# AI4R: 2nd Half Notes

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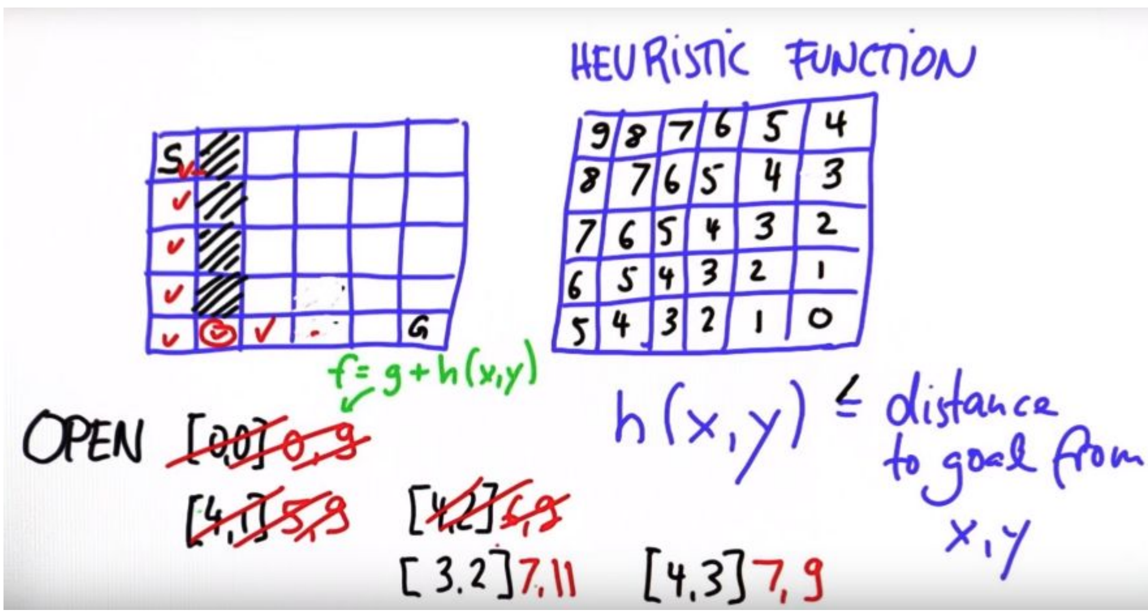
## Lesson 12 - Search

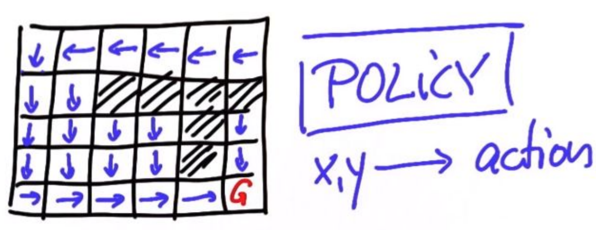
### A*

- Uses heuristic function
- Deterministic path
- Admissible if h(x) <= goal (numbers too large compared to surrounding ones)

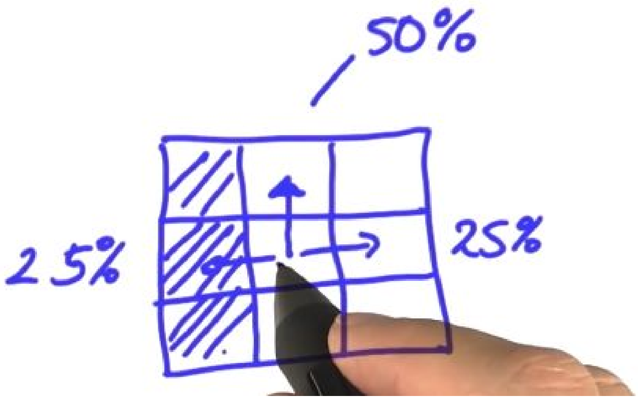



### Dynamic Programming

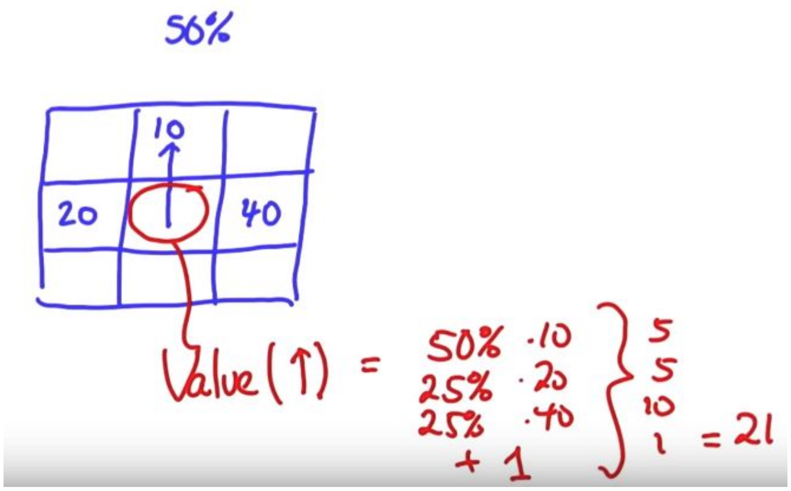
- Best path from anywhere
- Stochastic (adaptive to world) policy

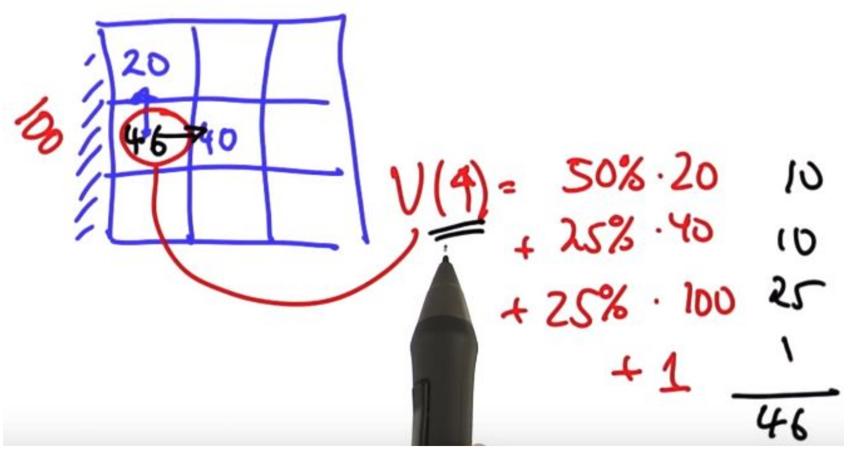


- Stochastic Motion example
    - Provide clearance
    - Movement succeeds based on probability




50% chance of succeeding, 25% chance of hitting left wall

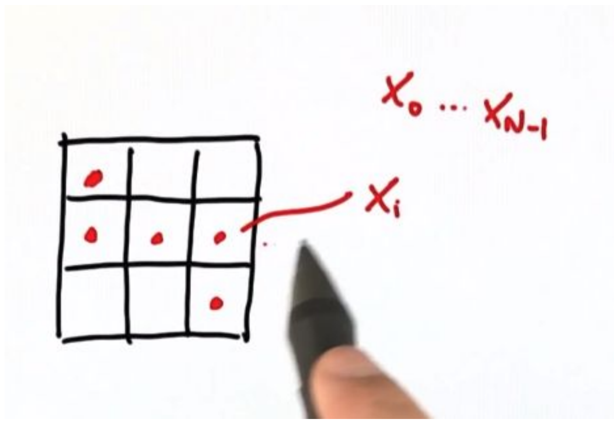


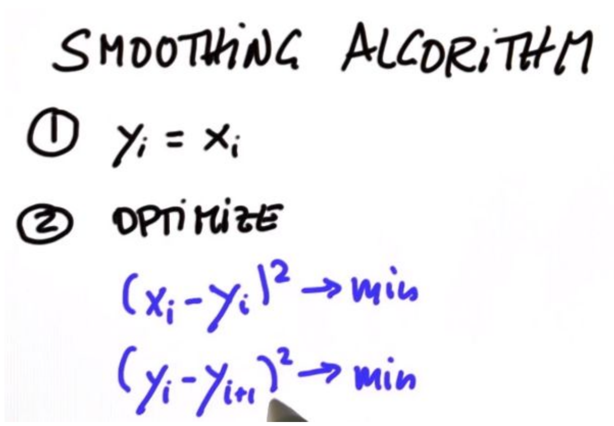



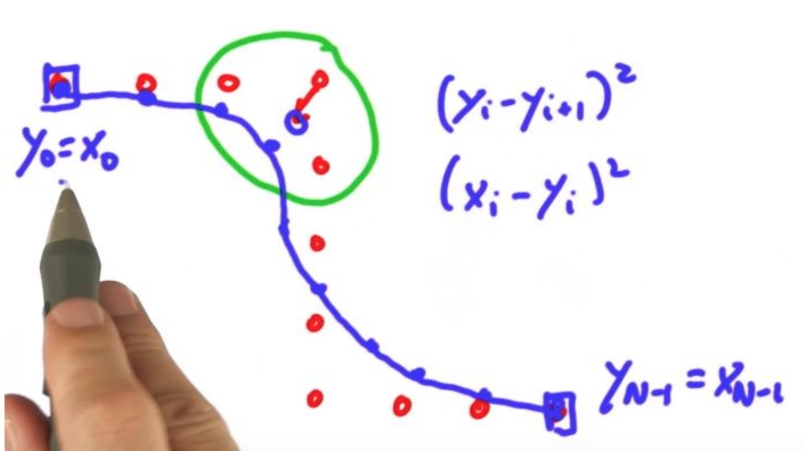
# Lesson 15 - PID Control

## Smoothing Algorithm

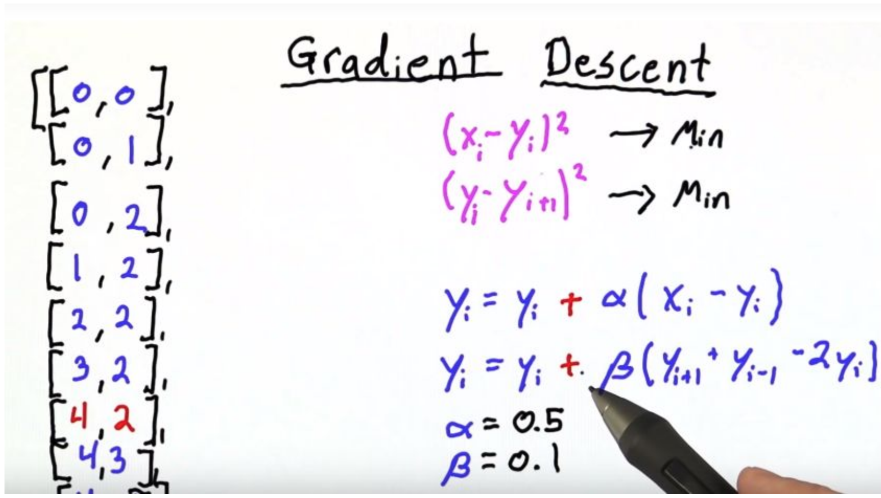
Original points:



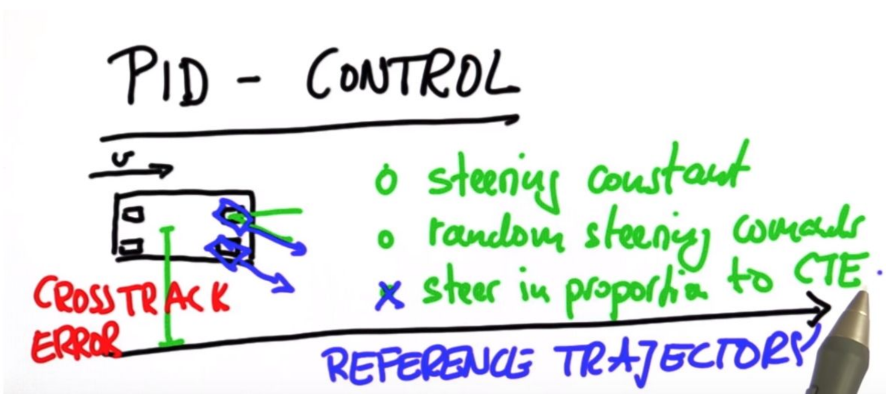



Smoothing by gradient descent

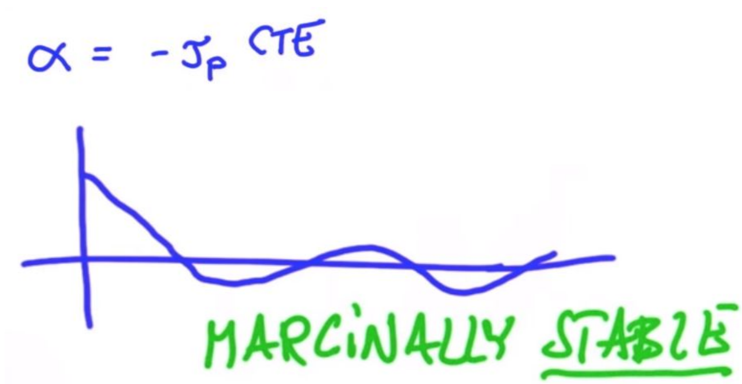



# P-Control

- “Proportional” - Controller (P-Controller)
- Cross track error = willingness to turn towards target trajectory (larger = more willing)

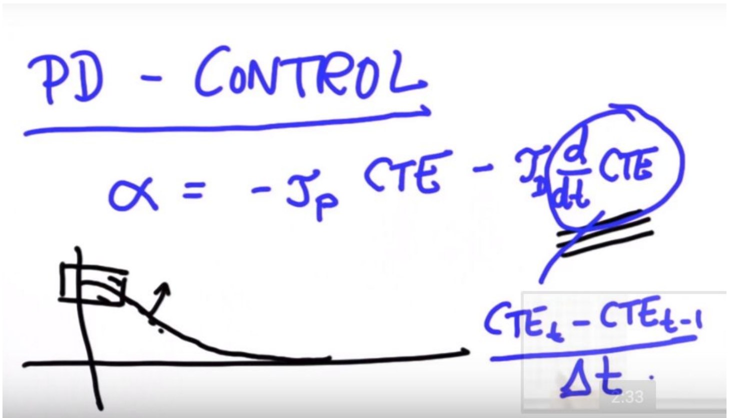



- Appling [alpha = -J * CTE] results in marginal stable:



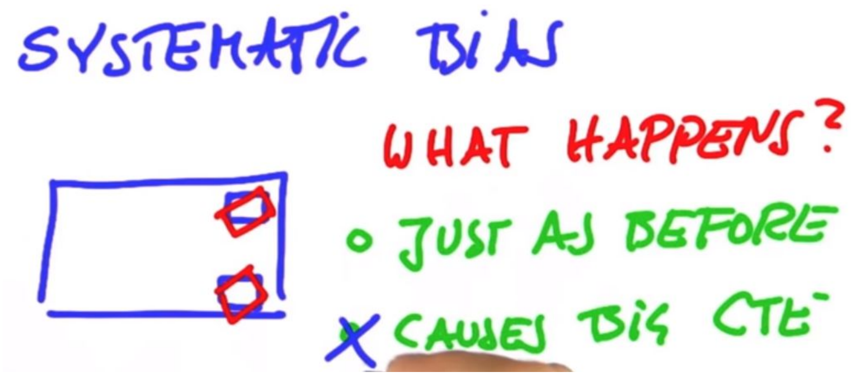
## PD Control

- A way to remove the oscillations of P-Control
- [alpha = -J * CTE - J(d/dt)CTE

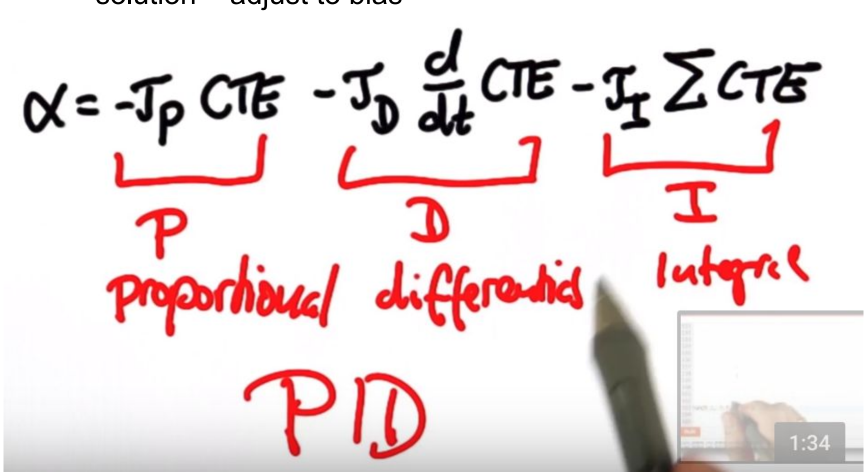



## Systematic Bias

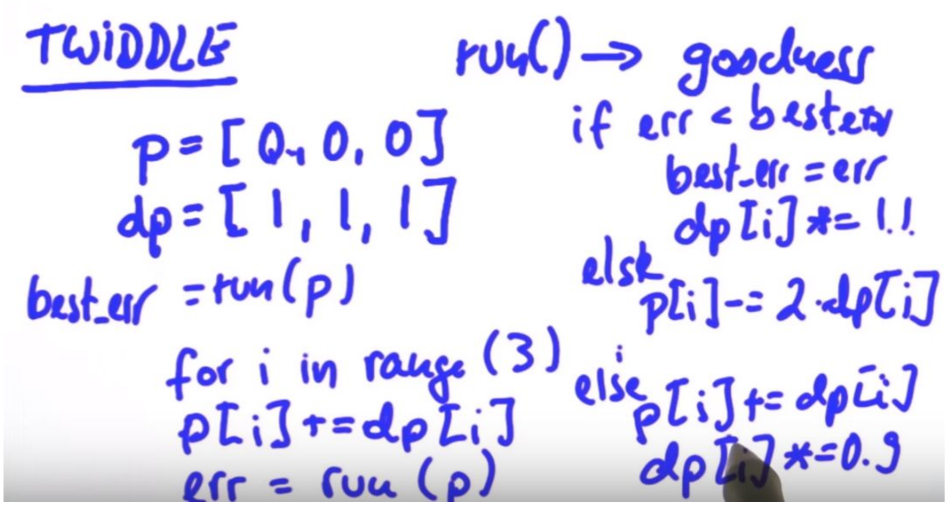
(IE wheels manufactured not perfectly straight)




- solution = adjust to bias

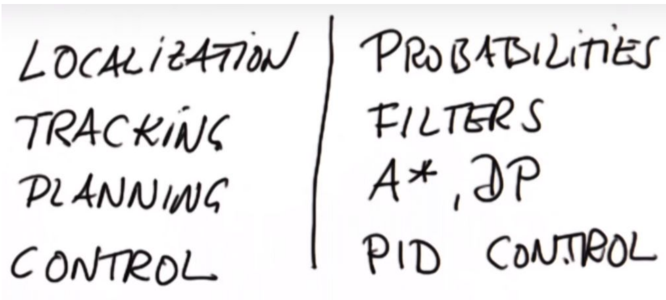


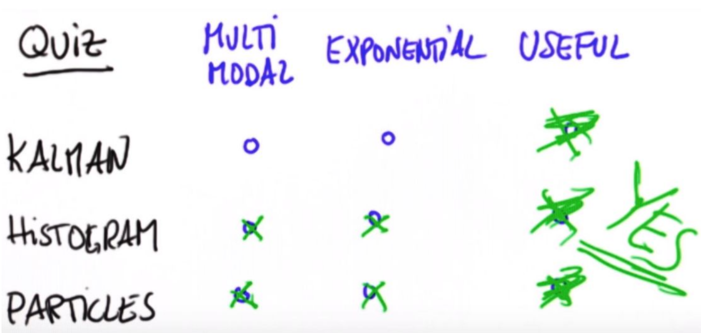
TWIDDLE (Coordinate Ascent)



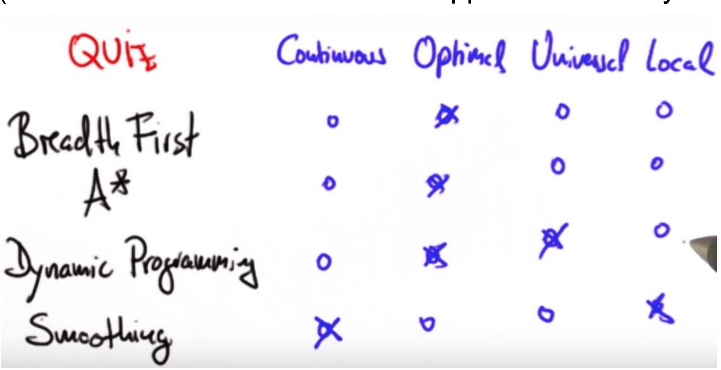

# Lesson 19 - SLAM

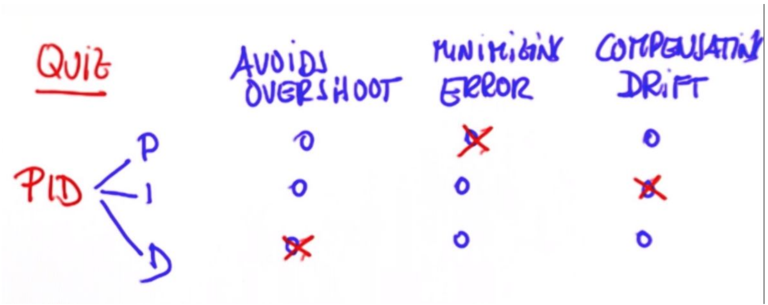
Putting it all together:

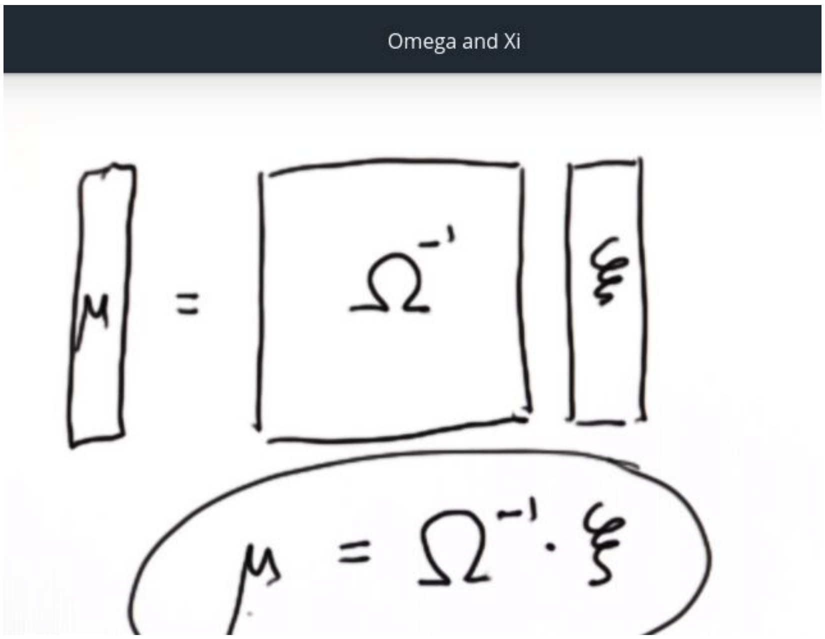


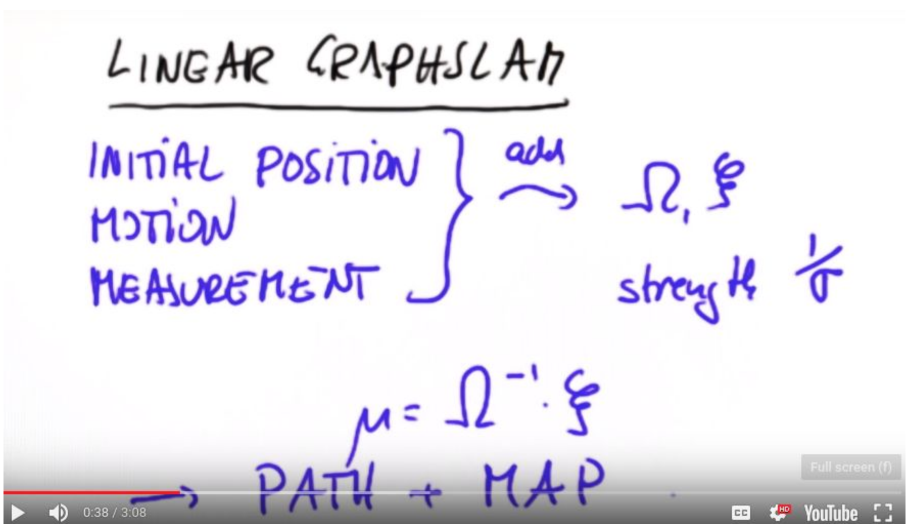




(universal means solution can be applied to arbitrary states)




QUIZ
AVOIDS OVERSHOOT
MINIMIZING ERROR
COMPENSATING DRIFT
PID
P
I
D


Omega and Xi
$\mu = \Omega^{-1} \cdot \xi$


LINEAR GRAPHSLAM
INITIAL POSITION
MOTION
MEASUREMENT
add
$\Omega, \xi$
strength $\frac{1}{\sigma}$
$\mu = \Omega^{-1} \cdot \xi$
PATH + MAP
0:38 / 3:08
Full screen (f)