

Alternative navigation system for autonomous vehicles using AI in case of GNSS signal loss

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Motivation

Global Navigation Satellite System (GNSS)

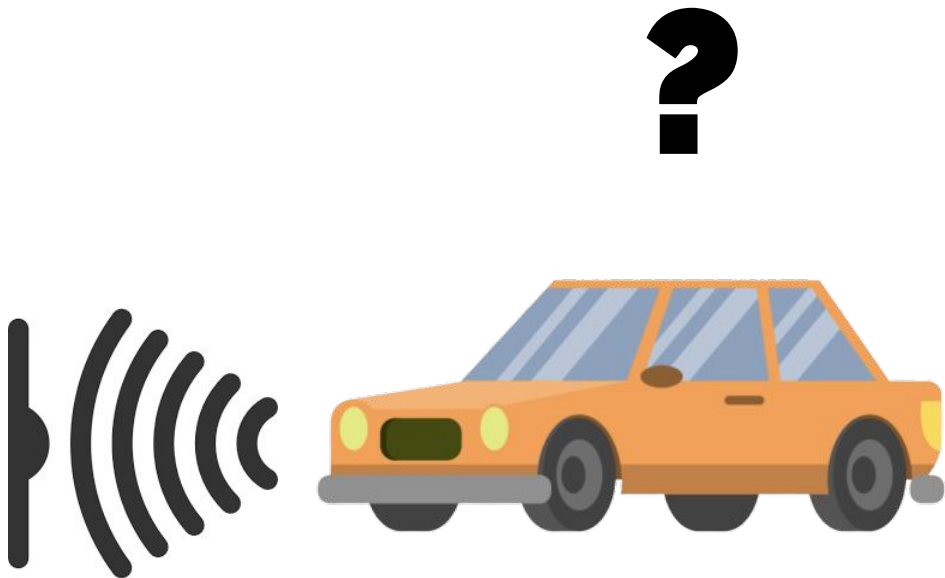


Global Navigation Satellite System (GNSS)





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Model Implementation

Framework

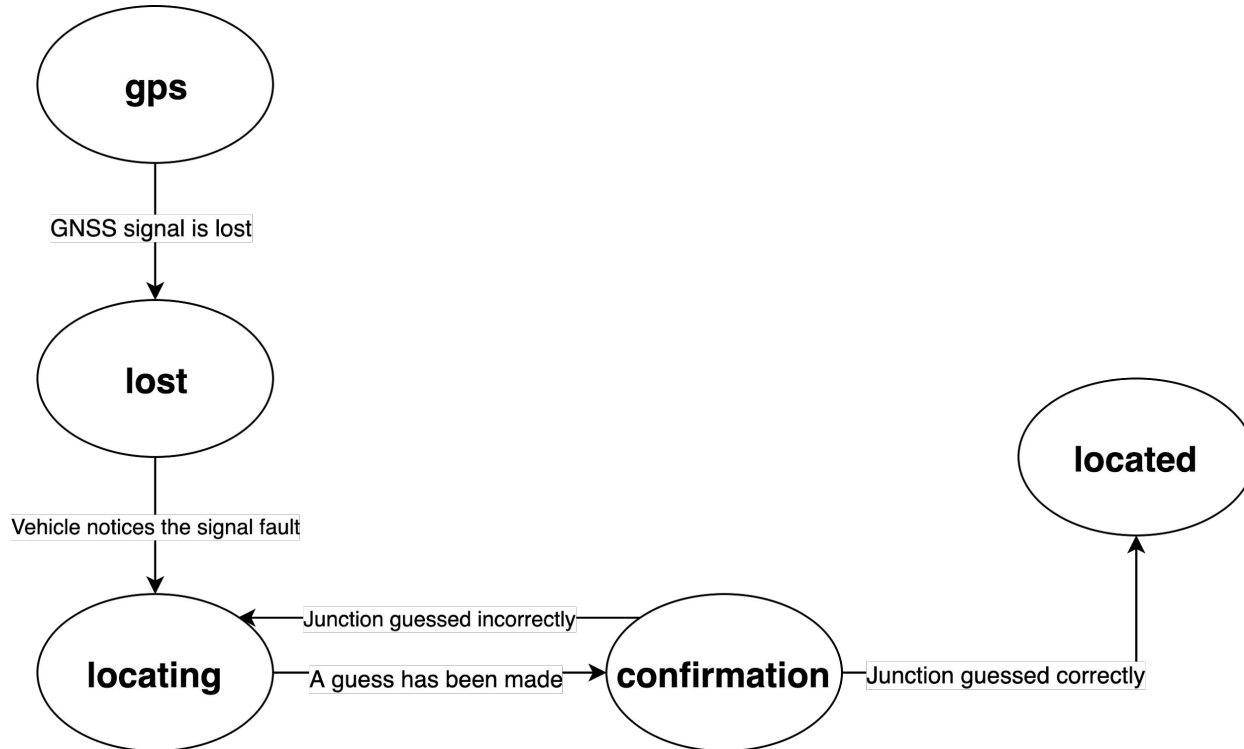
Programming Language



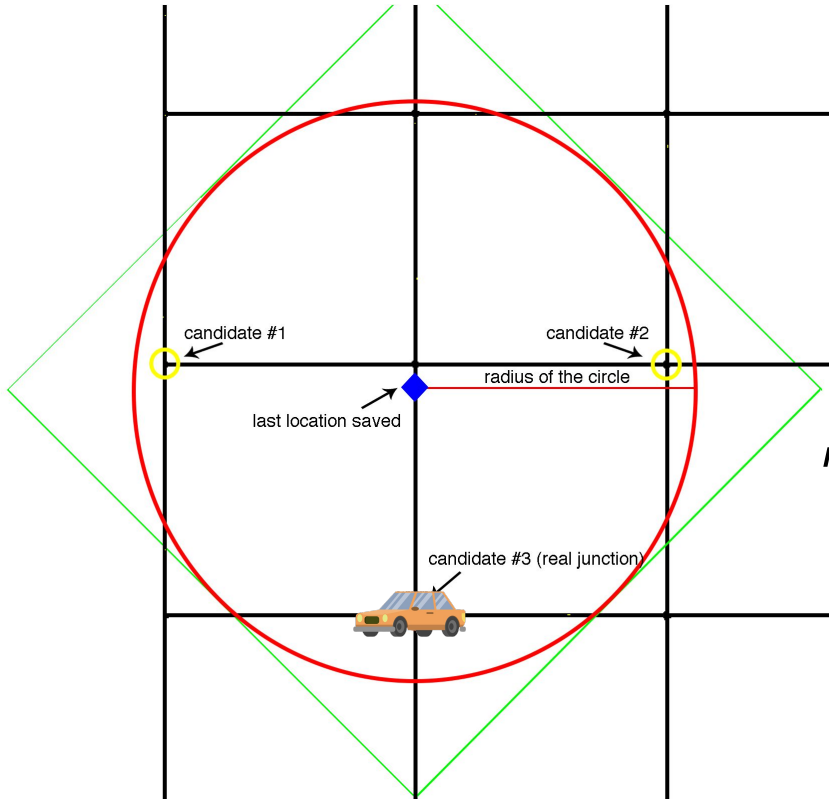
Microscopic Road Traffic Simulator



Basic behaviour



Making a guess



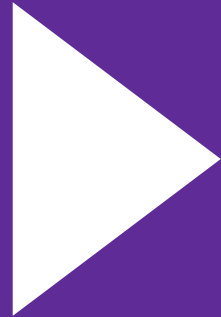
$$\text{radius} = 1.1 \cdot \text{max_speed} \cdot (\text{current_time} - \text{last_location_time})$$

Logical approach

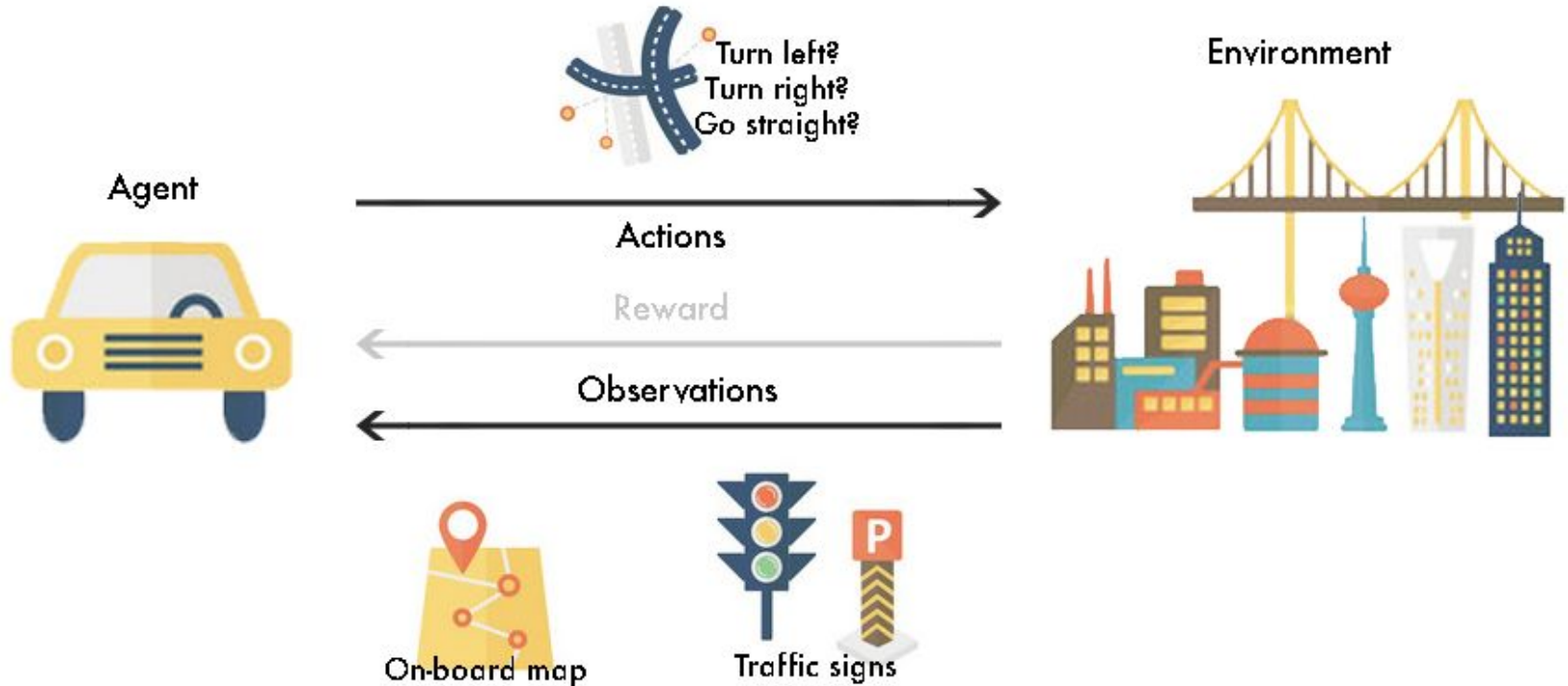
- ★ Random guess from candidates

- ★ Random turns

Logical Example



Reinforcement Learning approach

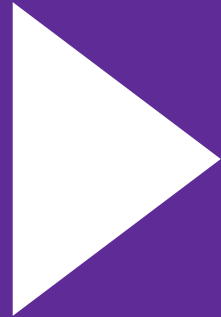


Choosing the best action

For each policy π :

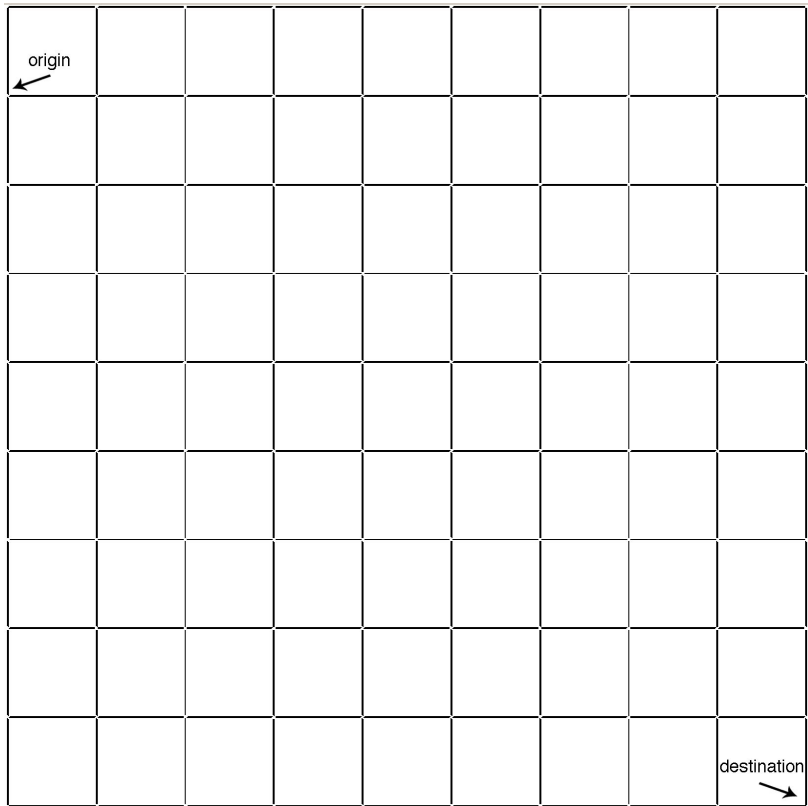
$$v_{\pi} = a \cdot b \cdot \text{distance_to_destination} + (1 - a) \cdot (\text{number_of_candidates})$$

RL Example



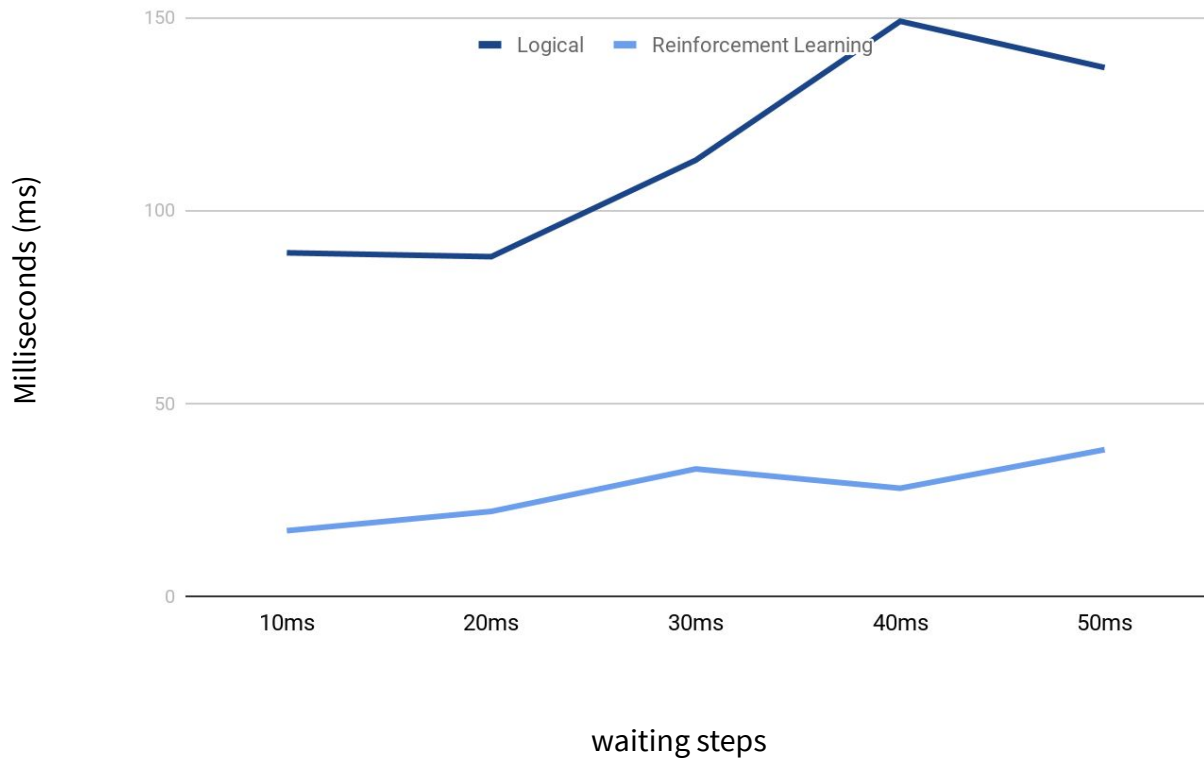
Results

- ★ Five artificially generated networks: three grid and two spider
 - ★ Three types of traffic signs: priority, warning and information
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Grid1

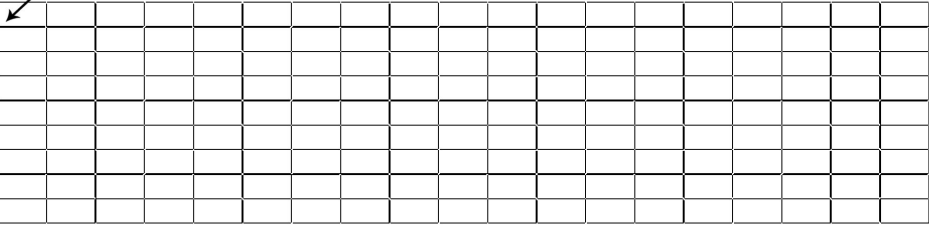
Locating Process (grid1)



Time to destination (grid1)



origin

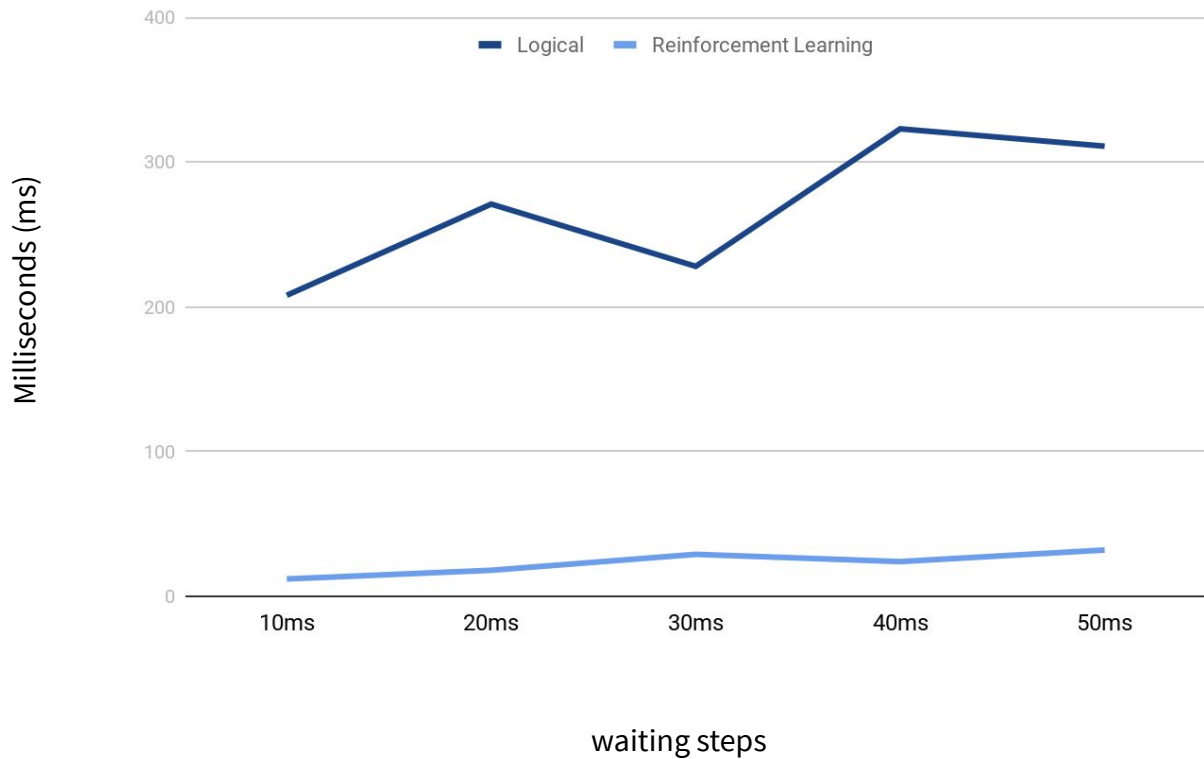


destination

Grid2

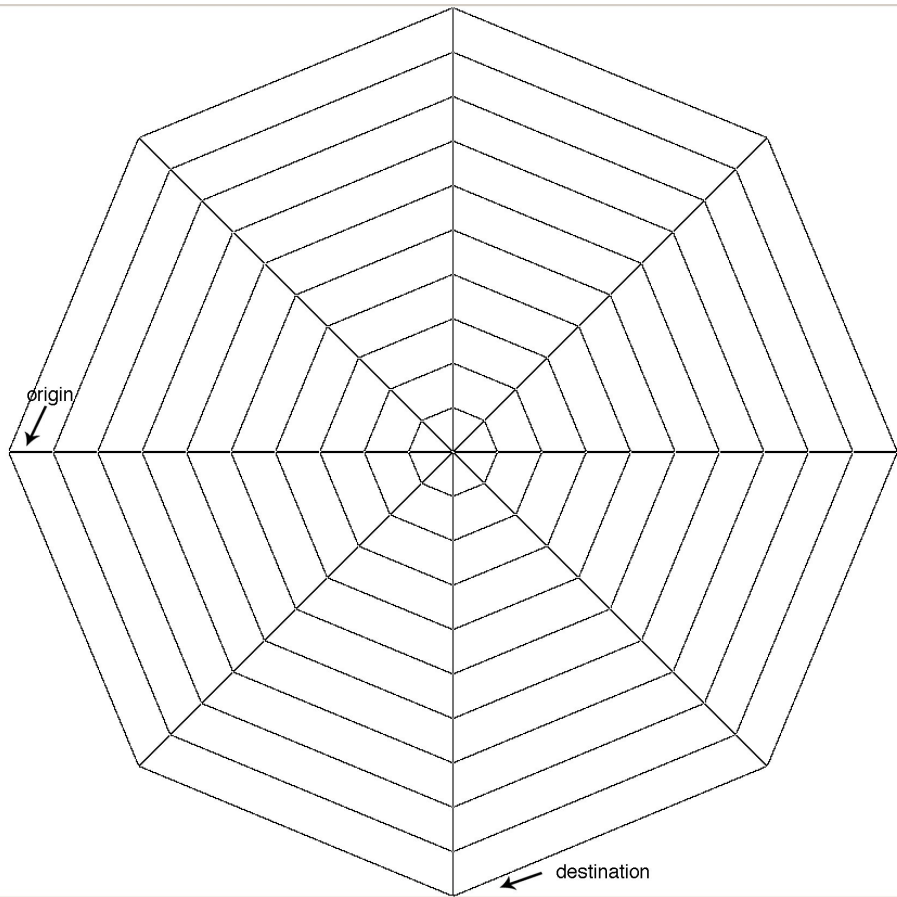


Locating Process (grid2)



Time to destination (grid2)

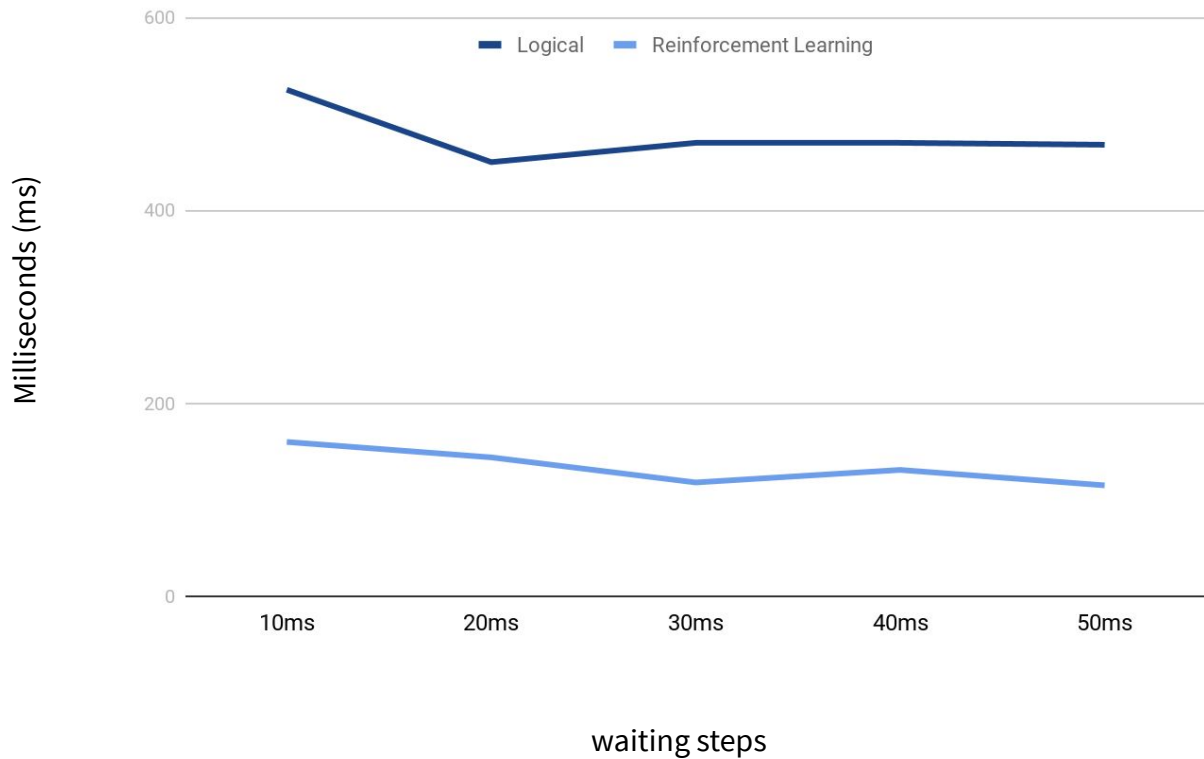




Spider2

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Locating Process (spider2)



Time to destination (spider2)



What's next?

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