

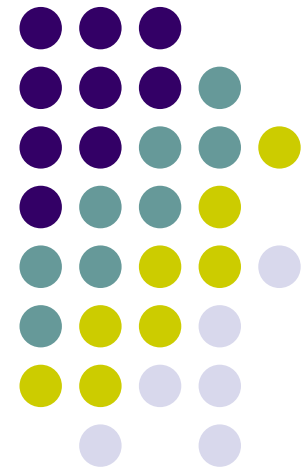
What is Control?

Zhong-Ping Jiang

Professor

ECE Dept

eeweb.poly.edu/faculty/jiang





What is Control?

**Control is the intelligence behind
how things work!**

T. Samad, IEEE CSS President

Control systems are all around us :

Air, land, sea and underwater vehicles;

Robots;

Cell phones and the Internet;

CD-player, washers, cookers;

Artificial hearts;

Electrical power networks;

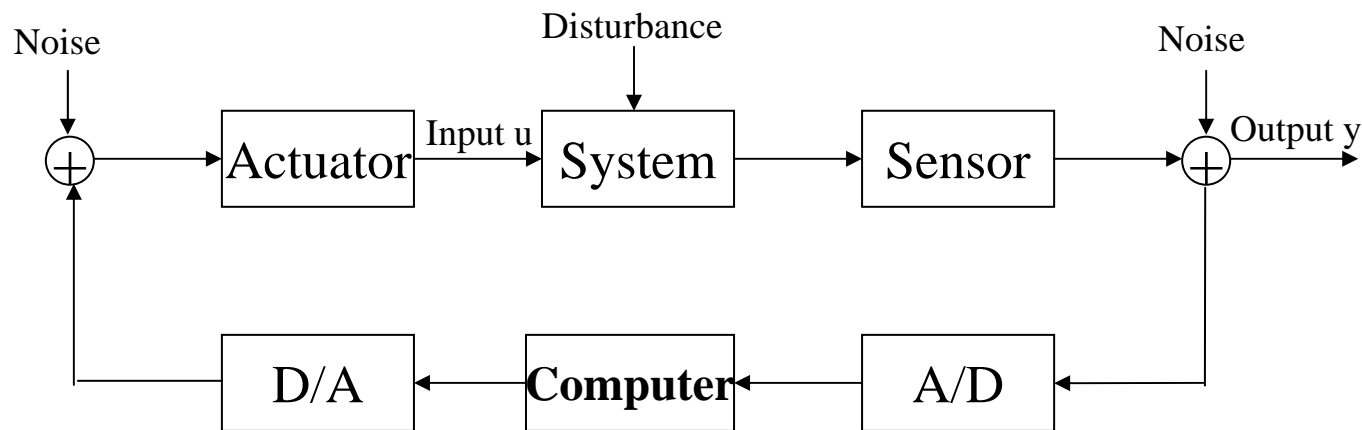
etc

Control = Automatic Control



Use of **algorithms** and **feedback** in engineered or natural systems

- **Stability:** Tracking a reference signal
- **Performance:** Fast response
- **Robustness:** Against uncertainties & disturbance



Control, versus non-Control

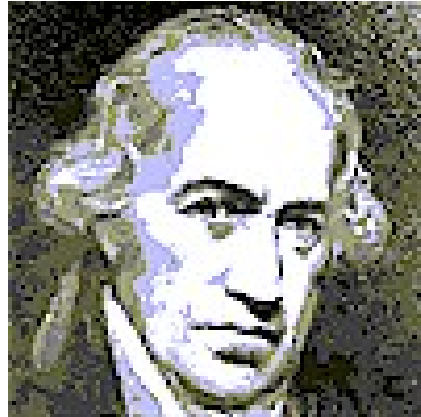
Why is control an important subject?



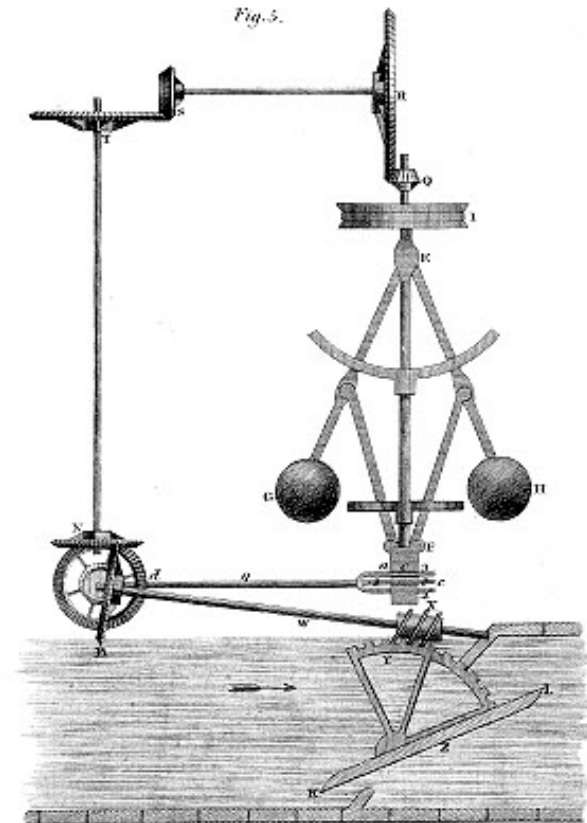
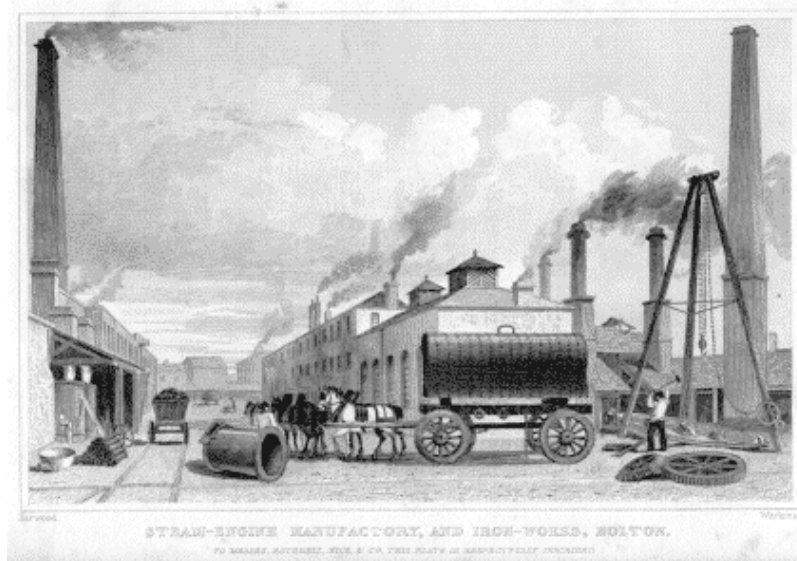
Early “Train” without Automatic Control



Industrial Revolution: Flyball Governor



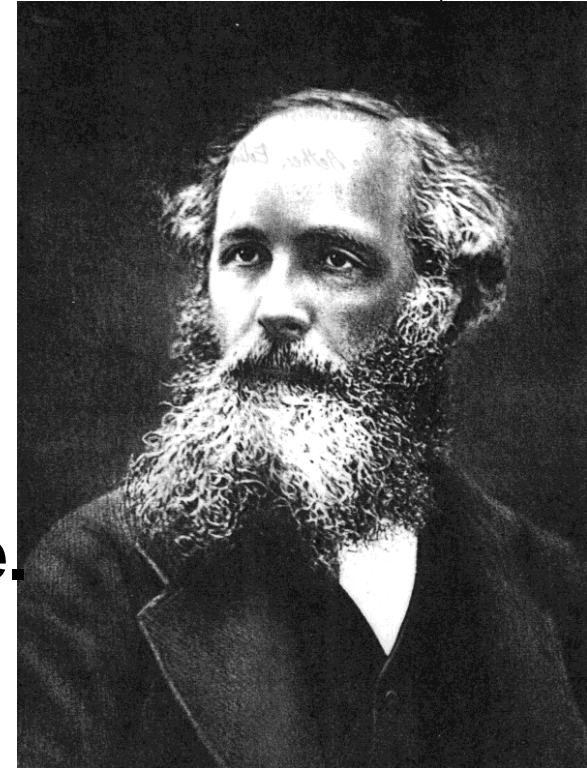
J. Watt (1736-1819)



“On Governors” : 1st Stability Proof



In his classical paper (1868), **J. C. Maxwell** used the theory of differential equations to prove stability of the closed loop system composed of flyball governor + steam engine.



Tragedy without automatic control



Titanic : A beautiful movie but a sad story !



The titanic sank in 1912, having killed 1500 people.

Modern Control Applications

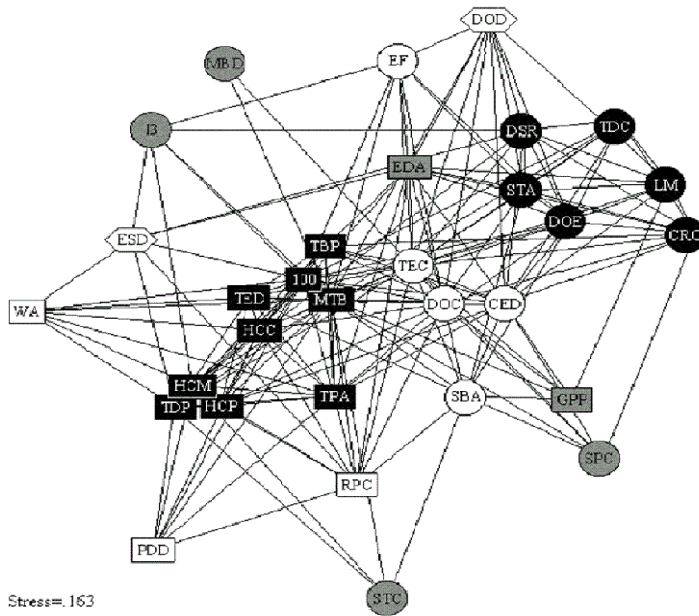


Figure 1. Communication links.



“Linked”: a book by Barabasi



Networks: Every thing touches everything!

- How do real networks form? (**Analysis**)
- How to change their behavior or improve performance/robustness (**Control**)

Control is the physics in the 21st century.

Y. C. Ho, Harvard University



Control Courses at Poly

- **EE3064:** Undergraduate feedback control
- **EL6243:** System Theory and Feedback Control
- **EL6233:** System Optimization Methods
- **EL6253:** Linear Systems
- **EL7253:** Linear Control
- **EL8223:** Nonlinear Control
- **Other courses:** EL5253, EL5223, etc

MS Systems Engineering



- EL5213: Introduction to Systems Eng.
- EL6213: System Modeling, Analysis and Design



Put Control in Your Future

Control-trained star professors at Poly:

- Professor Keith Ross (CSE Dept)
- Professor Charles Tapiero (FE Dept)
- Professor Yong Liu (ECE Dept, $\frac{1}{2}$ control?)
- Prof. D. Zcarkowski (ECE Dept, $\frac{1}{2}$ control?)
- Prof. S. Panwar (ECE Dept, $\frac{1}{2}$ control?)
- etc

Control-trained star students: many

Quiz

So, what is control?





For Further Information,

- My email address:
zjiang@control.poly.edu
LC214
- Or, ask Professor Khorrami