Adaptive Control

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Adaptive Control, a thirty-year old field, is an advanced control method that is becoming increasingly popular in various engineering applications. The ability to self-correct a controller in the presence of uncertainties using online information is its main and most compelling feature. This course will lay out the foundation of adaptive control in continuous-time and discrete-time systems. Examples from aerospace, propulsion, automotive, and energy systems will be used to elucidate the underlying concepts.

Grade distribution: Homework: 20%; Midterm: 40%; Project: 40%

Textbook: *Stable Adaptive Systems*, K.S. Narendra and A.M. Annaswamy, Dover Publications, 2004.

Additional notes will be distributed throughout the semester.

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Class Website: `http://www.mit.edu/~tgibson/teaching`

Lectures

Lecture #	Topic	Date
0	Introduction	February 6
1	Simple Adaptive Systems: Identification	Feb 11
2	Simple Adaptive Systems: Control	Feb 13
3	Simple Adaptive Systems: Transient Performance and Design	Feb 18
4	Simple Adaptive Systems: Transient Performance and Design	Feb 20
5	States Accessible: Identification	Feb 25
6	States Accessible: Control	Feb 27
7	Adaptive PI Control	March 4
8	Adaptive PID Control	March 6
9	Adaptive PID Control	March 11
10	Parameter convergence and persistent excitation	March 13
11	Parameter convergence and persistent excitation	March 18
12	Adaptive Control - Output Feedback	March 20
13	Robust Adaptive Control - Disturbances	April 1
14	Robust Adaptive Control - Disturbances	April 3
15	Robust Adaptive Control -Time-varying Parameters	April 8
16	Robust Adaptive Control -Time-varying Parameters	April 10
17	Robust Adaptive Control -Unmodeled Dynamics	April 15
18	Robust Adaptive Control - Unmodeled Dynamics	April 17
19	High-order Tuners	April 22
20	Back stepping methods	April 29
21	Adaptive Control in the Presence of Saturation	May 1
22	Adaptive Control and Improved Transient Response	May 3
23	Adaptive Switching Systems	May 6
24	Adaptive nonlinear control	May 8
25	Project presentations	May 13
26	Project presentations	May 15