Adaptive Control of 2-Link Manipulator

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Background

- Using Julia programming language, developed at MIT
  - https://julialang.org/
- Also using the JuliaRobotics suite, developed by Robot Locomotion Group
  - http://www.juliarobotics.org/
  -
- Source code hosted at: https://github.com/Lukeroberto/2.152_project

Double Integrator

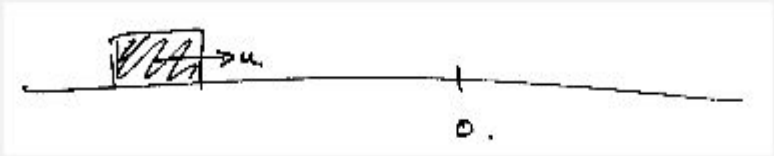

Figure 8.1 - The double integrator as a unit-mass brick on a frictionless surface

$$m\ddot{x} = \tau$$

Model

$$\tau = \hat{m}(\ddot{x}_d - 2\lambda\dot{\tilde{x}} - \lambda^2\tilde{x})$$

$$\dot{\hat{m}} = -\gamma v s$$

Control/Adaptation Law

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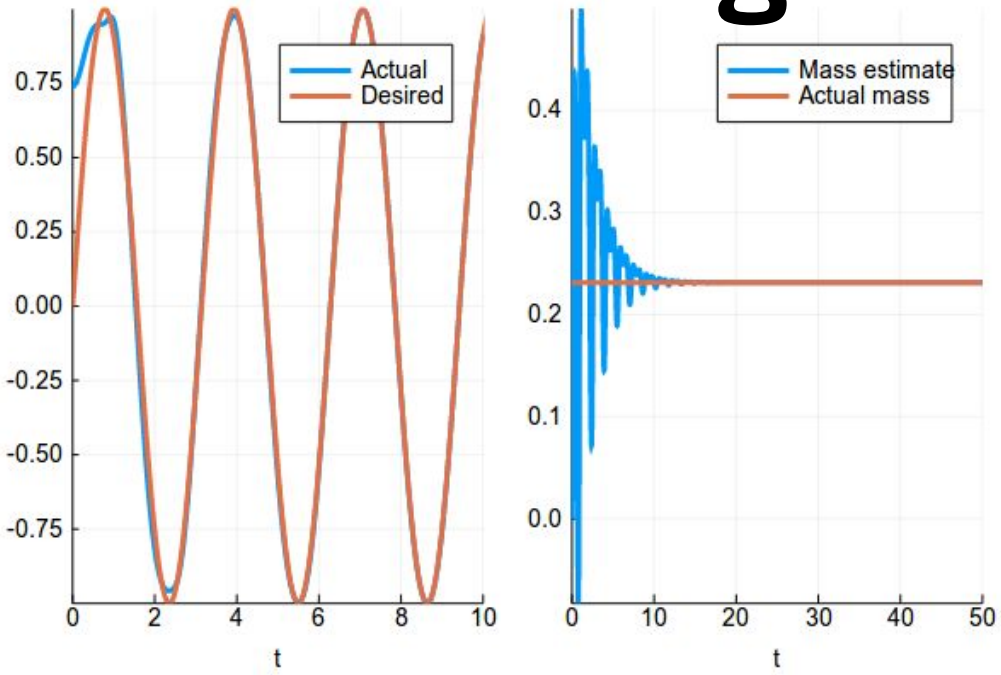
*http://underactuated.csail.mit.edu/underactuated.html?chapter=dp

Double Integrator



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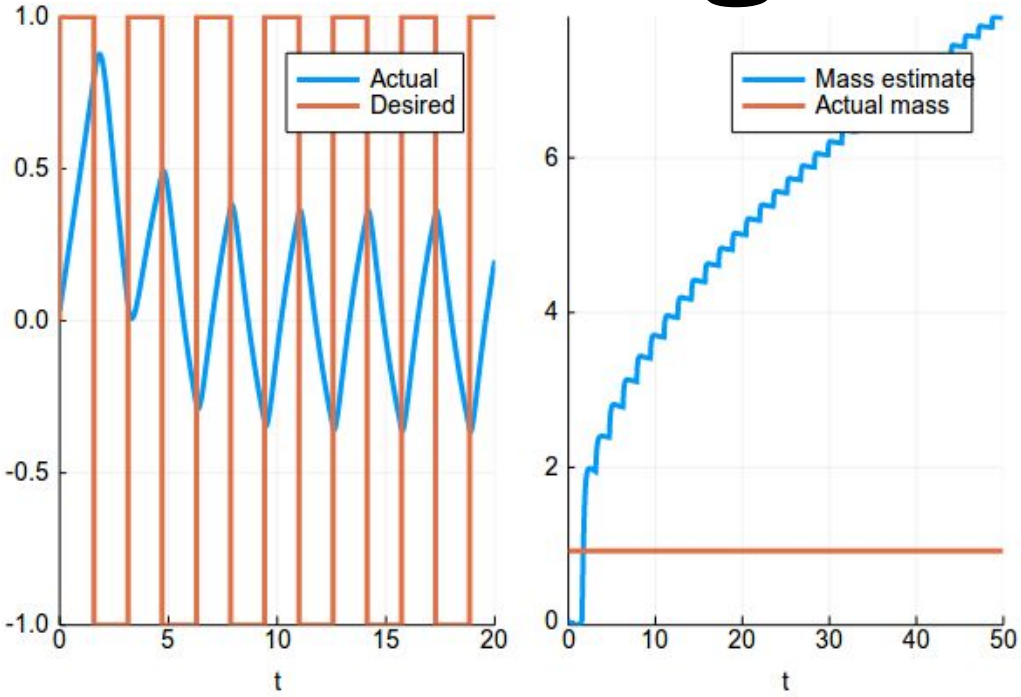
Double Integrator



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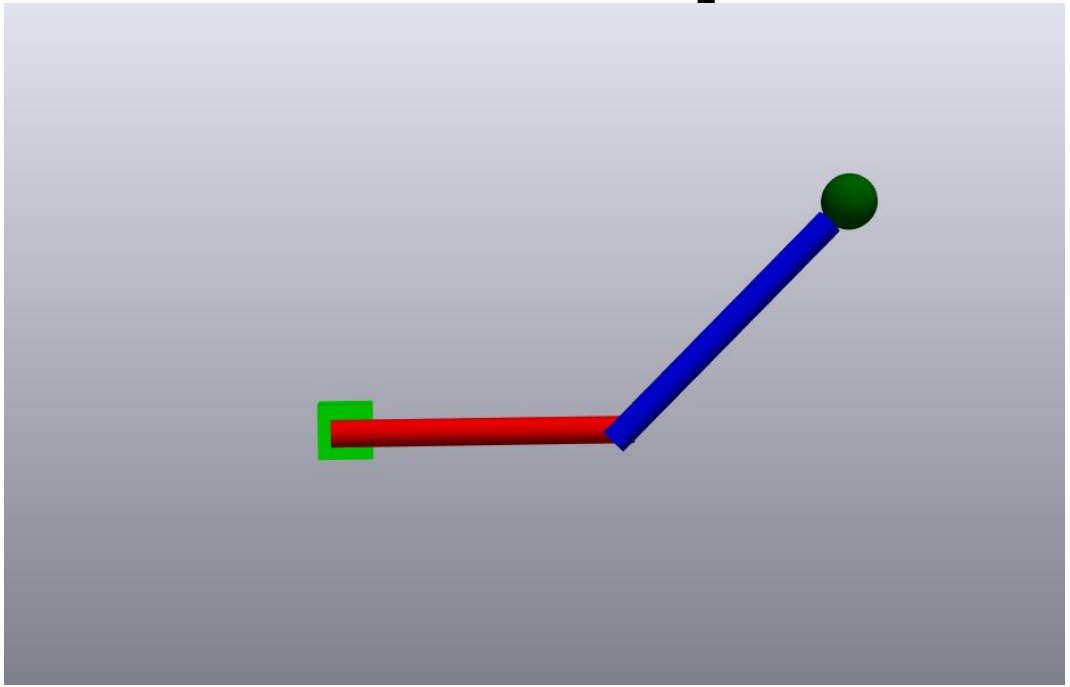
2-Link Manipulator



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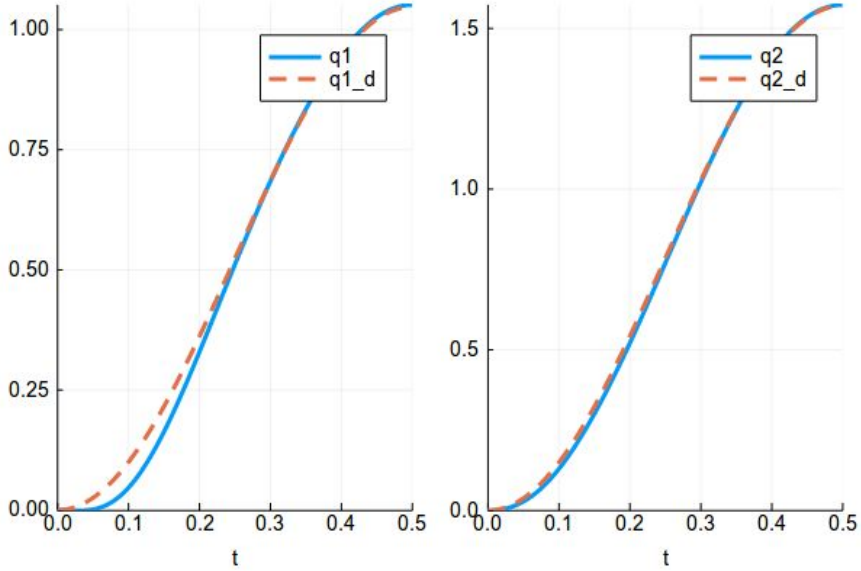
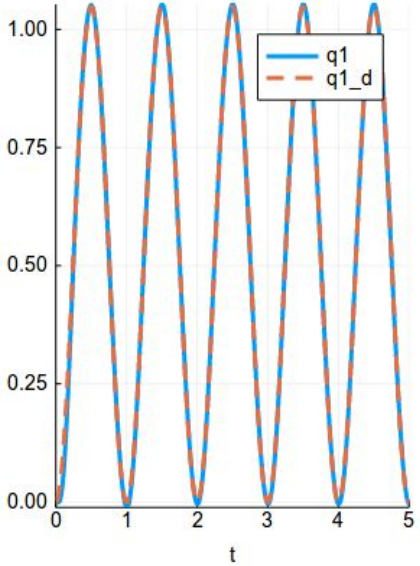
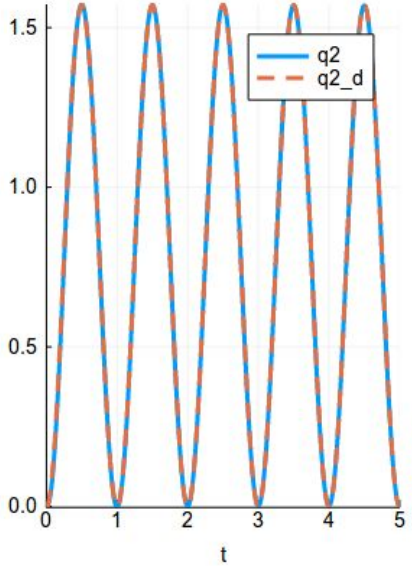
2-Link Manipulator







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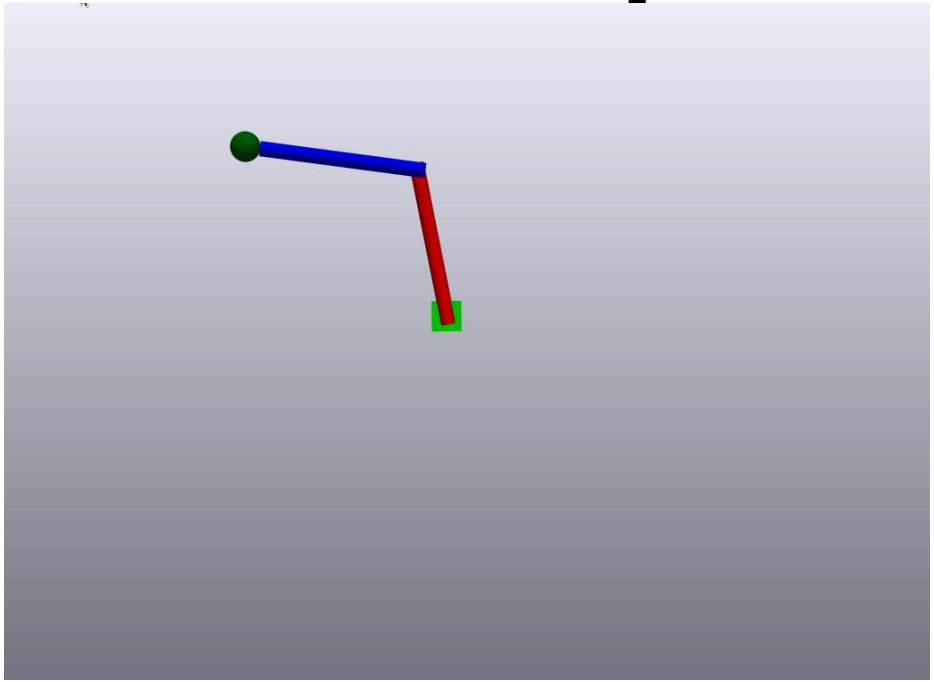
2-Link Manipulator



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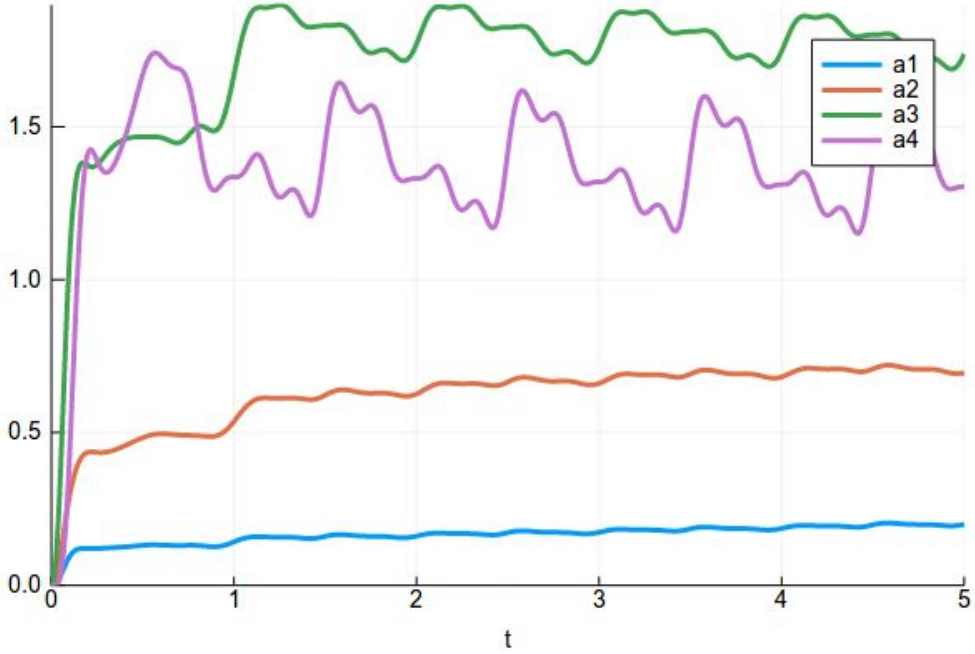
Composite Adaptation

- these estimates fluctuate quite a bit
- composite adaptation lets us extract information not only from our trajectory error, but from other knowns in the model
- computational costs of adaptation?



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Questions?