

- start by showing <https://www.youtube.com/watch?v=-7xvqQeoA8c> from second 0 to second 17

Making robots balance

Part 1



Our purposes

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- have fun

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- have fun
- understand the world a bit better

Our purposes

- have fun
- understand the world a bit better
- see that math is useful

What is going to happen in the whole series

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- build a robot

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- build a robot
- fiddle with it

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- build a robot
- fiddle with it
- fiddle with our intuitions

What is going to happen in the whole series

- build a robot
- fiddle with it
- fiddle with our intuitions
- see what we can achieve using math and control

What we are going to learn in the whole series

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- understand what control and automatic control mean

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- create and tune a controller

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- understand what control and automatic control mean
- create and tune a controller
- get intuitions of the pervasiveness of control

What is going to happen in today's part

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- look into some examples of control

What is going to happen in today's part

- look into some examples of control
- play with some pens

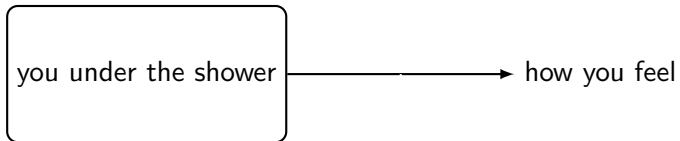
- let's make an example
- you enter a shower, and turn on the water
- is it too cold? then you turn the knob to make it warmer
- is it too warm? then you do the viceversa
- is there too little water? you increase the flux
- are you happy now? well done, you controlled the shower!

More seriously... what is control?

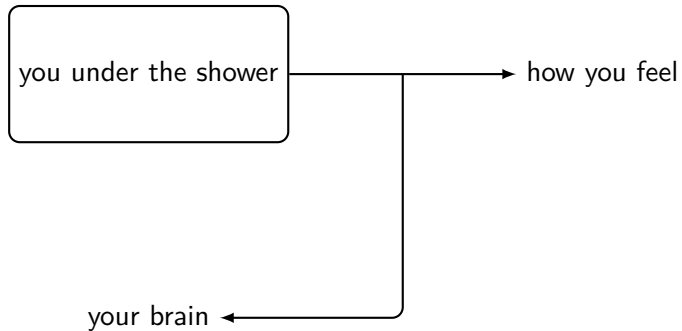
More seriously... what is control?

you under the shower

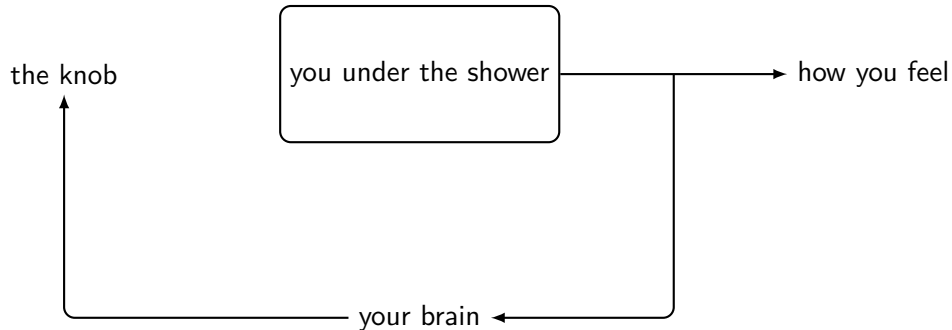
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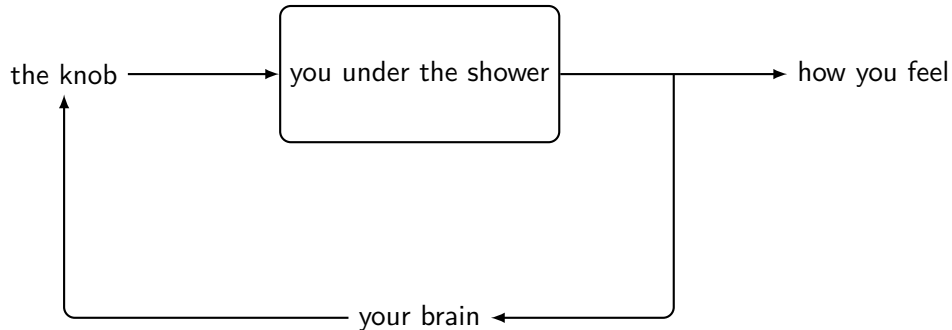
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More seriously... what is control?



Control and Automation

<https://www.youtube.com/watch?v=XJLMW6l303g>

Automation, by Alessandro Falsone - IEEE CSS Video Clip Contest 2014

- which examples can you come up with?
- look around you and try to find examples of control!
- which other control tasks can you accomplish?
- pause this video and discuss with your friend!
- Let's see, who can find the most examples!

- how did it go?
- did you find many examples?
- another example from everyday life, that we can connect to the concept of control is to balance a pen in your hand

Tryout pause!

- what do you do with your hand to balance the pen?
- more difficult to balance a longer or a shorter pen? A heavier or a lighter pen?
And why?
- is it easier to start with the pen vertical? And why?
- how do you adapt your strategy?

- you are actually applying feedback and control when you are balancing your pen!
- what you have to do is to counteract the tipping by observing how the pen tips and reacting with your hand
- your eyes = your sensors seeing the pen tip
- your hand = actuator moving around to balance the pen
- your brain = the computer deciding how to move