

# Control of Mobile Robots: Glue Lectures



Instructor:



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# Glue Lecture 7: In a nutshell

# Math to motion ...

Dynamical models

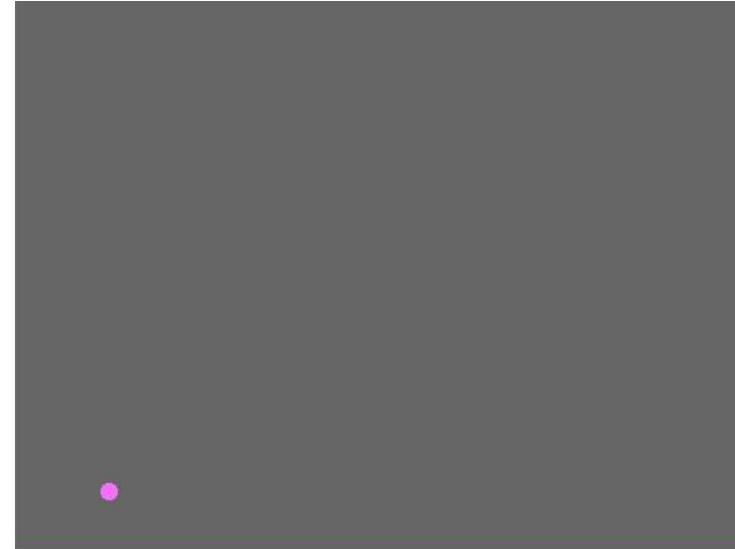
$$\dot{x}(t) = f(x, t)$$

$$x(t^*) = x^*$$

$$\dot{x}(t) = 2x$$

$$x(0) = 10$$

$$x(t) = x_0 e^{2(t-t_0)} = 10e^{2t}$$



# Math to motion ...

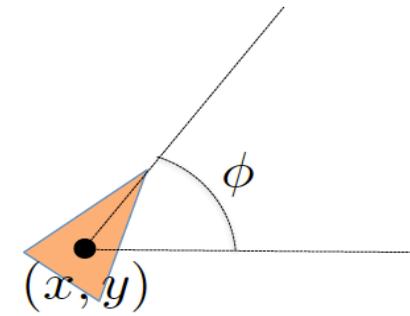
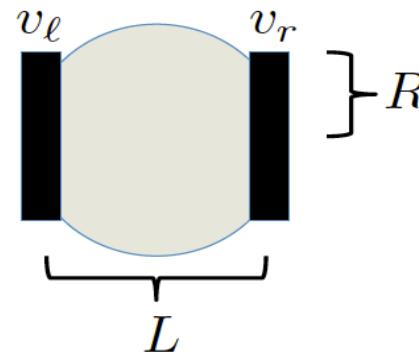
## Dynamical models

(a)

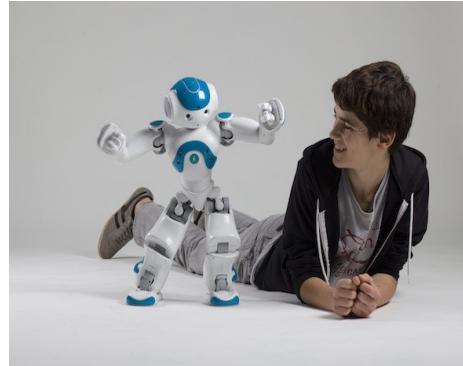
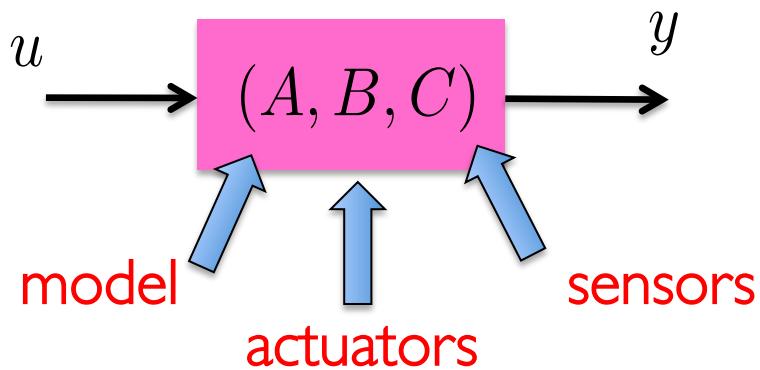
$$\begin{aligned}\dot{x} &= \frac{R}{2}(v_r + v_l) \cos \phi \\ \dot{y} &= \frac{R}{2}(v_r + v_l) \sin \phi \\ \dot{\phi} &= \frac{R}{L}(v_r - v_l)\end{aligned}$$

(b)

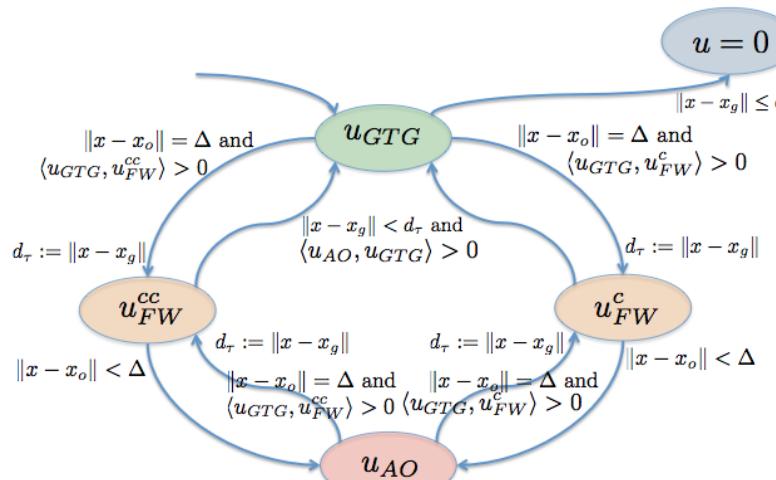
$$\begin{aligned}\dot{x} &= v \cos \phi \\ \dot{y} &= v \sin \phi \\ \dot{\phi} &= \omega\end{aligned}$$



# Systems

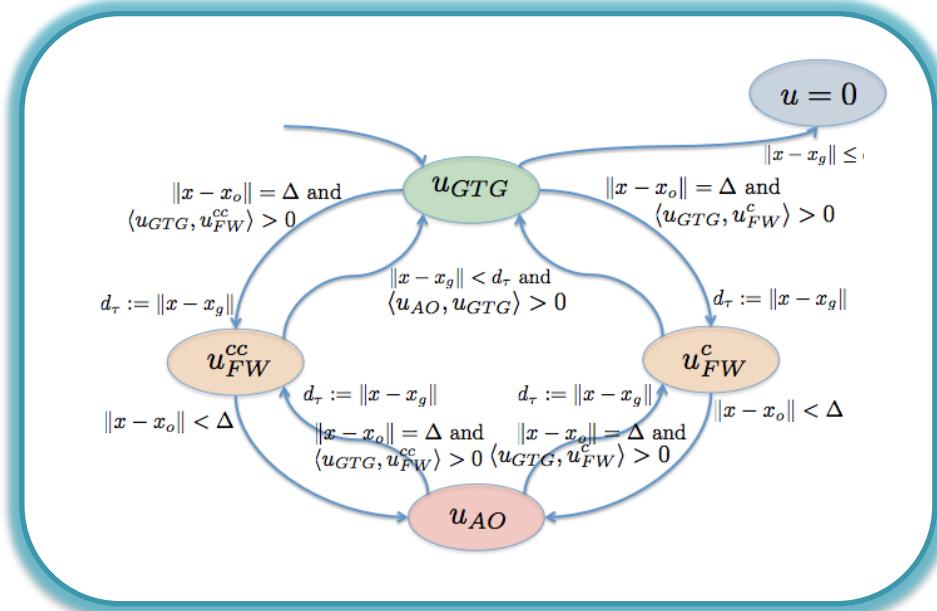


# We can make robots do anything!



Stability  
Controllability  
Observability  
Automata  
No Zeno Effect .....

# We can make robots do anything .. with math!



Differential Equations  
Linear Algebra  
Geometry

# Signing off...



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# Good luck with Quiz 7... and the rest of your lives !!



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