

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

- (turning around from a chair)
- did you ever wonder how “handle” works? Like, photoshop? magic? aliens? Well, even better: automatic control!
- hello, I am Steffi, and today we are going to learn how to make a robot balance on its wheels

# Making robots balance

## Part 1



# What are we doing here

- before jumping in the details, let's discuss what is the purpose of this project, what is going to happen, what you are going to do, and what you are going to learn

# Our purposes

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- have fun

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- have fun
- understand the world a bit better

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



What is going to happen

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- get intuitions of what control means
- touch with hand how to create a controller
- get intuitions of the pervasiveness of control

A controller? What is it, mom?

- 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!

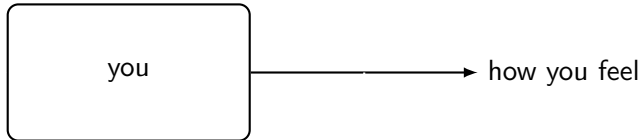
More seriously. . . what is control?

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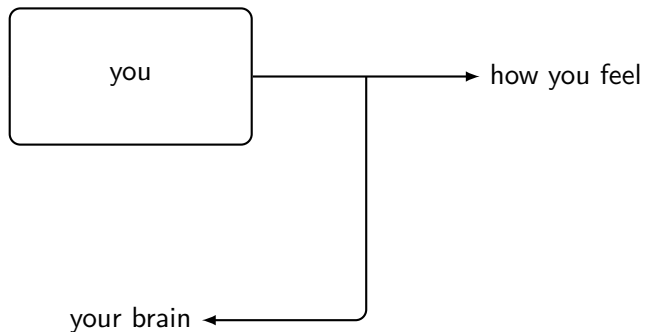


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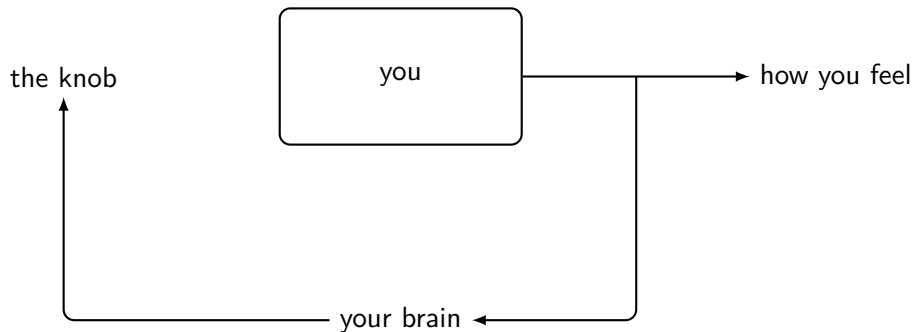
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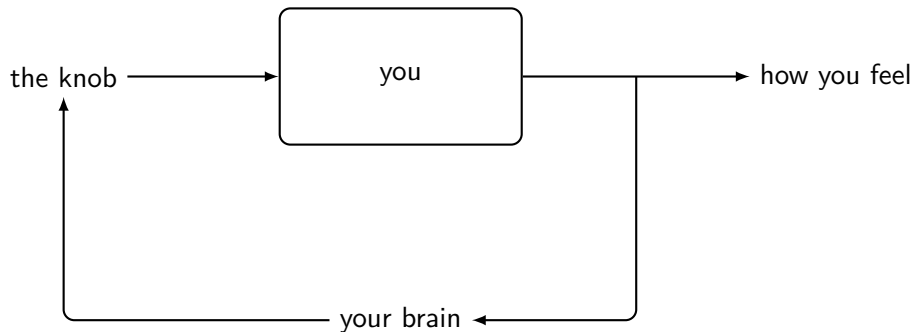


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# Control and Automation

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

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

- another example from everyday life, that we can connect to the concept of control is to balance a pen in your hand
- this is also called feedback
- try to do it by yourself!
- try to use different pens with different heights and weights, and get an intuitive understanding of the following things:
  - how would you describe the strategy you use to balance the pen to your friends?
  - do you feel it is more difficult to balance a longer pen or a shorter one? a heavier pen or a lighter one? and why?
  - how do you adapt your strategy?
  - try and discuss!
  - so, time for a pause and some minutes of playing with your friends!
  - and for me it took 10 minutes to learn, so don't worry if it seems difficult at the beginning

## 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?

- amazing, I am proud of your trying!
- now we are ready to move to the next part of the experience! See you in 'part 2'