HOMEWORKS

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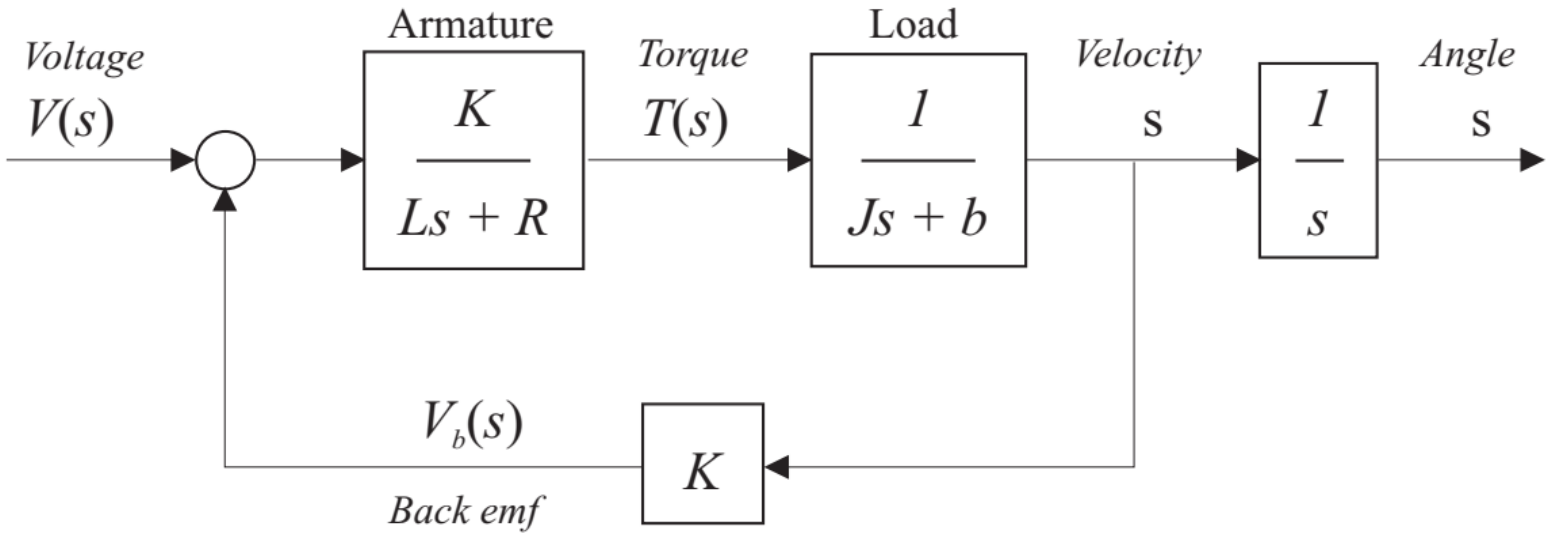
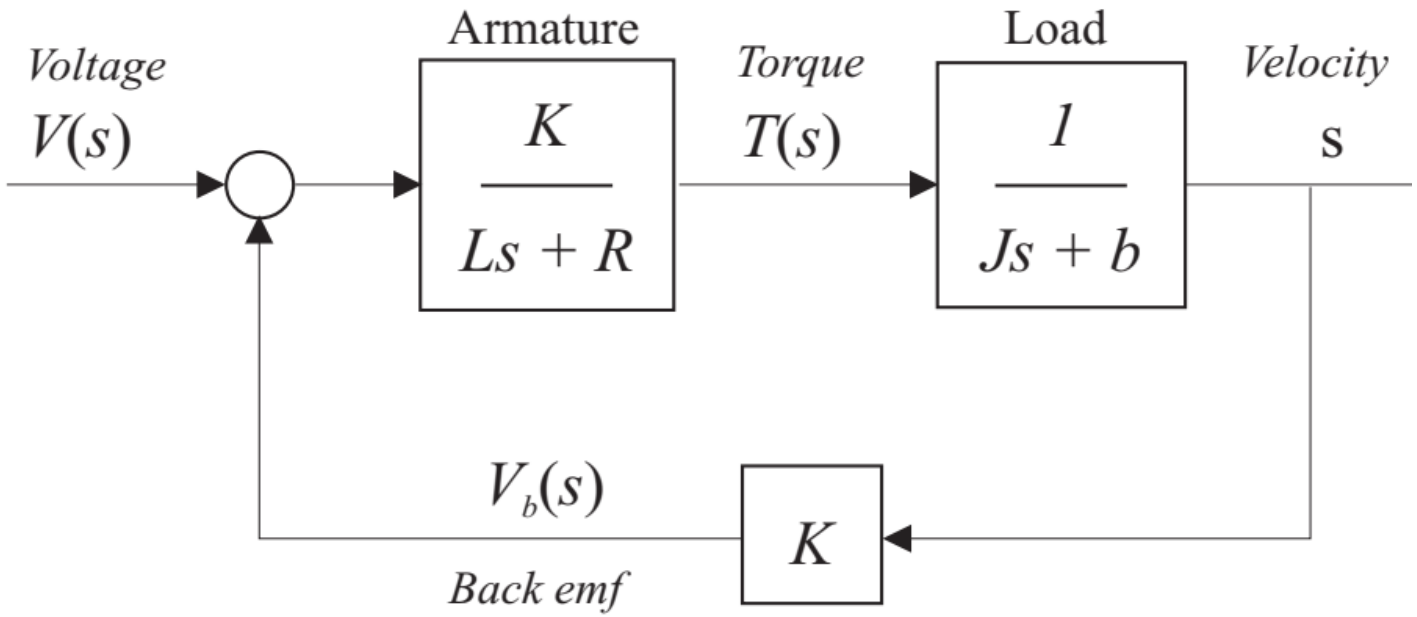
Homework 1: Position Control

- Control the motor position (voltage is the plant input)
- Reach the highest possible bandwidth
- Reach 0 steady state error
- Avoid overshoot
- Nullify the disturbance du
  (at steady state)



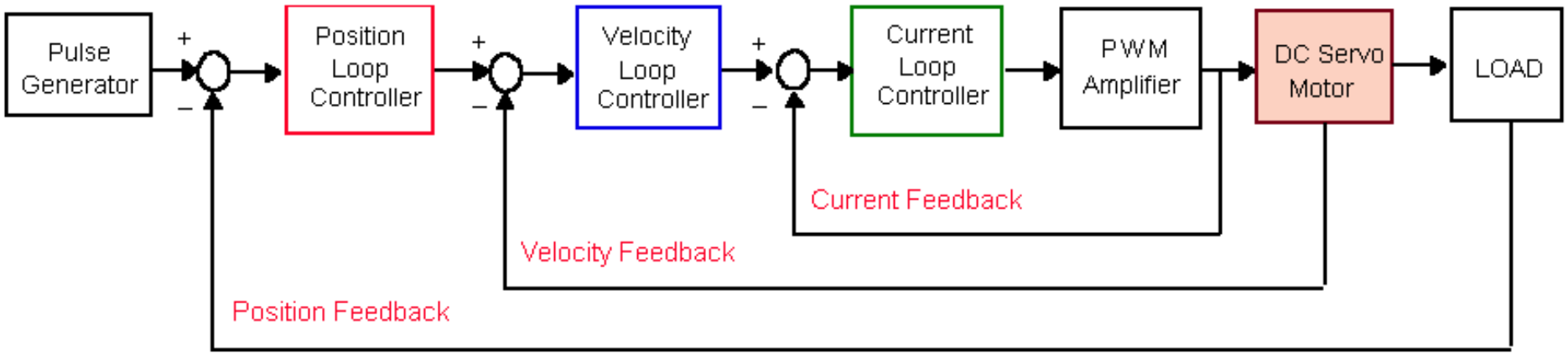
Homework 2: Current Control

- Control the current (voltage is the plant input)
- Reach at least 100,000Hz bandwidth
- Reach 0 steady state error
- Avoid overshoot



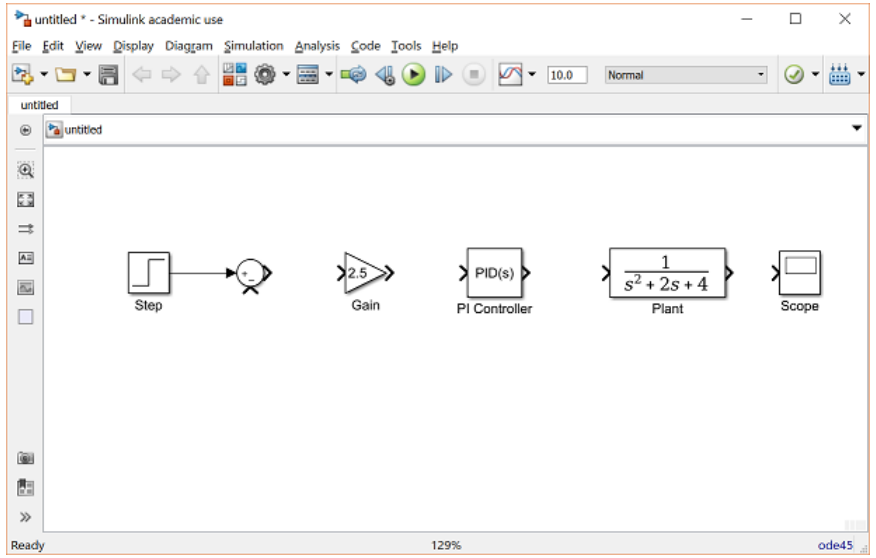
Homework 3: Cascaded Position-Velocity-Current

- Control the motor position
- Reach the highest possible bandwidth
- Reach 0 steady state error
- Avoid overshoot
- Nullify the disturbance du
  (at steady state)



Homework 4a: Cascaded Control on Simulink

- Implement cascaded control schemas* on Simulink considering the complete electromagnetic motor model and an inner current loop.
  - * position-current and position-velocity-current
- Use saturation blocks to account for current and voltage saturation.
- Consider a sinusoidal position reference $\theta_{ref} = \mathrm{A}\sin(2\pi f t)$. Which is the maximum frequency f you can track? Does it depend on the amplitude A?



Homework 4b: Cascaded Control on Simulink

- Add feedforward terms in your Simulink model. Does control bandwidth increase?
- Now remove any saturation blocks. Does control bandwidth increase?
- Is there any conclusion you can make about feed-back, feed-forward and your motor saturation? *e.g. in practice, is it more important to have a proper motor or a proper controller?*