and for a first order system $t_r = \frac{2.2}{\sigma}$