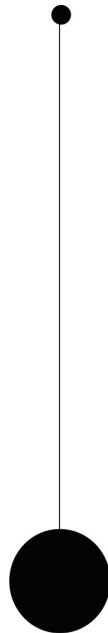


Stabilizing unstable systems: balance and levitation

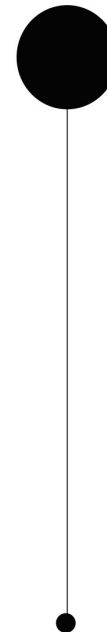
Sally Wolfe

Equilibria

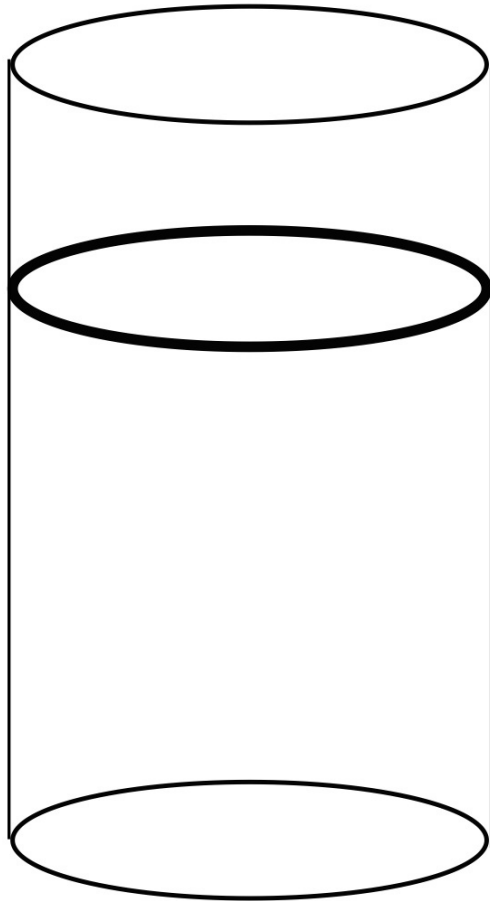
Stable



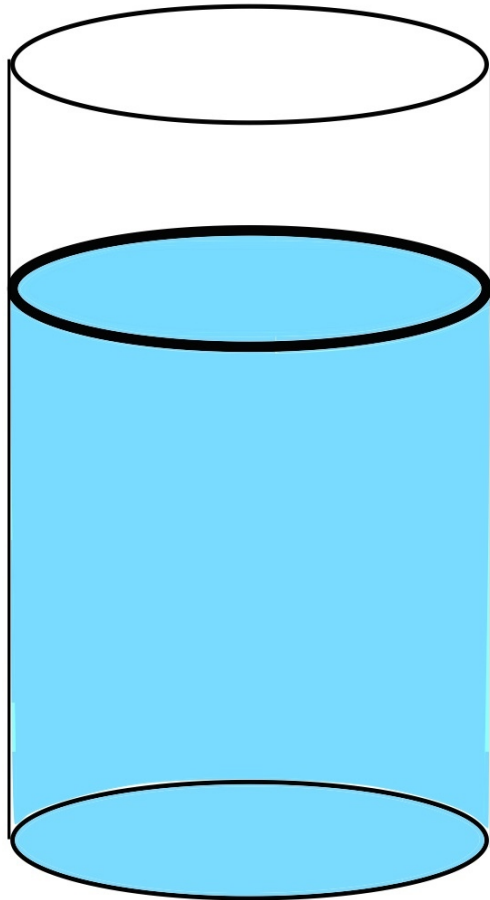
Unstable



Filling a glass to a specific height



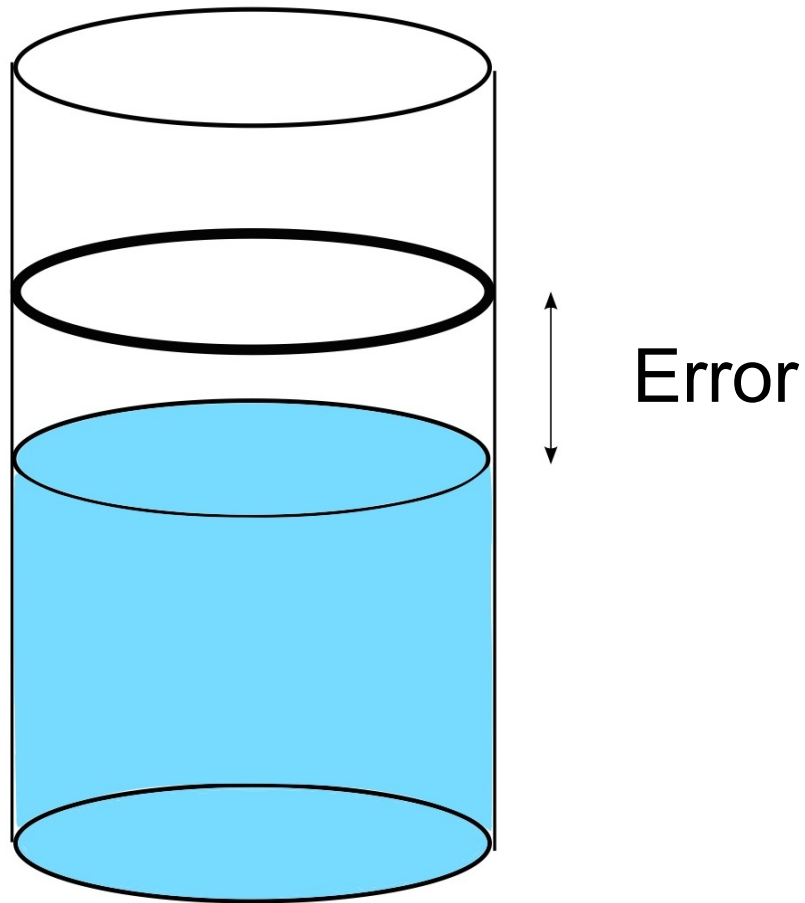
Filling a glass to a specific height



Constant rate of flow

Time = volume/rate of flow

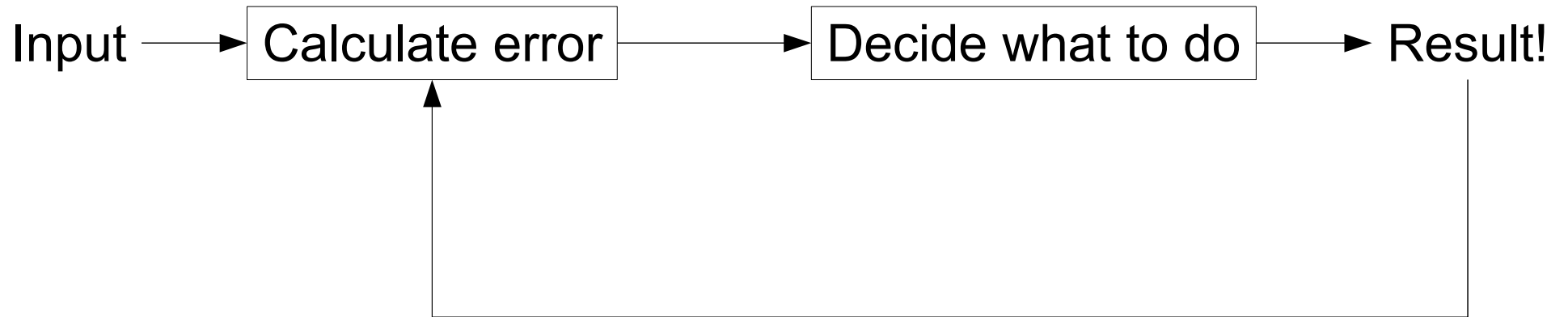
Filling a glass to a specific height



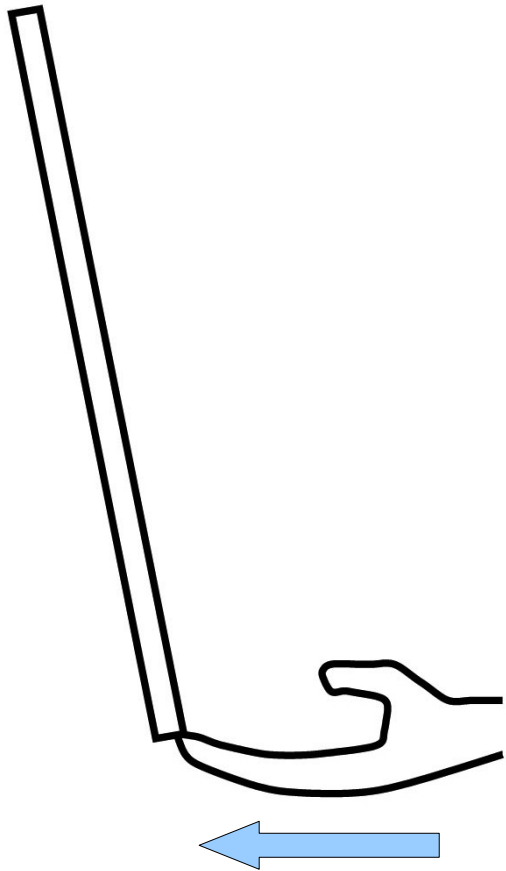
Choosing behavior based on error

- Desired result
- Method of making error measurement
- Way to control the system
- Way of deciding what to do based on error

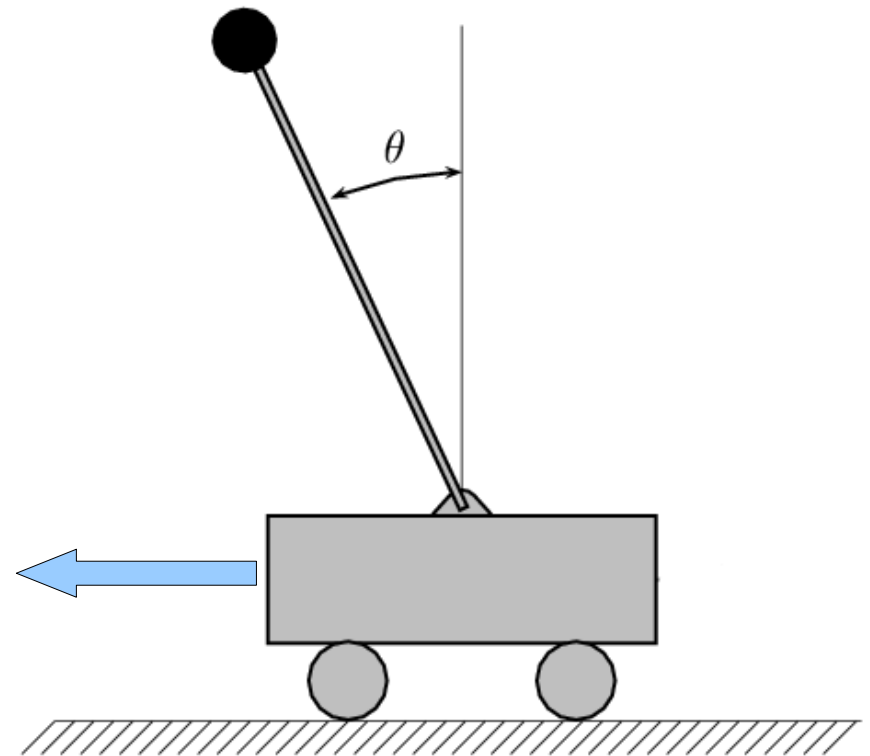
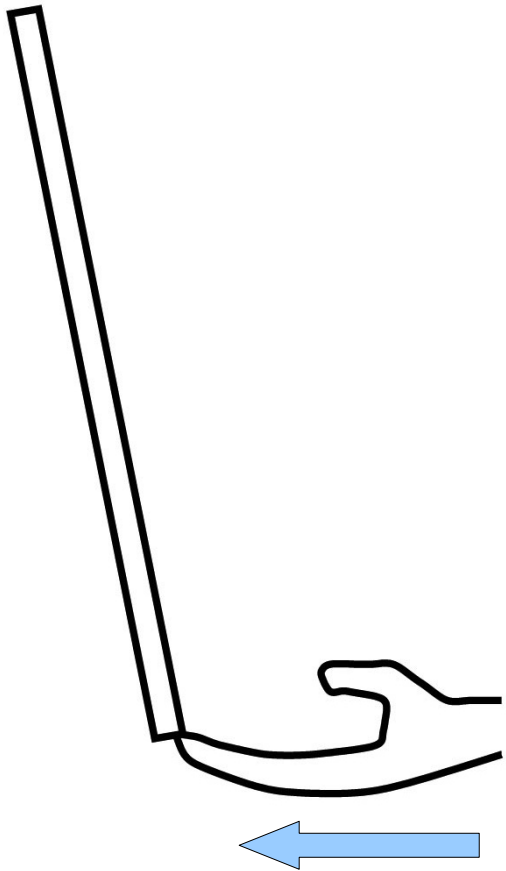
Feedback



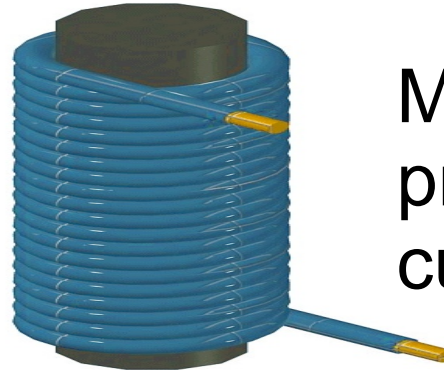
Unstable systems



Unstable systems



Levitation!



Magnetic field
proportional to
current



Position sensor