

# Control of Mobile Robots: Glue Lectures



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# Glue Lecture 7: In a nutshell

# Math to motion ...

Dynamical models

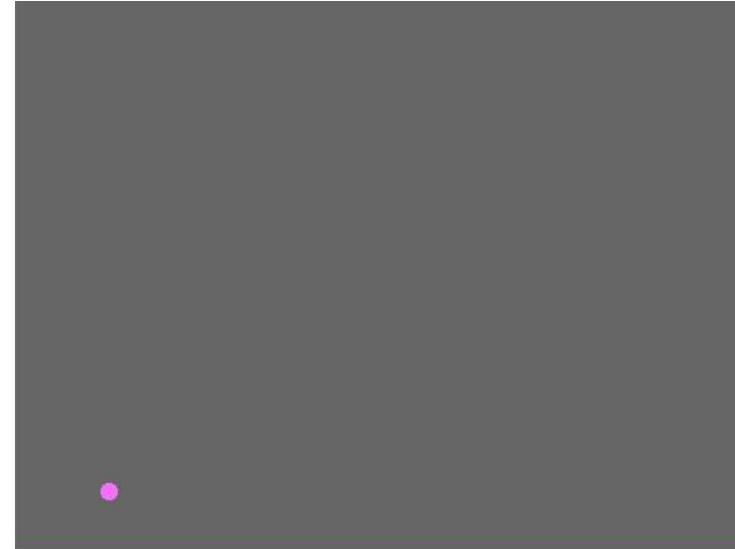
$$\dot{x}(t) = f(x, t)$$

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

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

$$x(0) = 10$$

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



# Math to motion ...

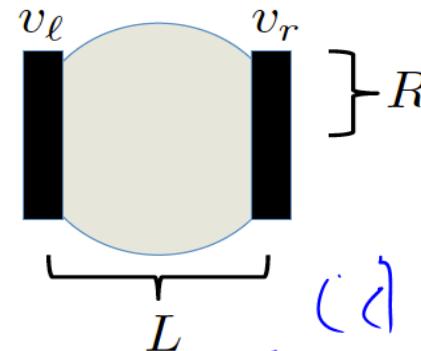
## Dynamical models

(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)

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

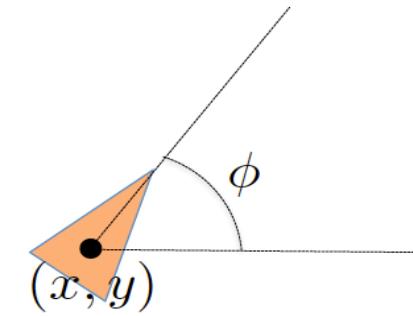


(c)

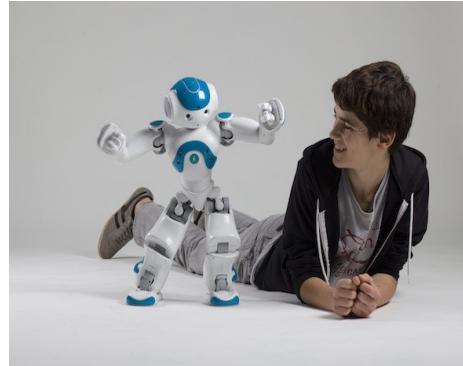
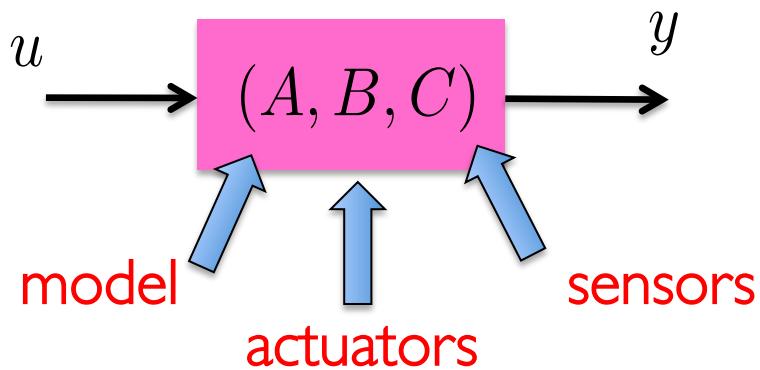
*Simpler model*

$$\dot{x} = u$$

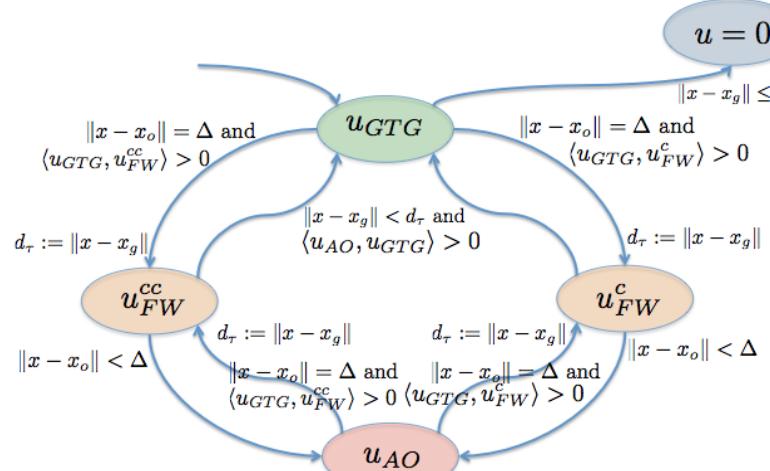
For cars, we add  $\dot{\psi}$



# Systems

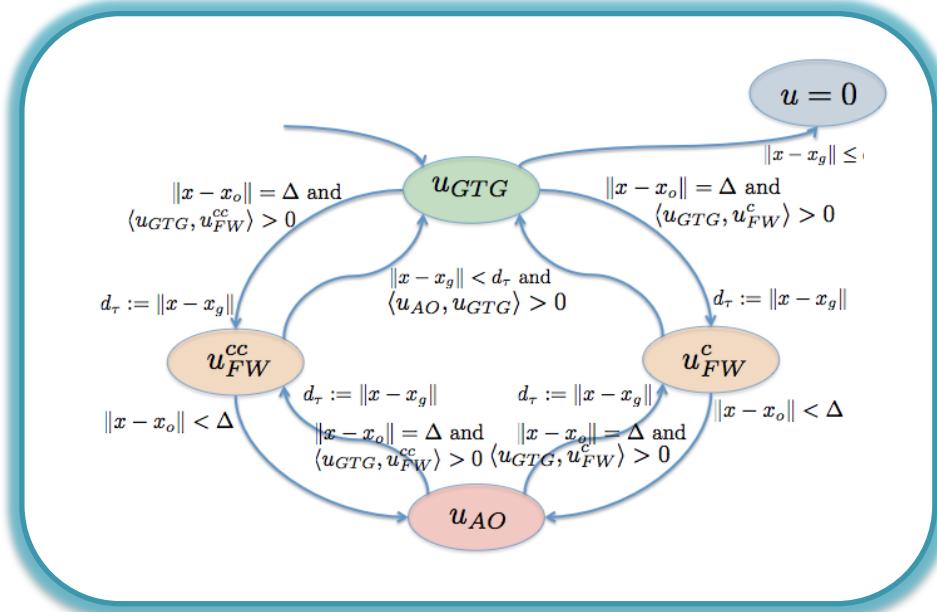


# We can make robots do anything!



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

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



Differential Equations  
Linear Algebra  
Geometry

# Signing off...



GRITSLab Youtube Channel



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



GRITSLab Youtube Channel

