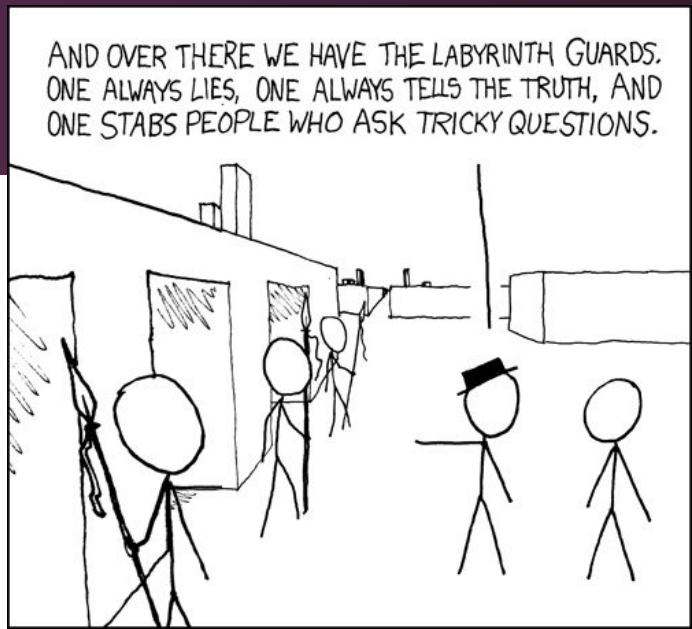
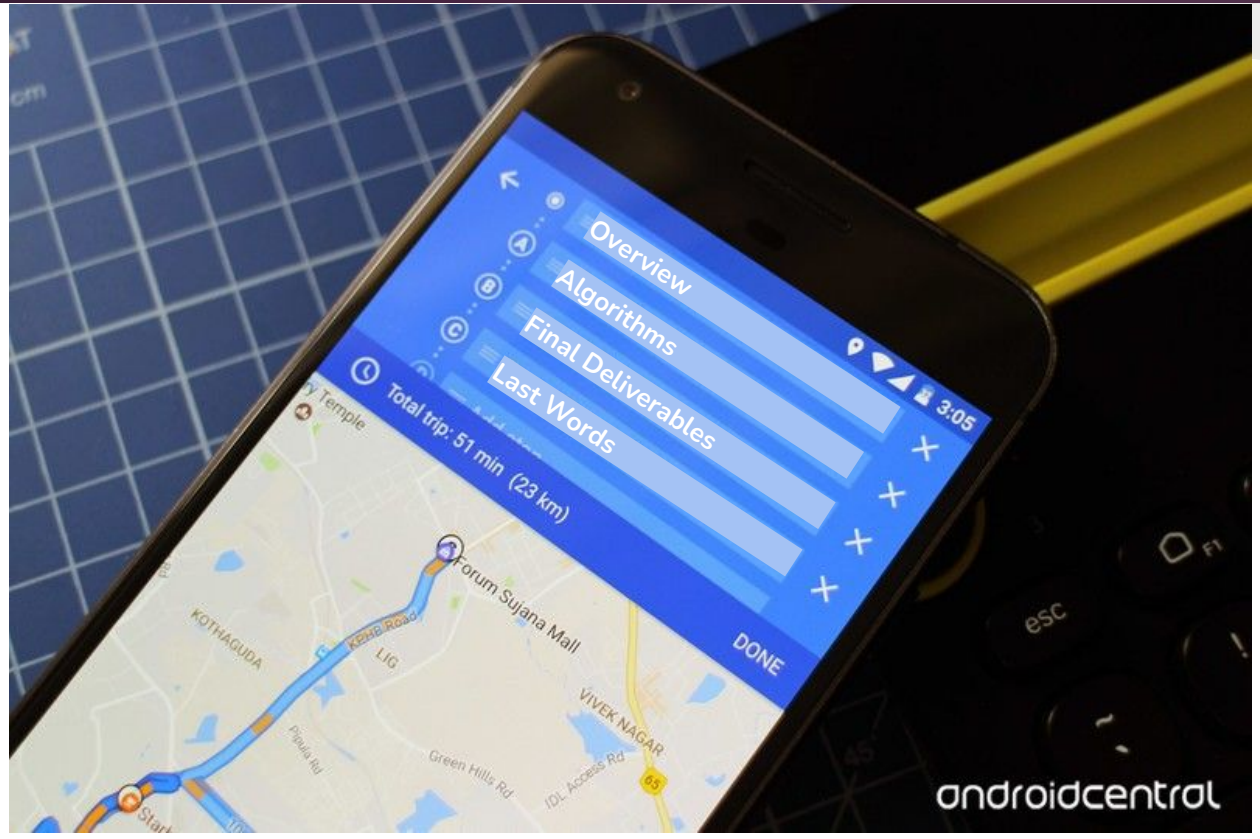
Week 9: Final Overview and Maze Solving

IEEE Micromouse Decal



XKCD 246

Overview

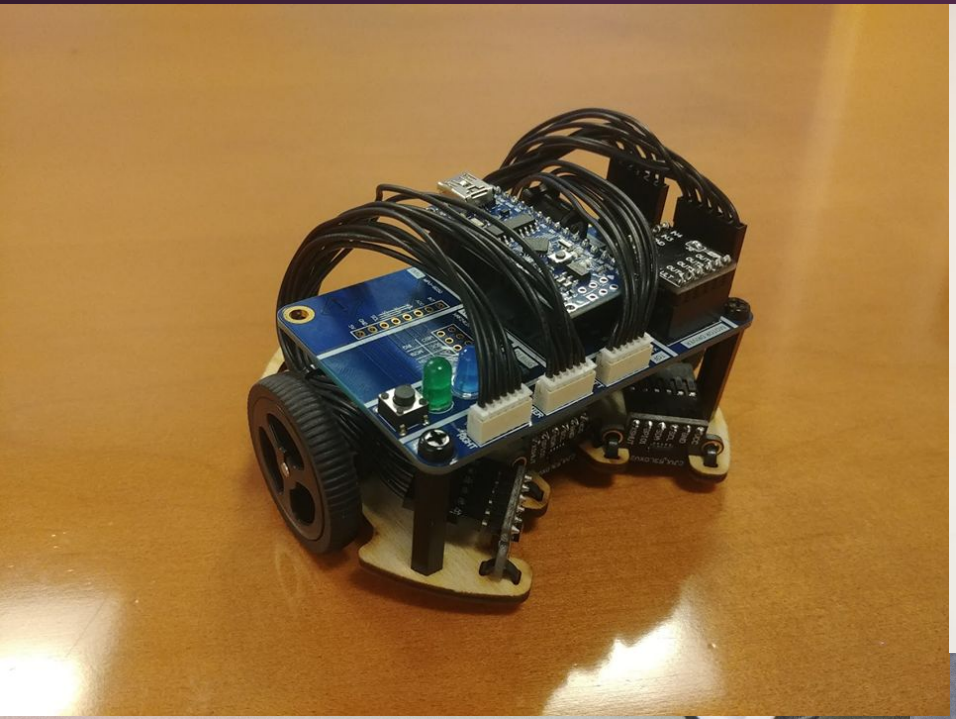

Overview
Algorithms
Final Deliverables
Last Words
Total trip: 51 min (23 km)
DONE
3:05
Forum Sujana Mall
KOTHAGUDA
LIG
VIVEK NAGAR
Green Hills Rd
androidcentral

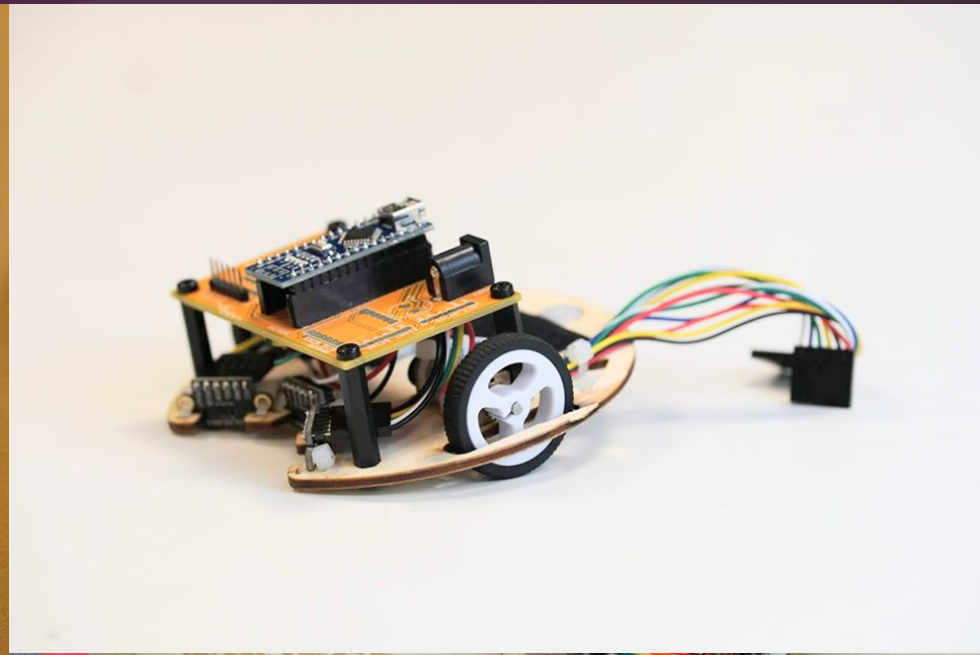
Micromouse: The Problem

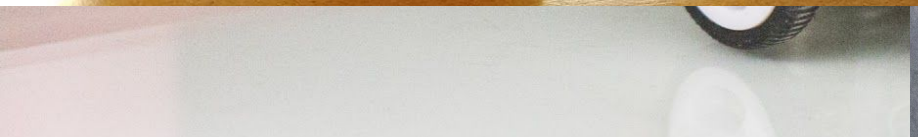
Design and build an autonomous robotic "mouse" that negotiates a maze of standard dimensions from a specified corner to the center in the shortest time.

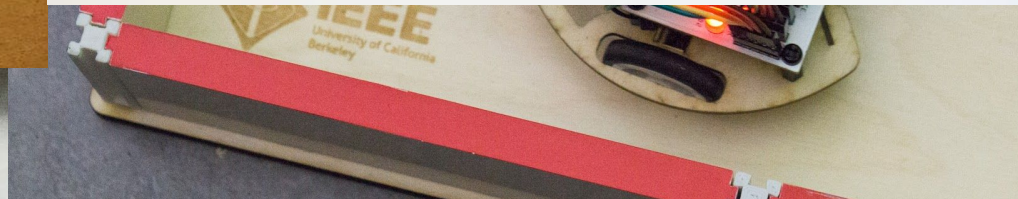
"Recalculating ... recalculating ..."

You Built the Robot!









You Programmed the Arduino!

Looks like it's back to pixels for you!

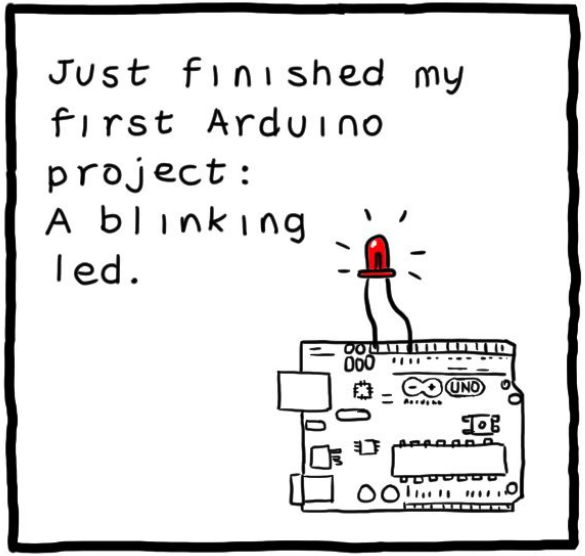
Getting an Arduino LED to Blink

And Then Losing Interest

O RLY?

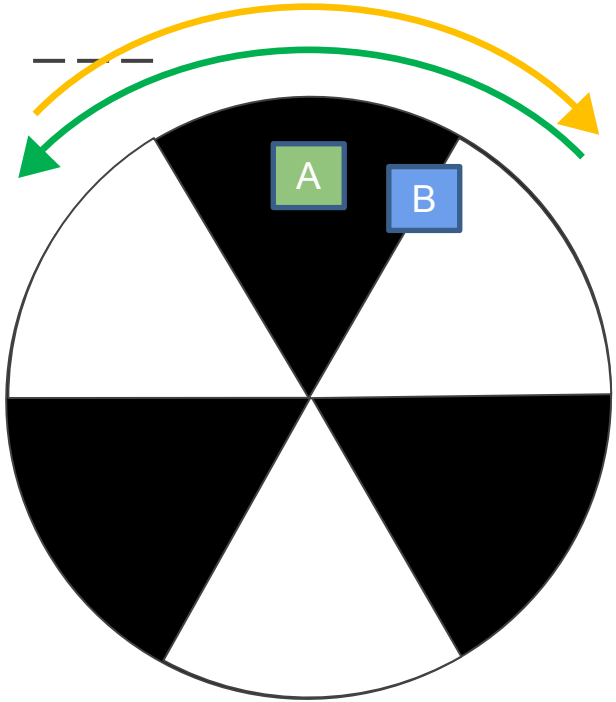
@ThePracticalDev

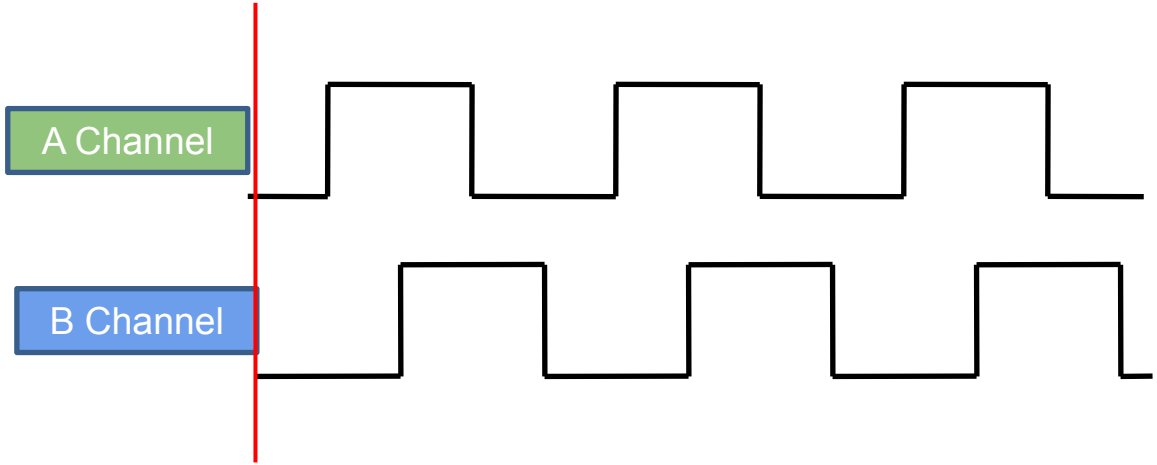
The Practical Dev



Eevblog

You Coded an Encoder!





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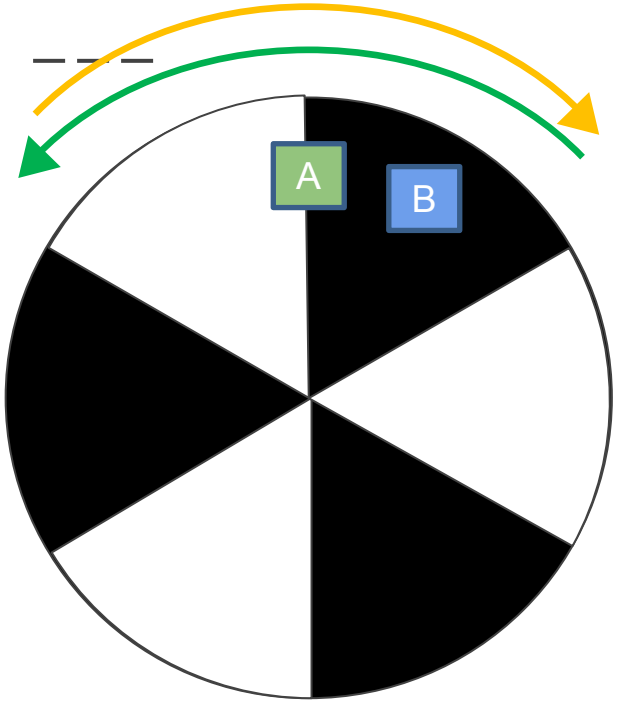

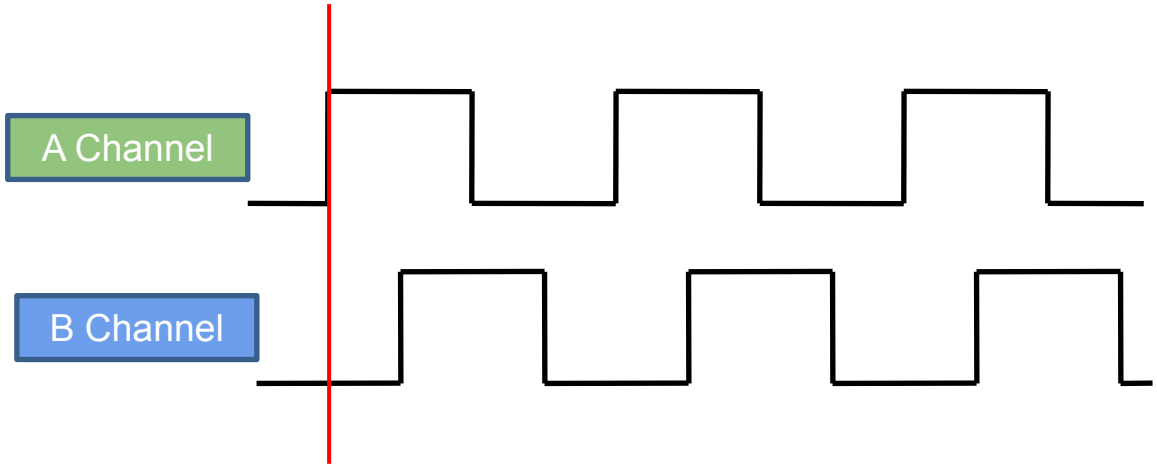

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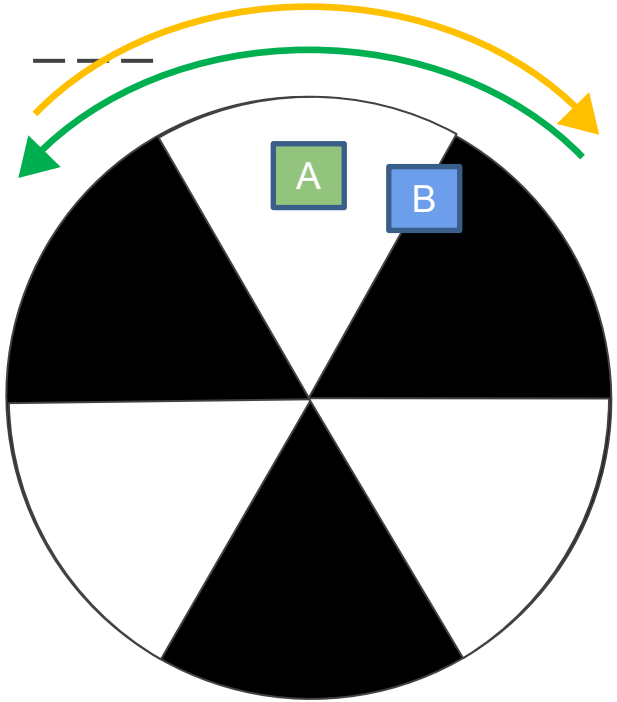

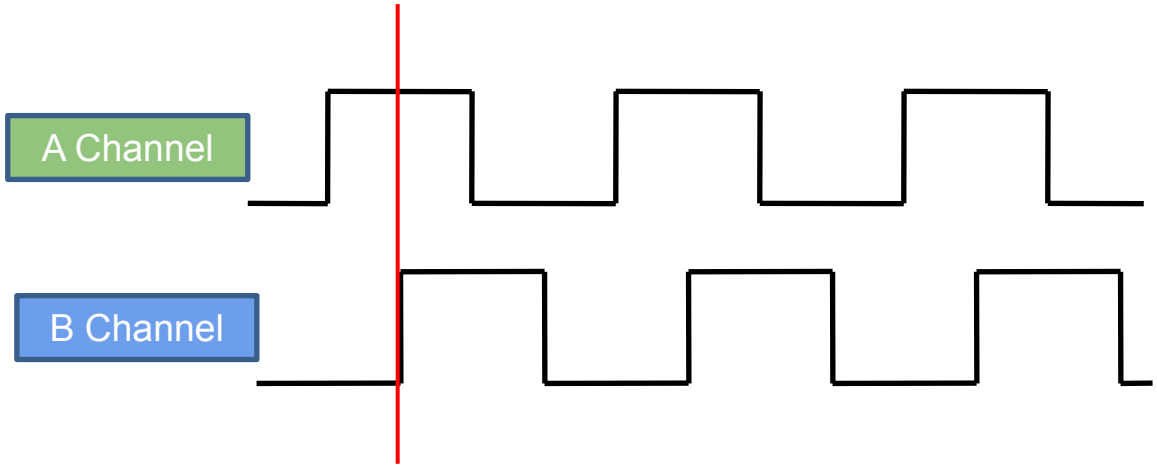

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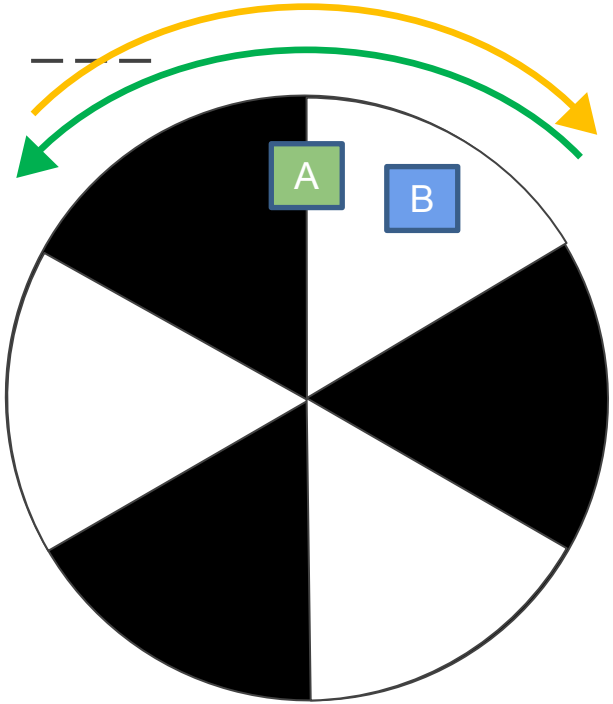

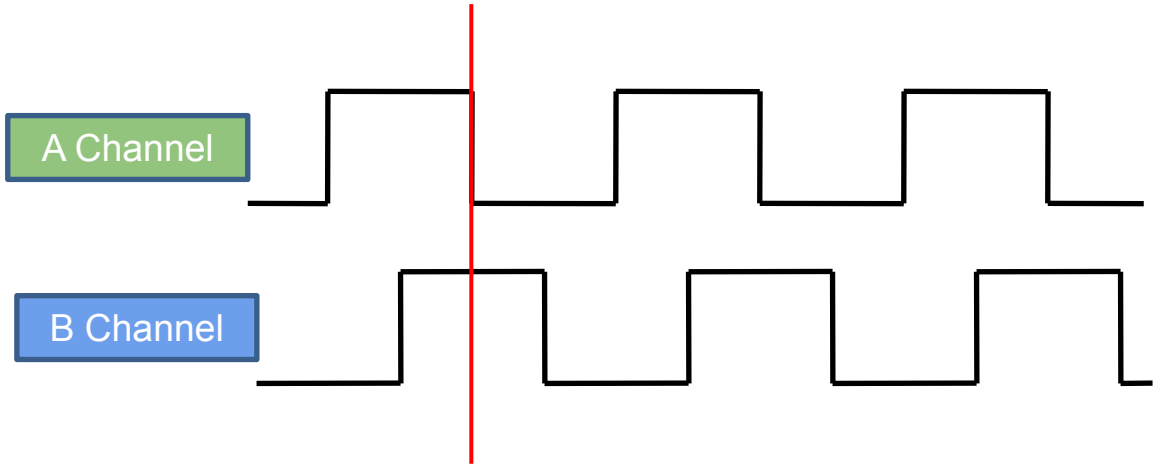

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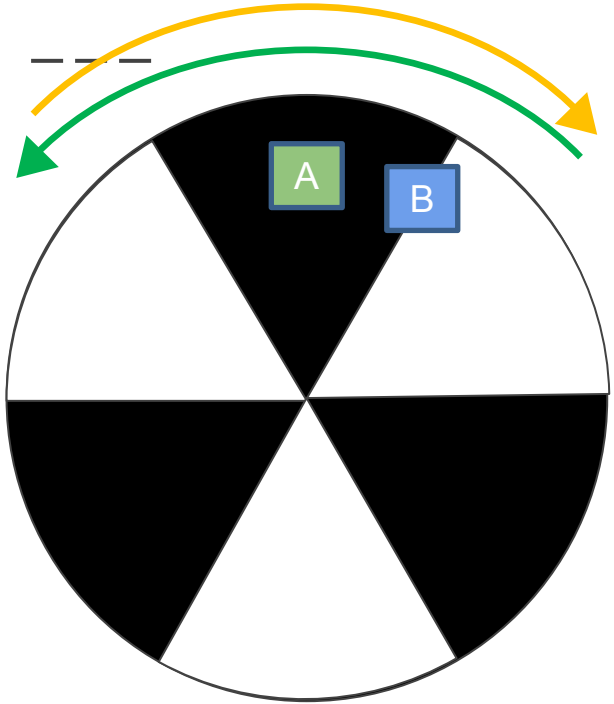

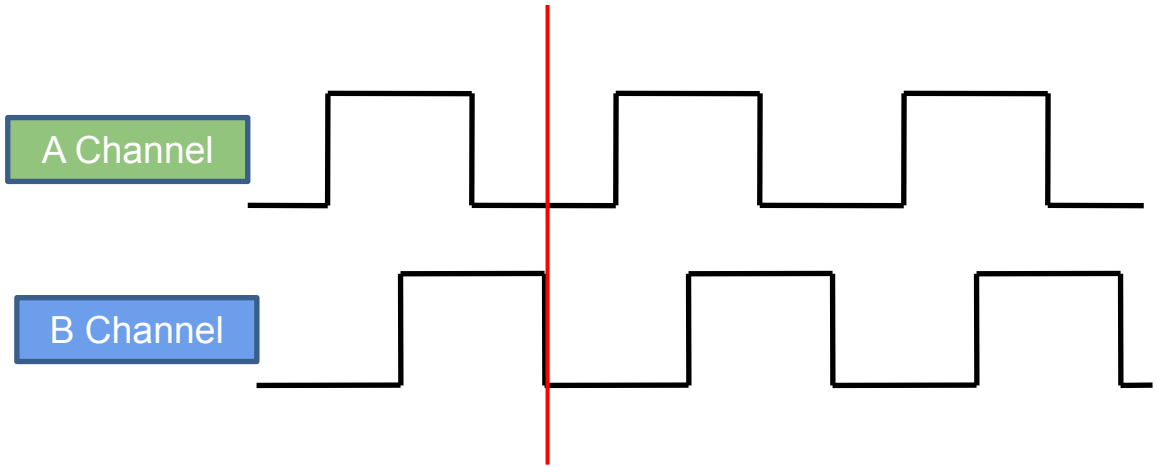

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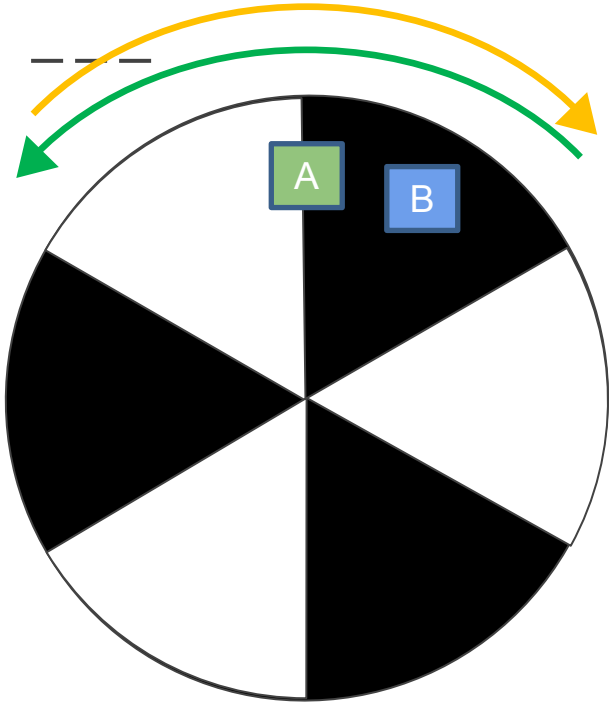

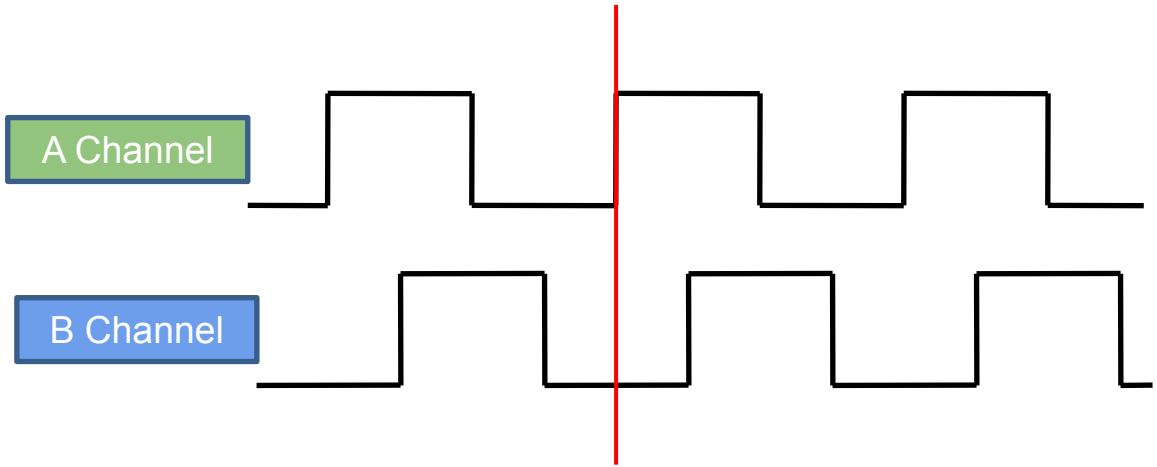

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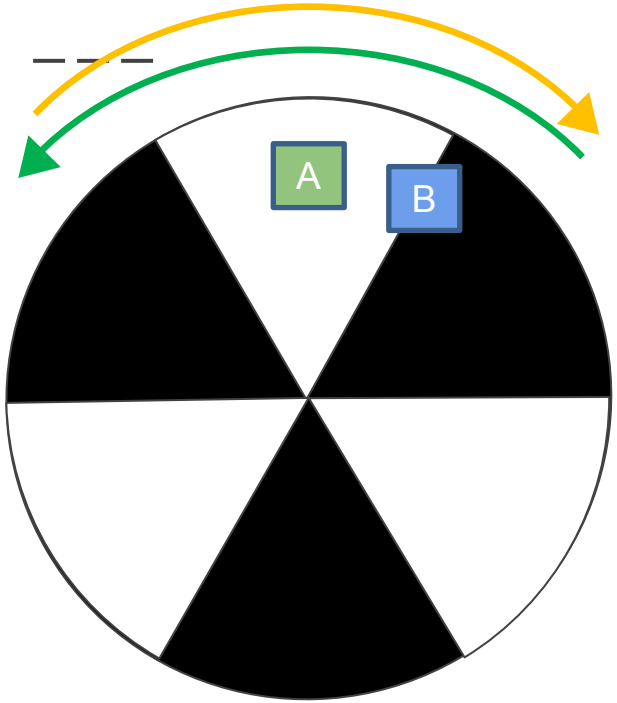

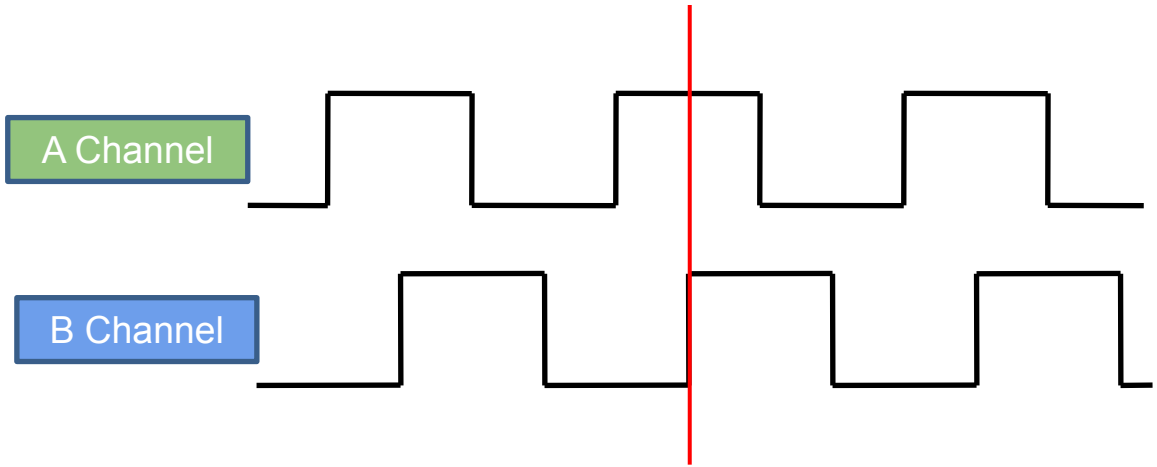

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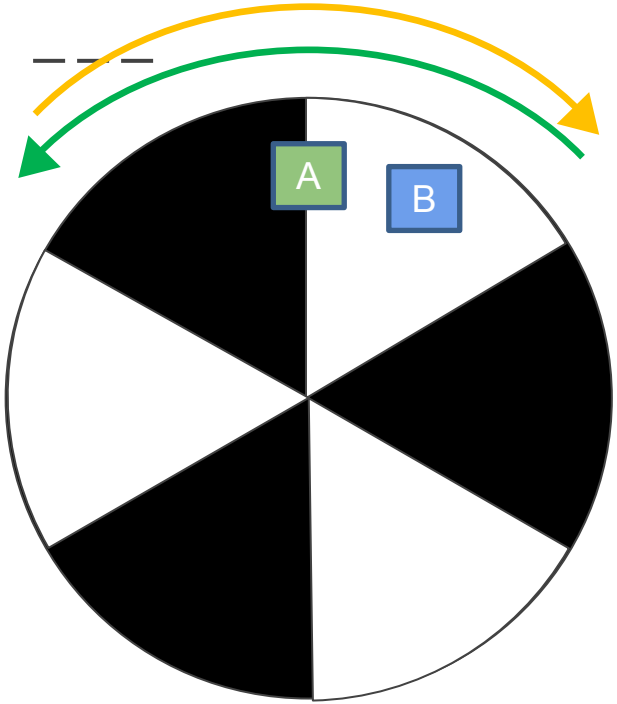

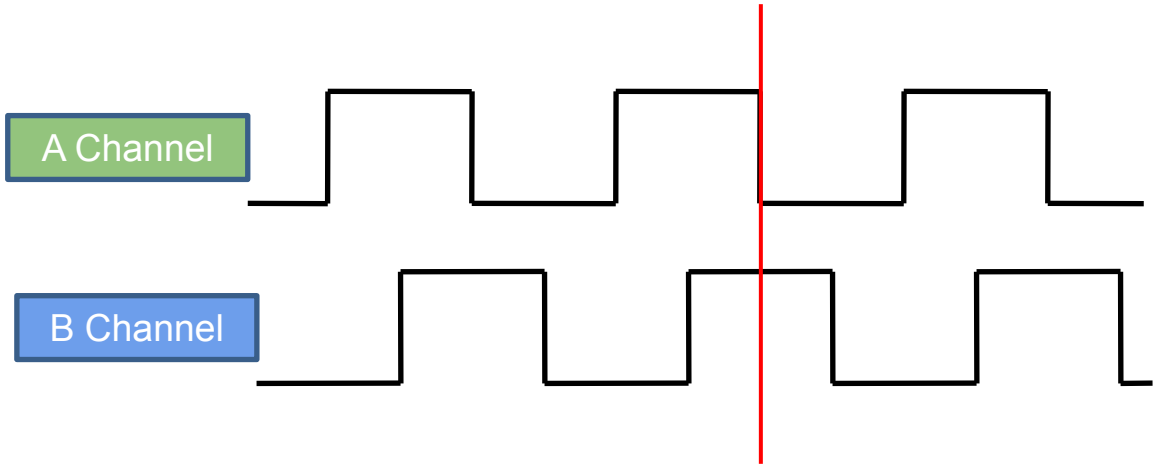

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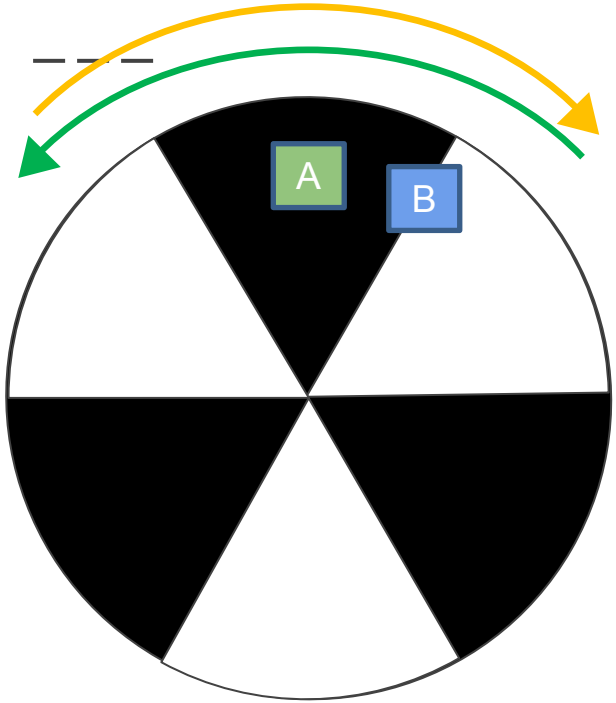

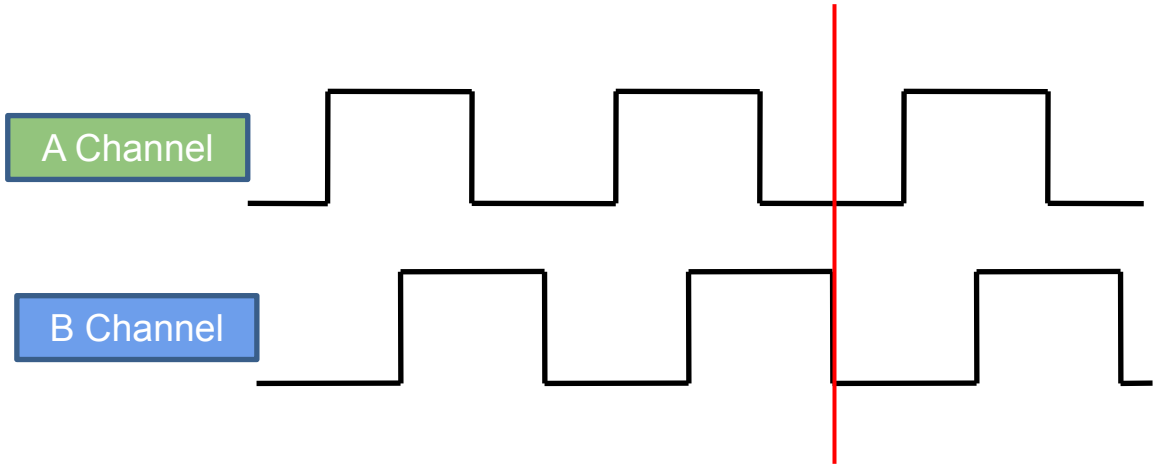

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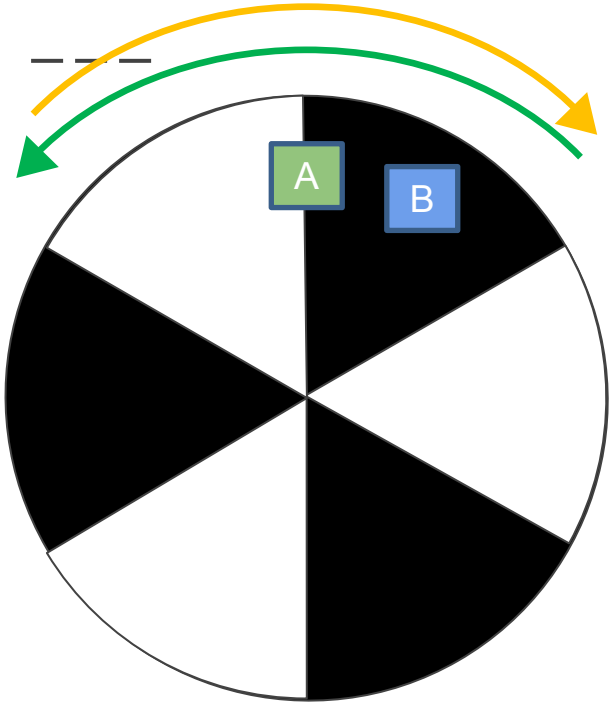

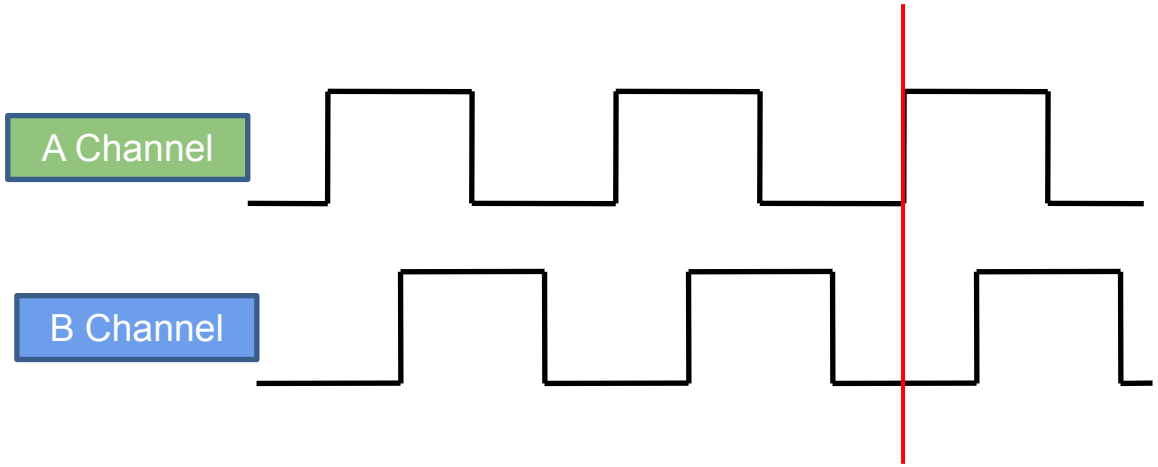

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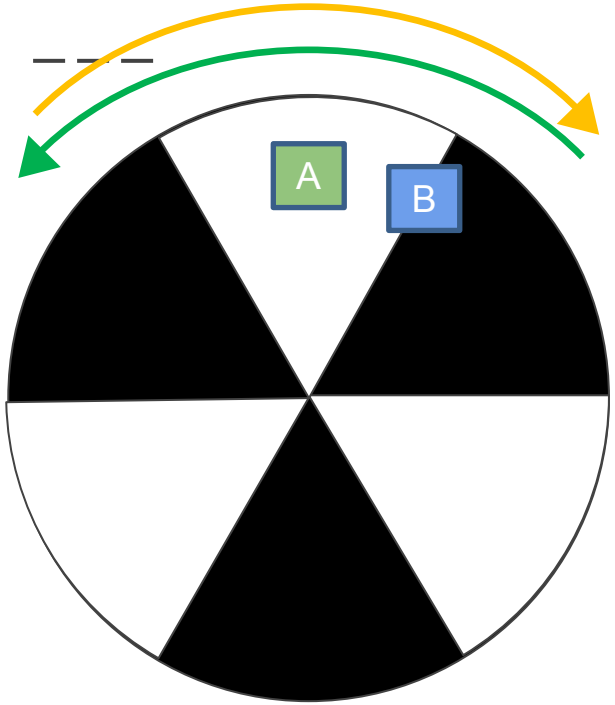

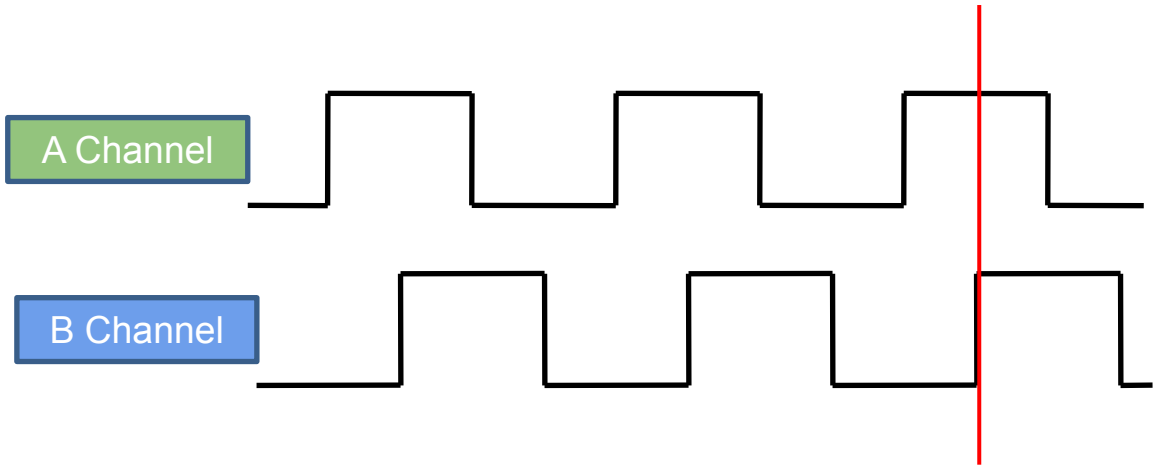

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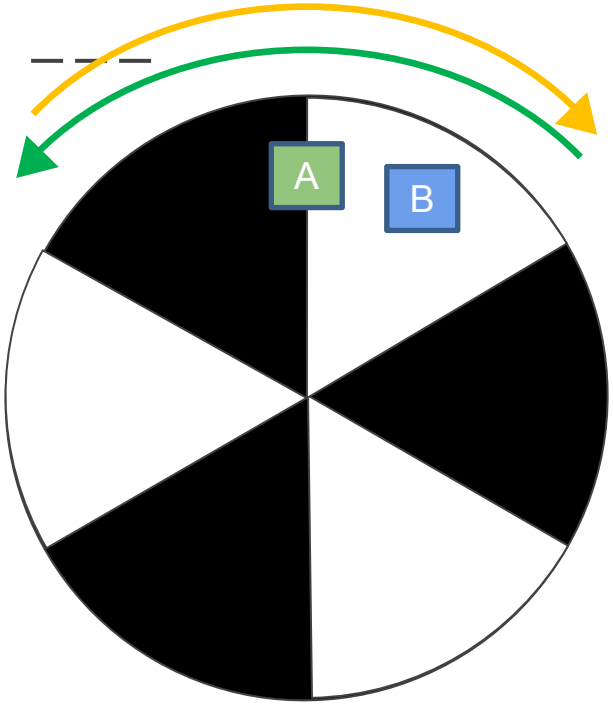

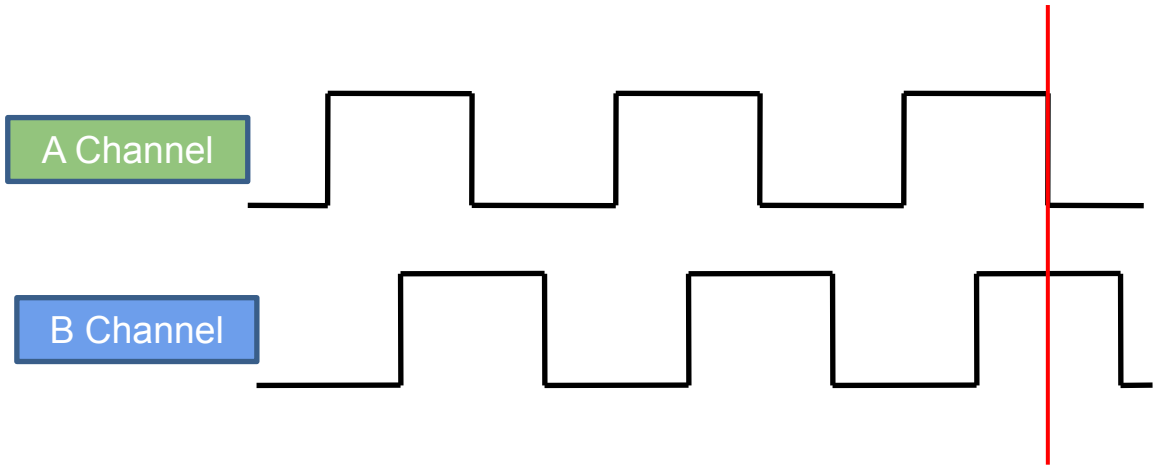

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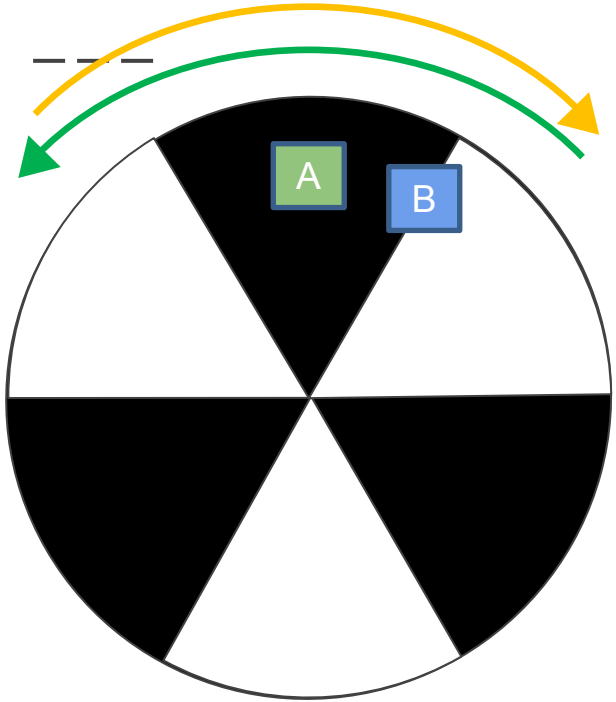
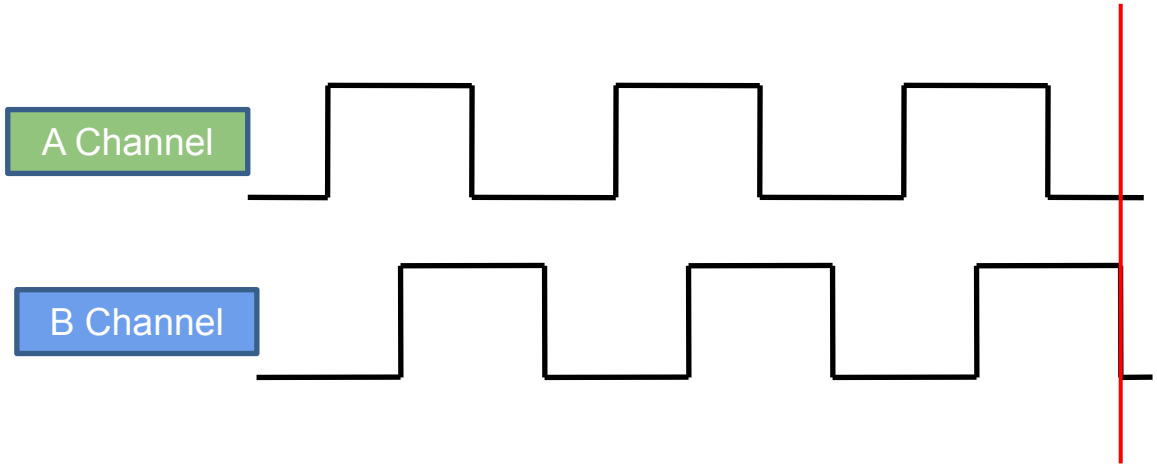
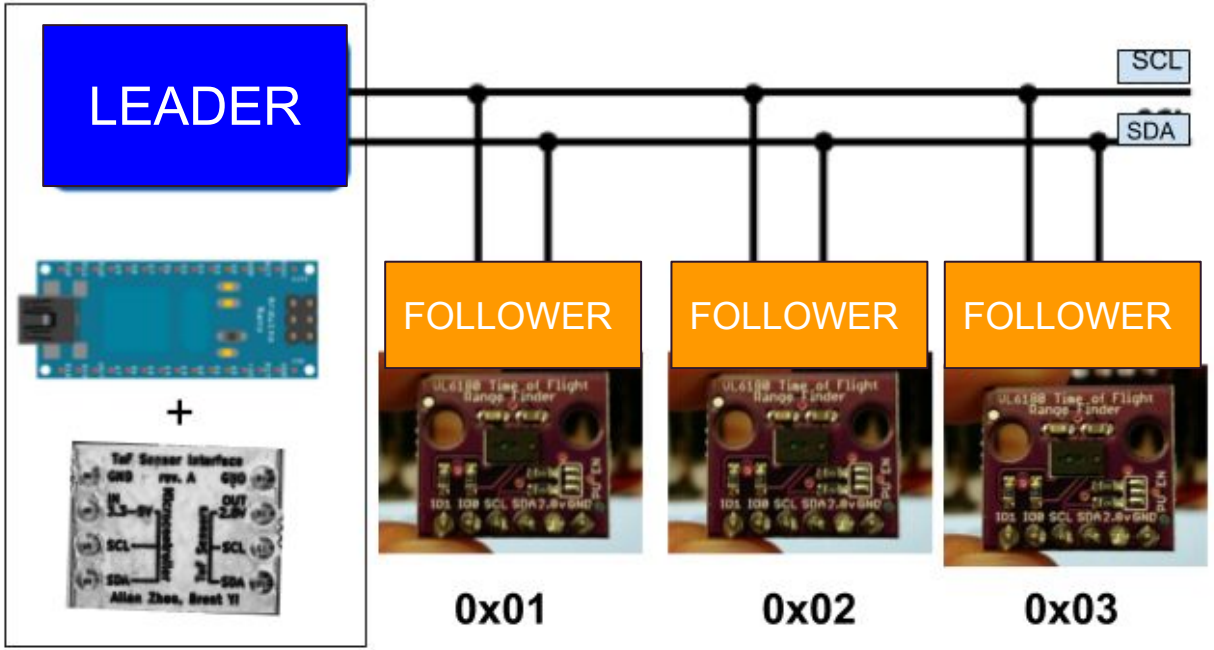




You Learned I2C!

XKCD 1860: Communicating



You Designed a PID Controller!

- Motors move at slightly different speeds
- CROOKED PATHS

Google

proportional controller meme

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proportional integral | overshoot | temperature | cascade | motor | derivative | response | p p

PI Controller Tuning Methods ...
researchgate.net

PI Controller Tuning Methods ...
researchgate.net

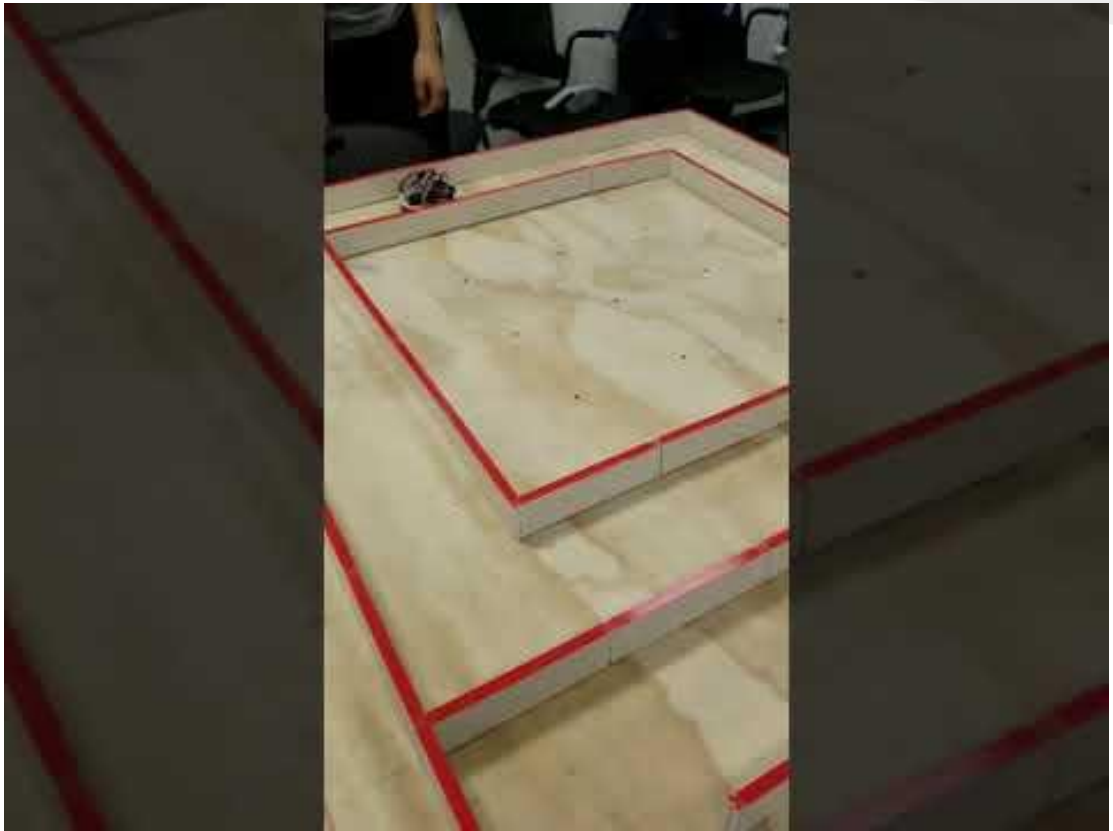
PI controller using PSO optimiz...
researchgate.net

Model-based PI(D) autotuning | ...
researchgate.net

You Programmed Wall Detection!

What If?

And…Now!

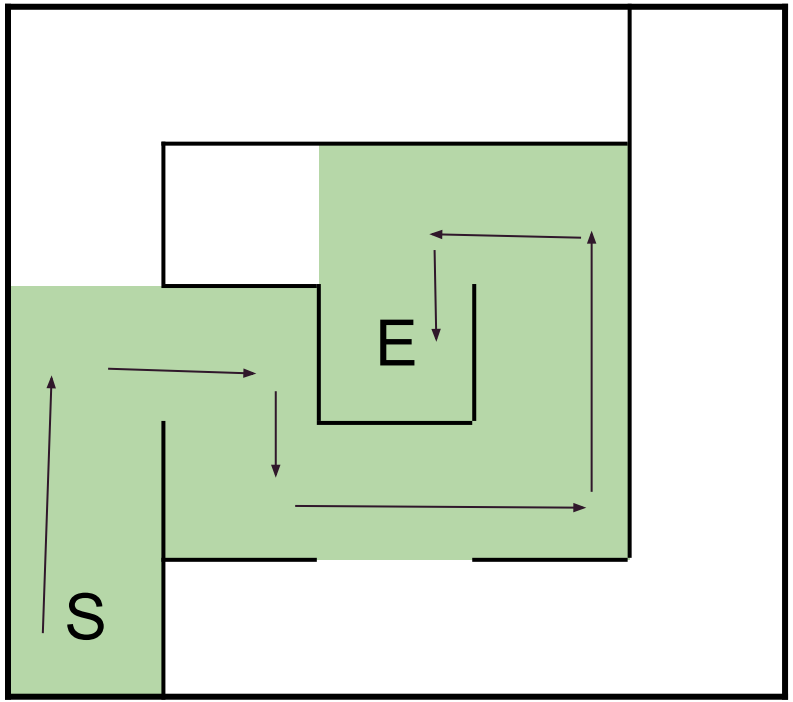


Want More? Floodfill!

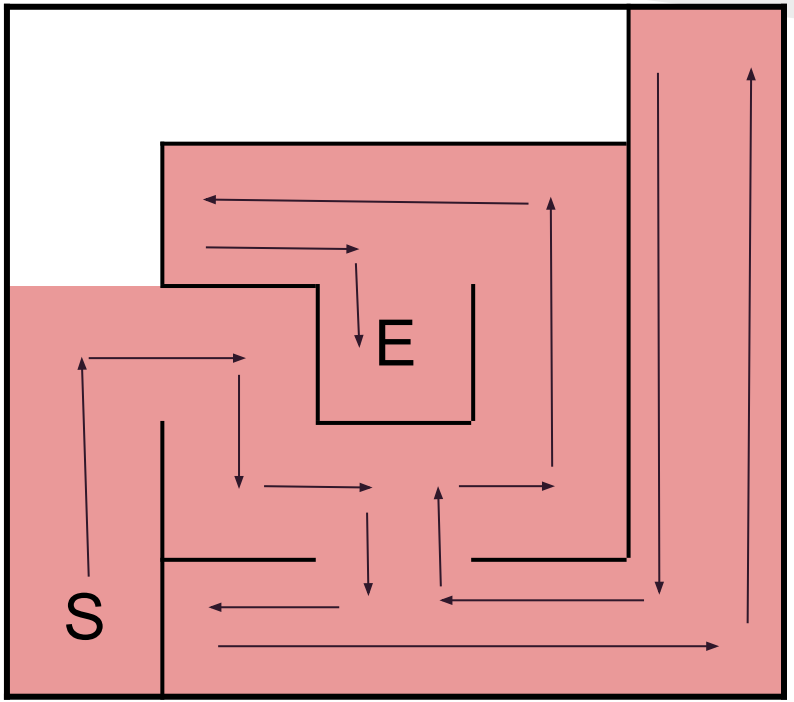
1. Implement localization
   a. Where is our mouse in the maze?
   b. Update (X, Y, Orientation) every time our mouse moves
2. Build data structure for storing maze information
   a. Easiest: 2D array
   b. Update maze data every time our mouse moves
3. Write path planning algorithm
   a. Floodfill!

Algorithms

Floodfill

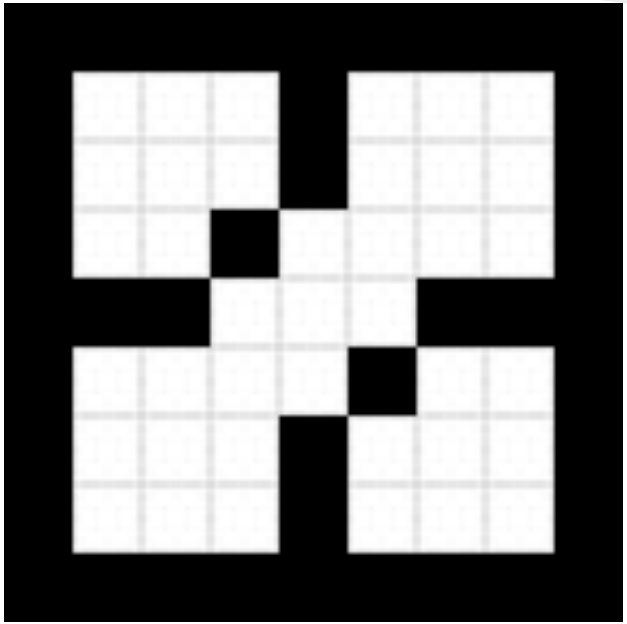


Right Wall Follow



Floodfill Introduction

- What is Floodfill?
  - Maze solving algorithm
  - Finds path to goal position from start



Floodfill Explanation

- Manhattan Distance
  - When traversing blocks we can't go diagonal
  - Measure distance via x,y blocks to center

4	3	2	3	4
3	2	1	2	3
2	1	0	1	2
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Floodfill Explanation

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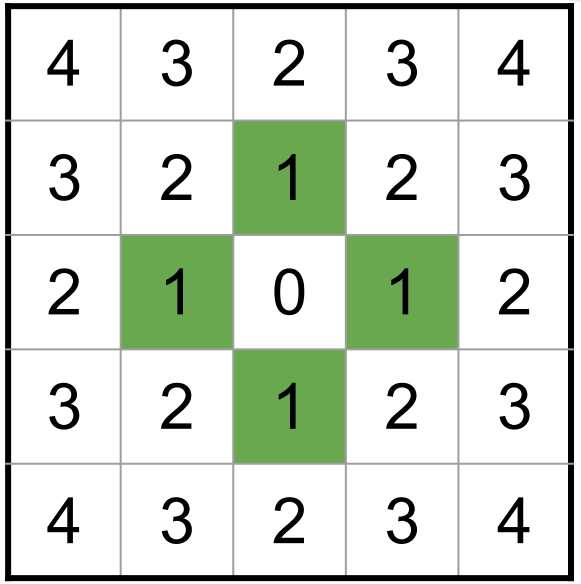

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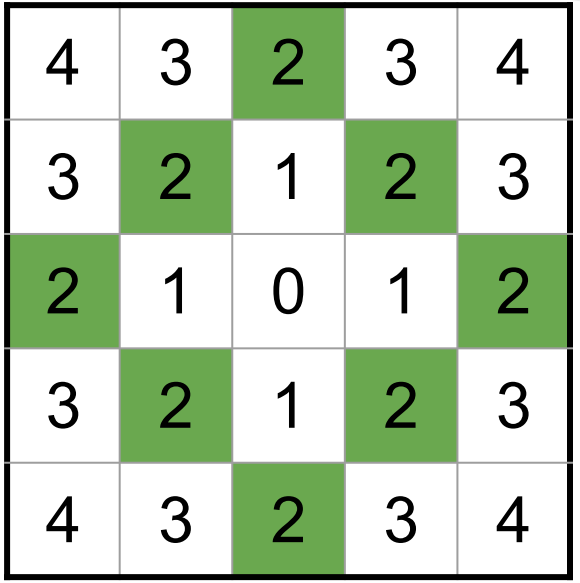

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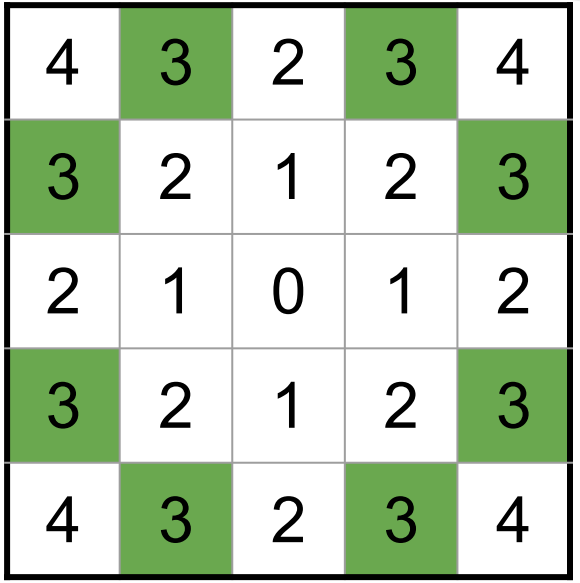


Floodfill Explanation

- Manhattan Distance
  - When traversing blocks we can't go diagonal
  - Measure distance via x,y blocks to center
  - Movement
    - Travel to the lowest adjacent value
    - What happens when we have no lower values?
      - Run floodfill algorithm on current location

4	3	2	3	4
3	2	1	2	3
2	1	0	1	2
3	2	1	2	3
4	3	2	3	4

Floodfill Algorithm

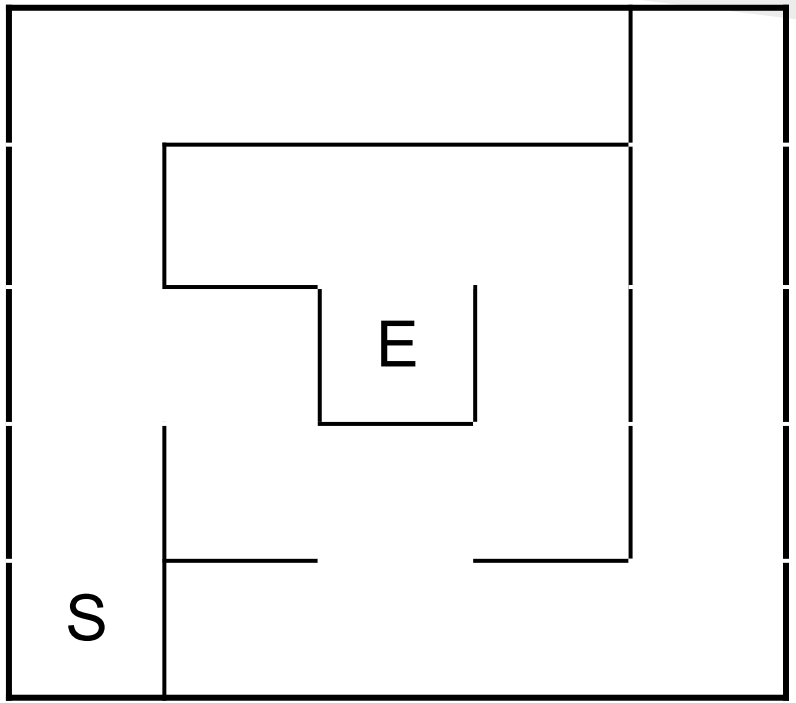
- Neighbor: An adjacent cell with no dividing wall
- Add all neighbors to a queue (first in first out)
- While queue isn't empty:
  - Take node off of queue
  - If all the node's neighbors have a higher value than it, set the node's value to be 1+value of lowest neighbor
  - Add all of the node's neighbors to queue.

Floodfill

Mouse memory

4	3	2	3	4
3	2	1	2	3
2	1	0	1	2
3	2	1	2	3
4	3	2	3	4

Physical maze



Floodfill

Mouse memory

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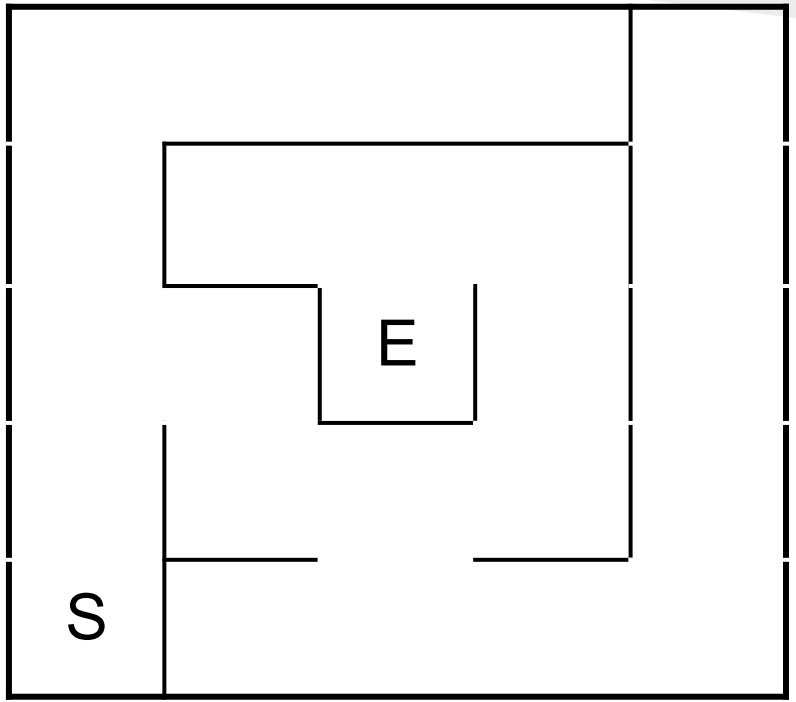
Physical maze



Floodfill

Mouse memory

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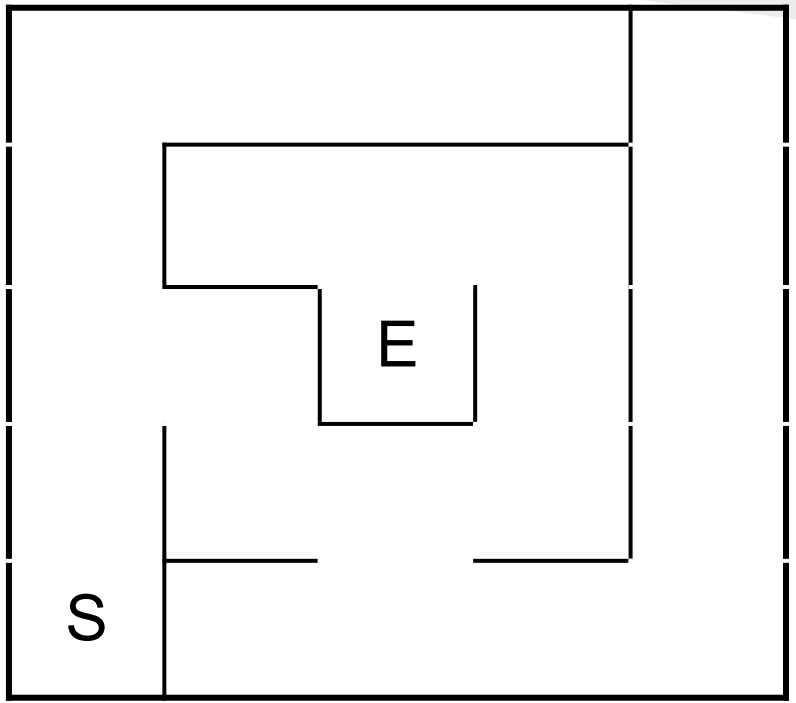
Physical maze



Floodfill

Mouse memory

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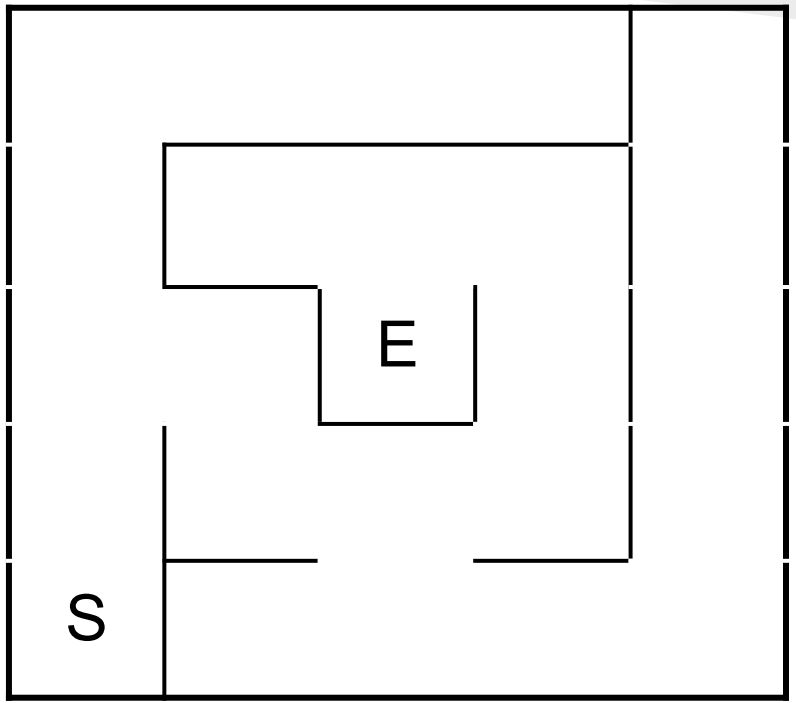
Physical maze



Floodfill

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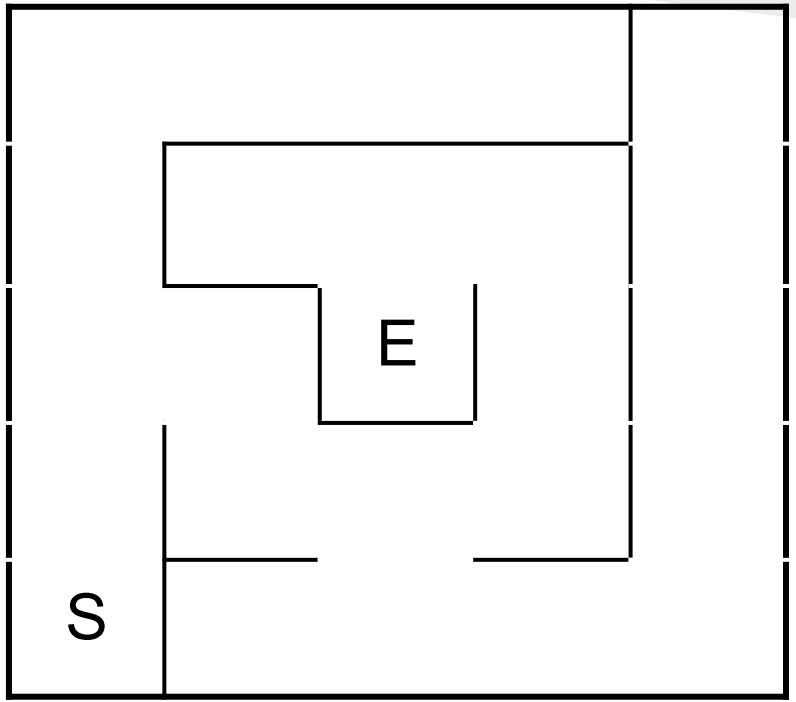
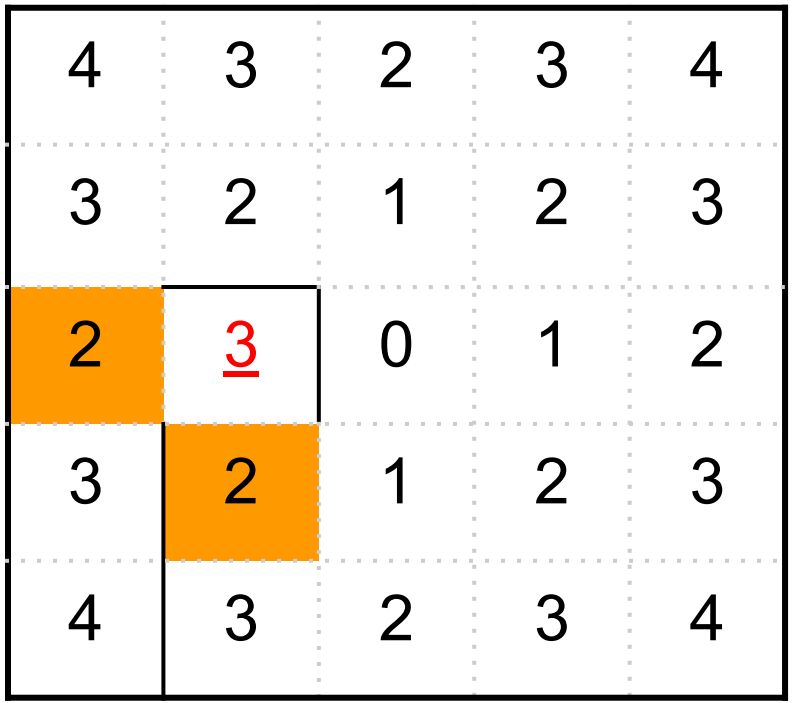
Physical maze

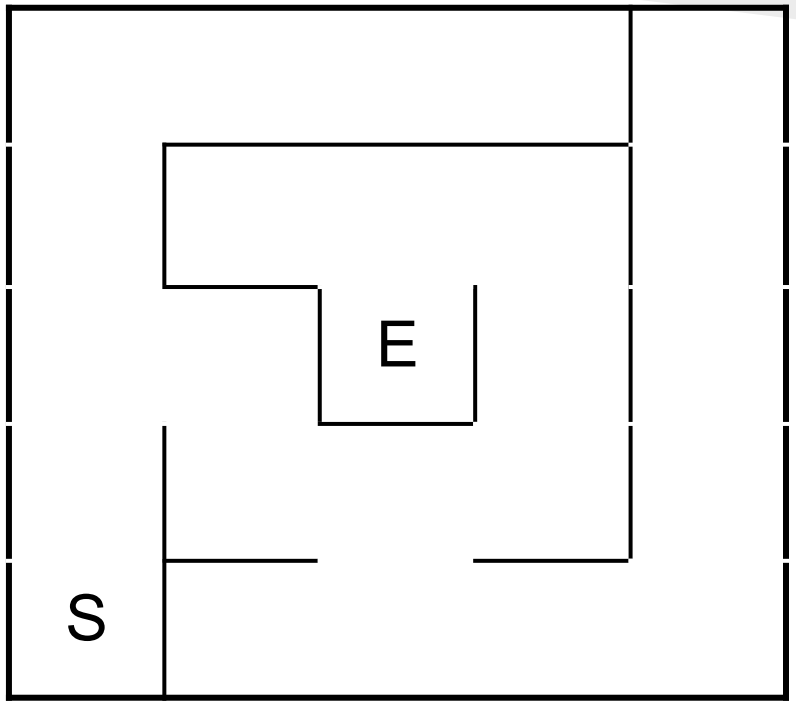


Floodfill

Mouse memory

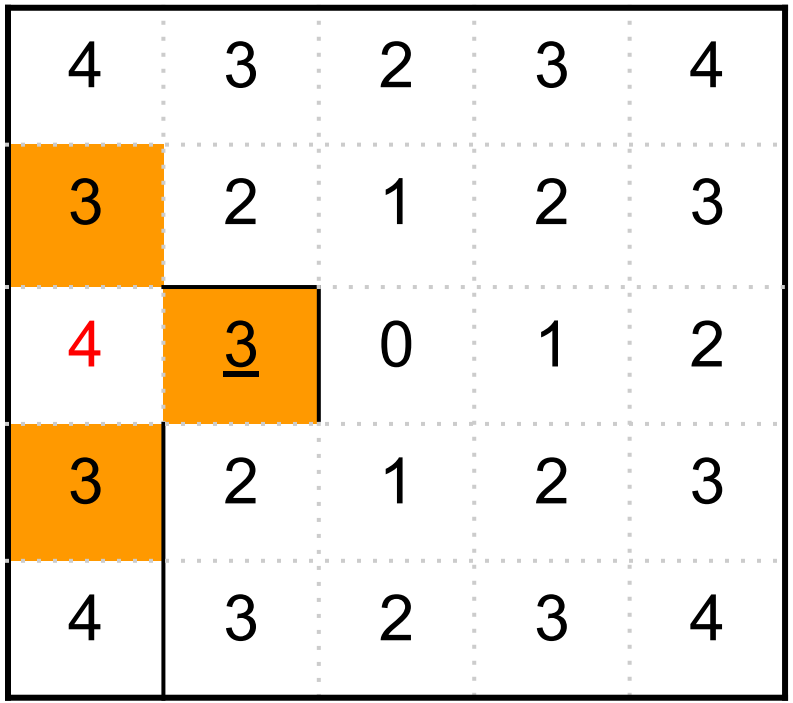


Physical maze

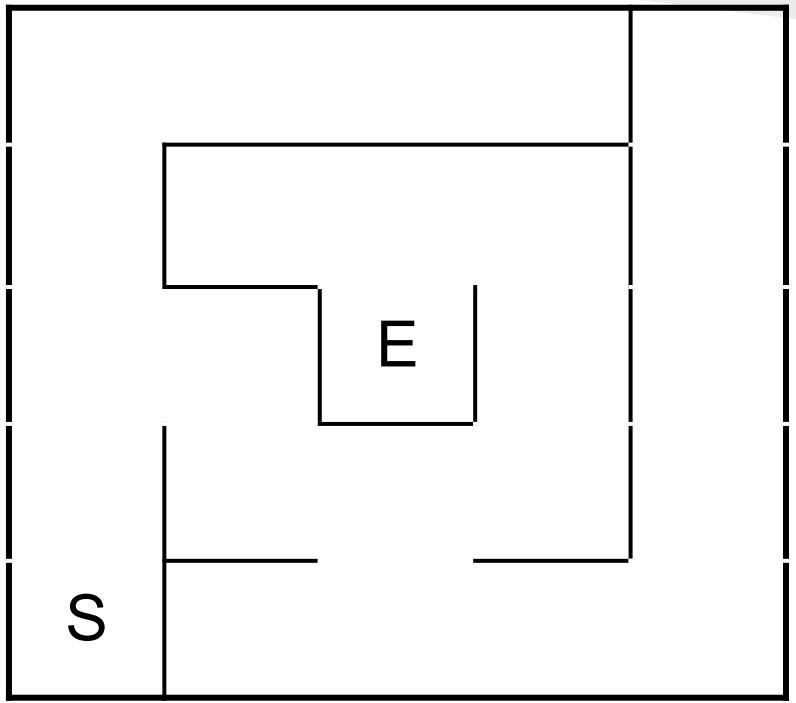


Floodfill

Mouse memory



Physical maze



Floodfill

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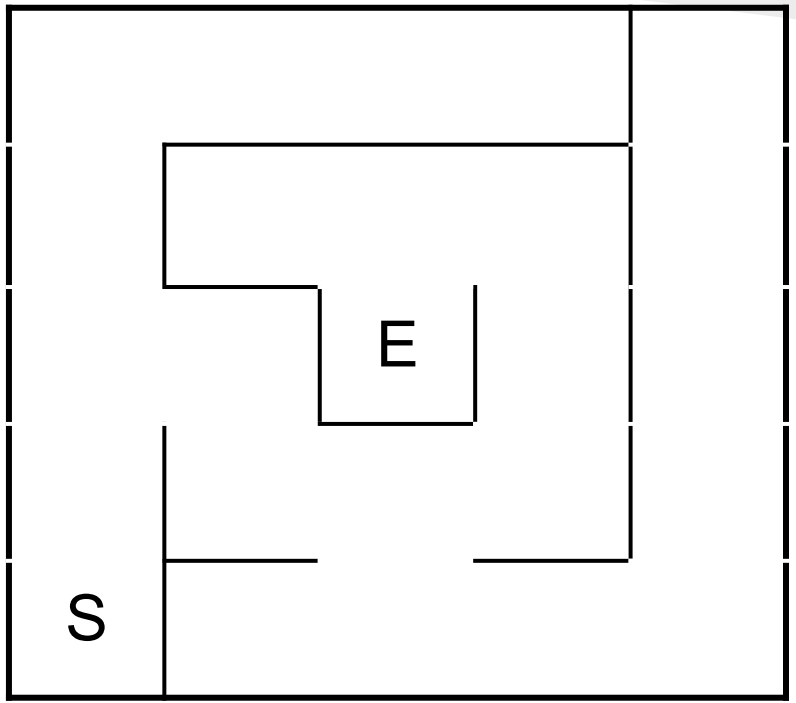
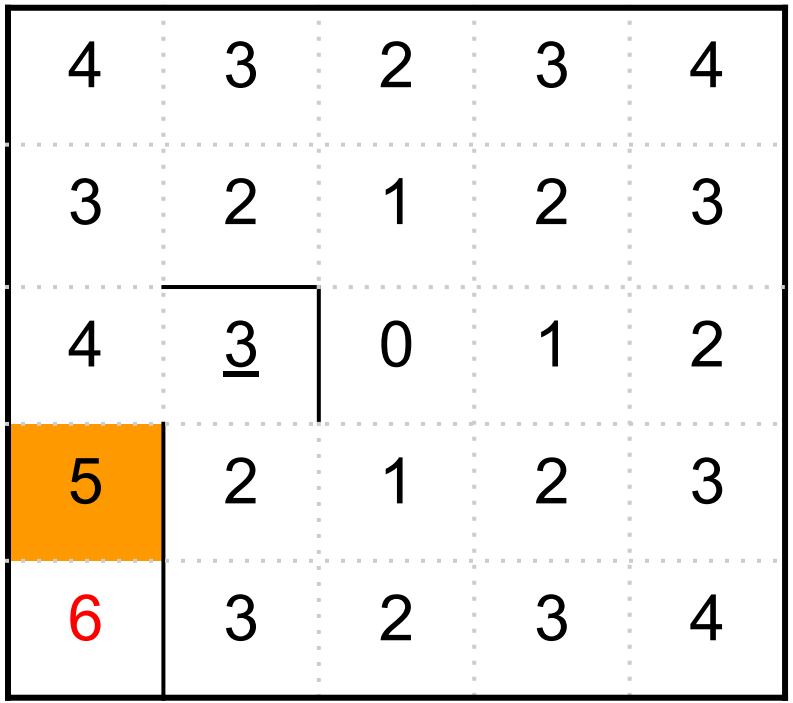
Physical maze

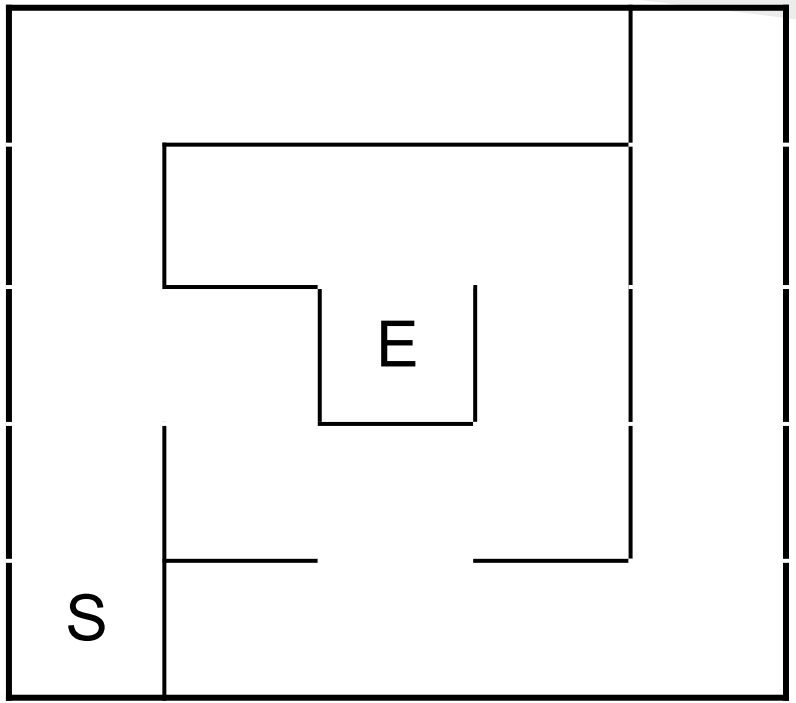


Floodfill

Mouse memory



Physical maze

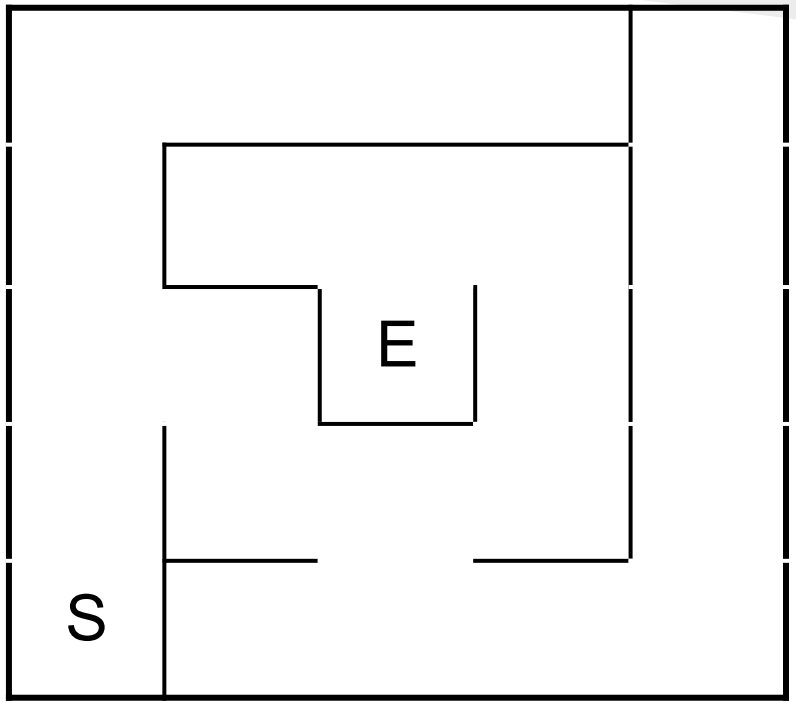


Floodfill

Mouse memory

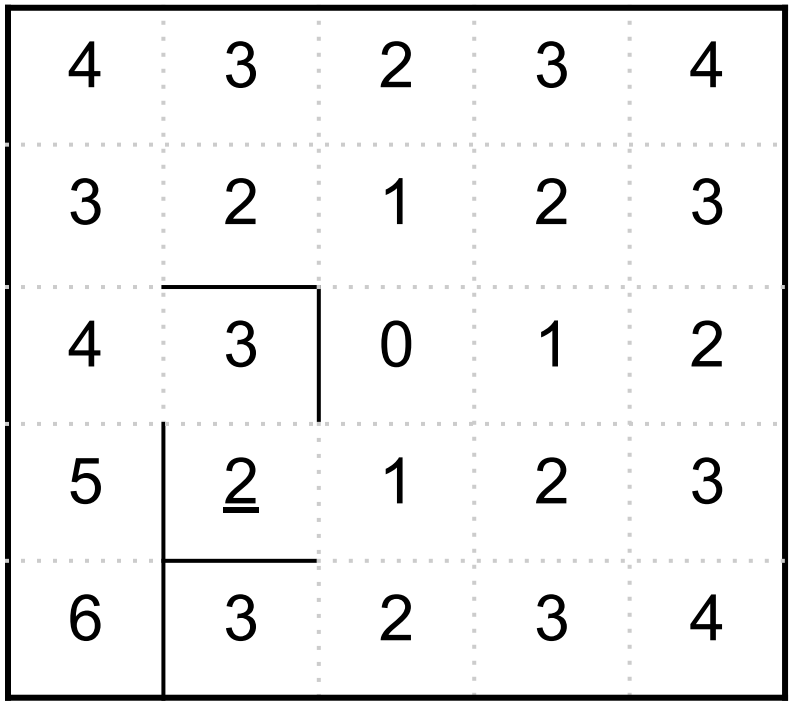
4	3	2	3	4
3	2	1	2	3
4	3	0	1	2
5	2	1	2	3
6	3	2	3	4

Physical maze

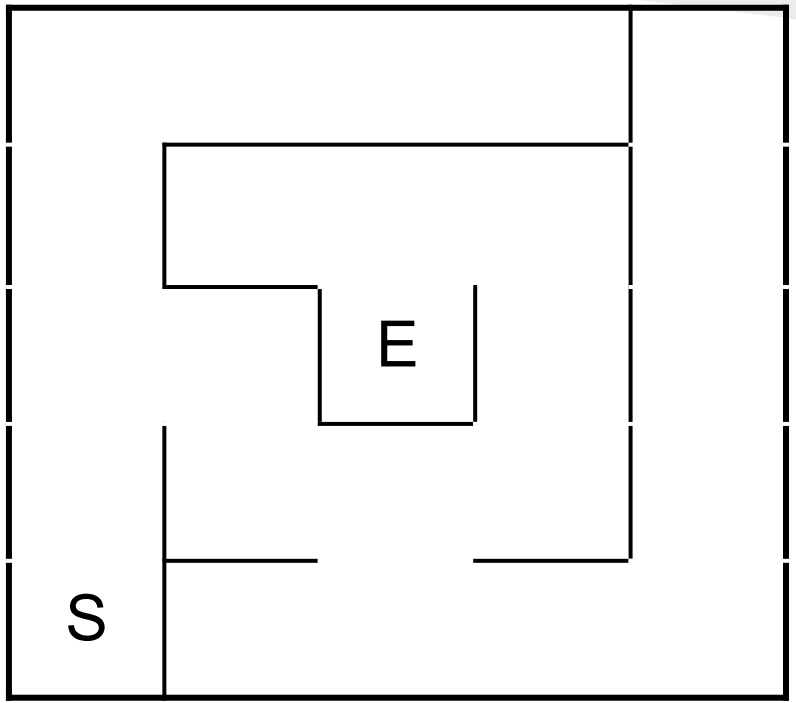


Floodfill

Mouse memory

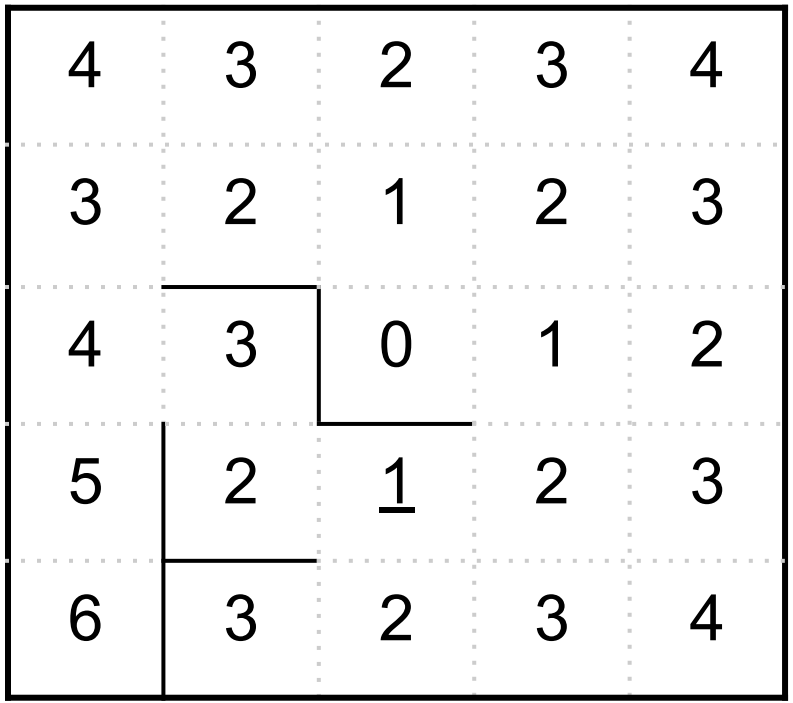


Physical maze

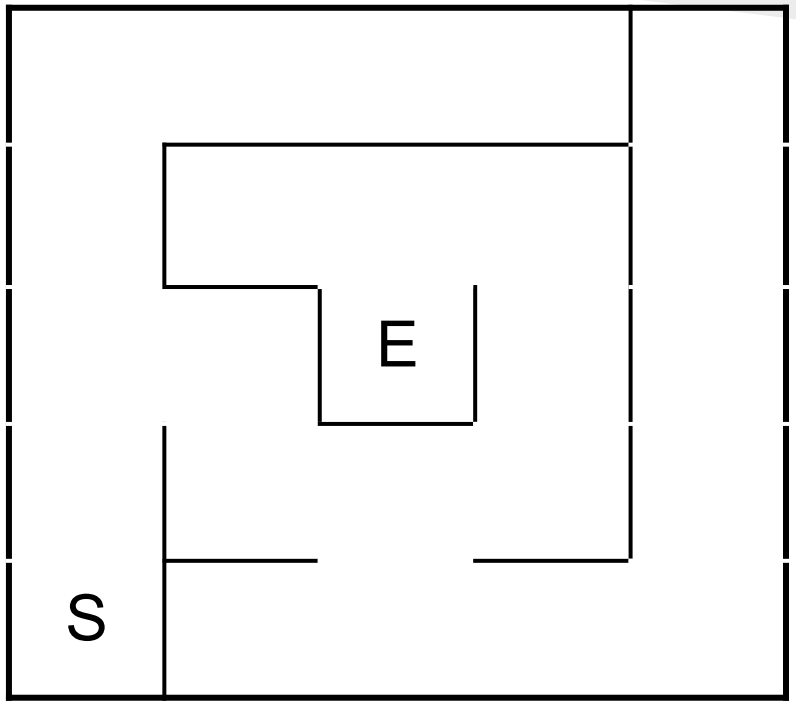


Floodfill

Mouse memory

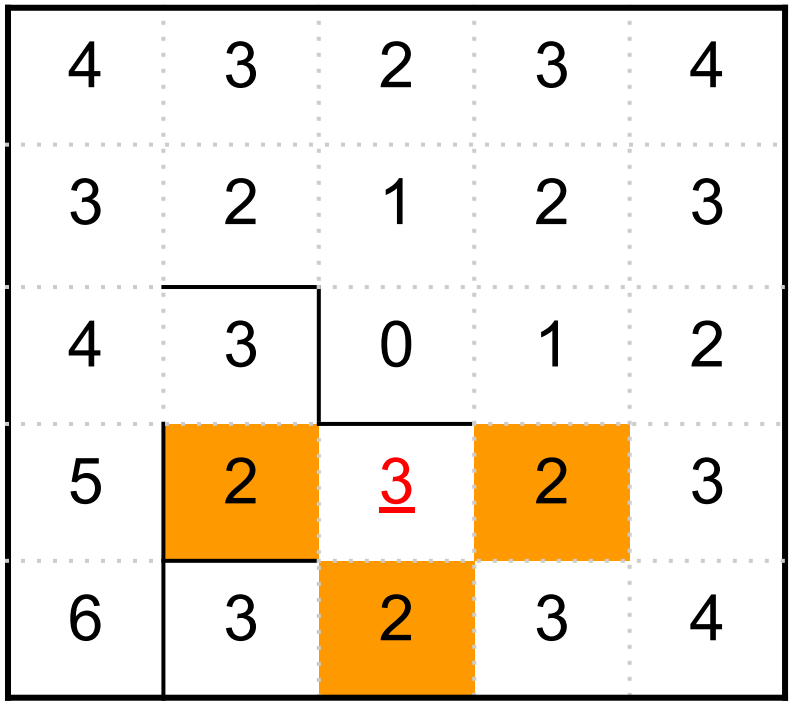


Physical maze



Floodfill

Mouse memory



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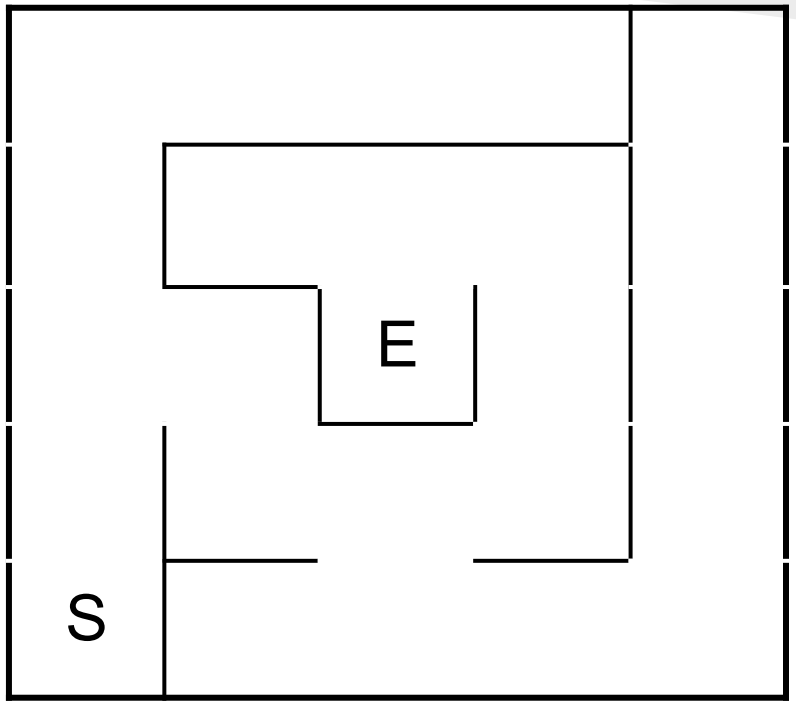

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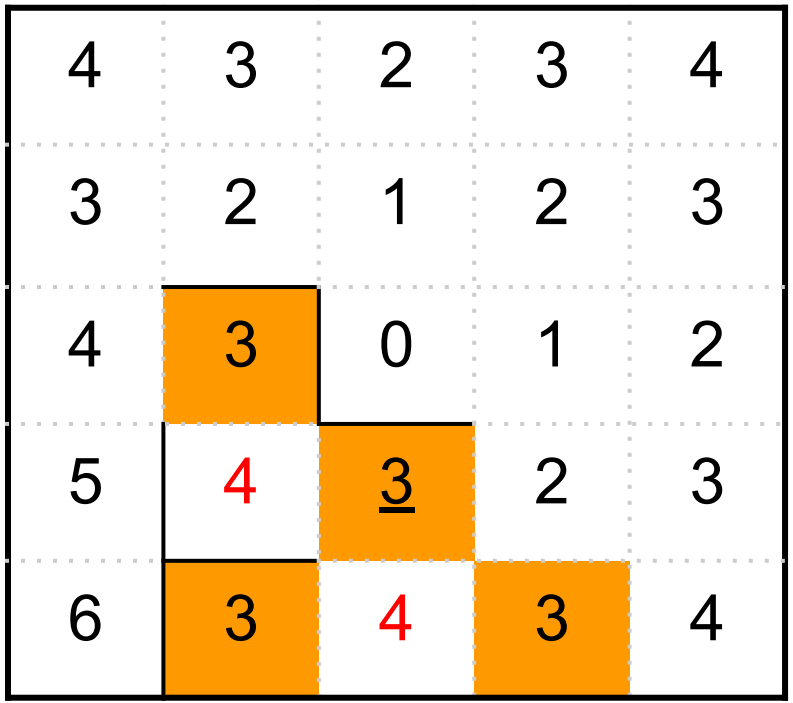
Mouse memory



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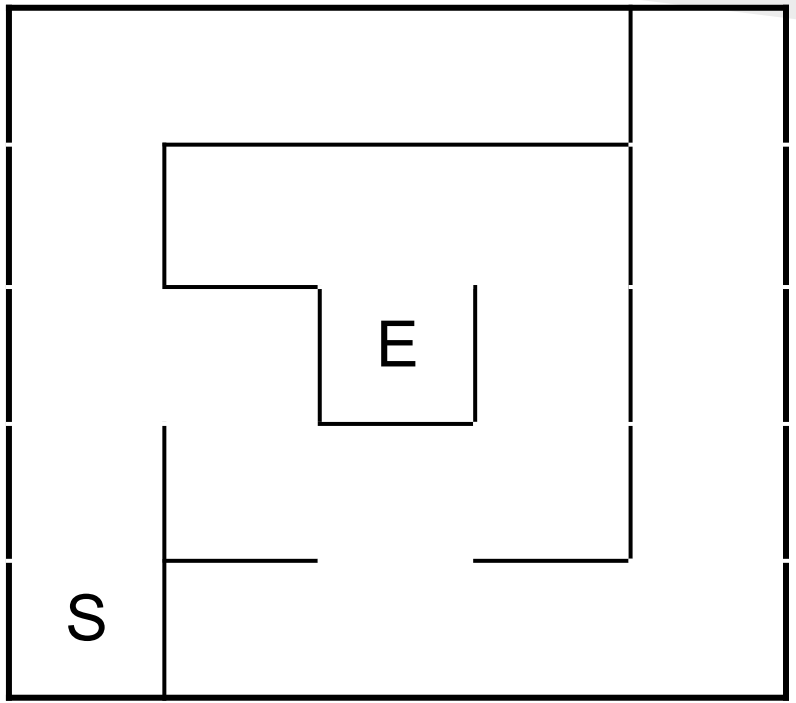
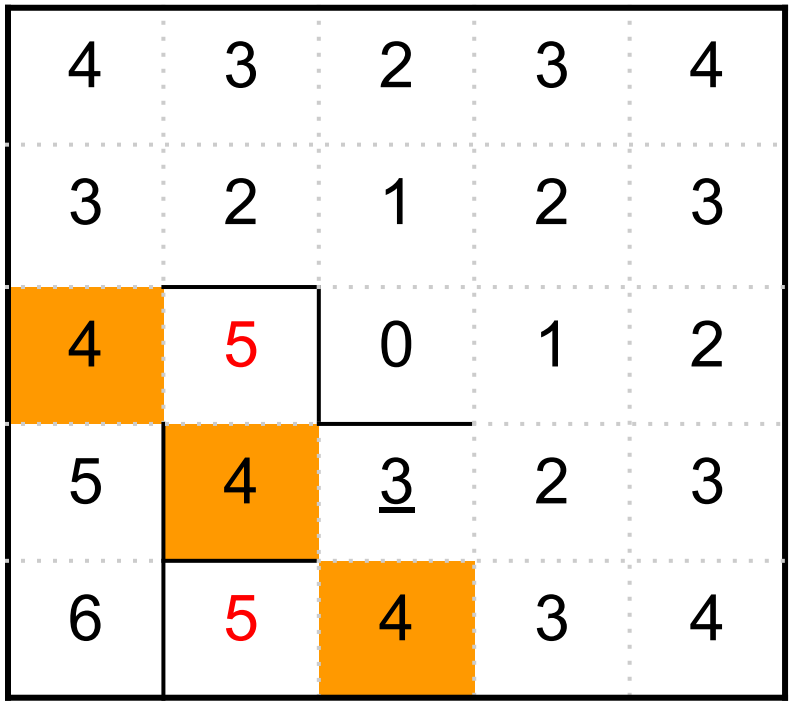


Floodfill

Mouse memory



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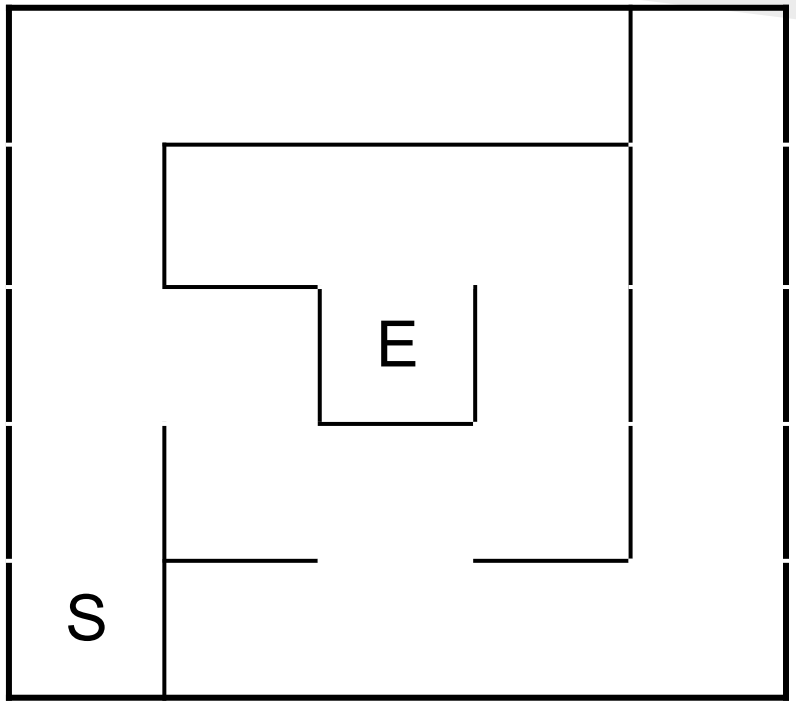
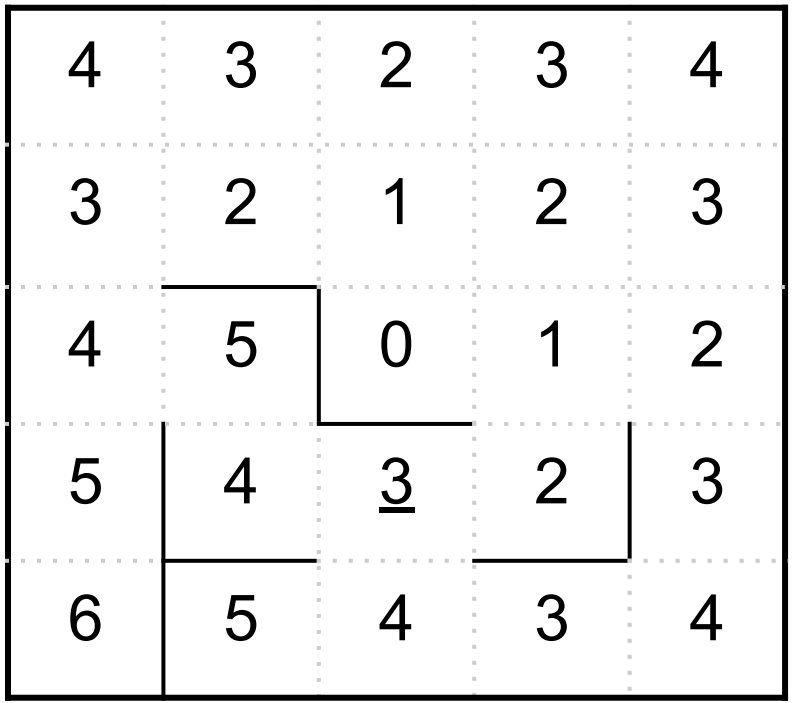
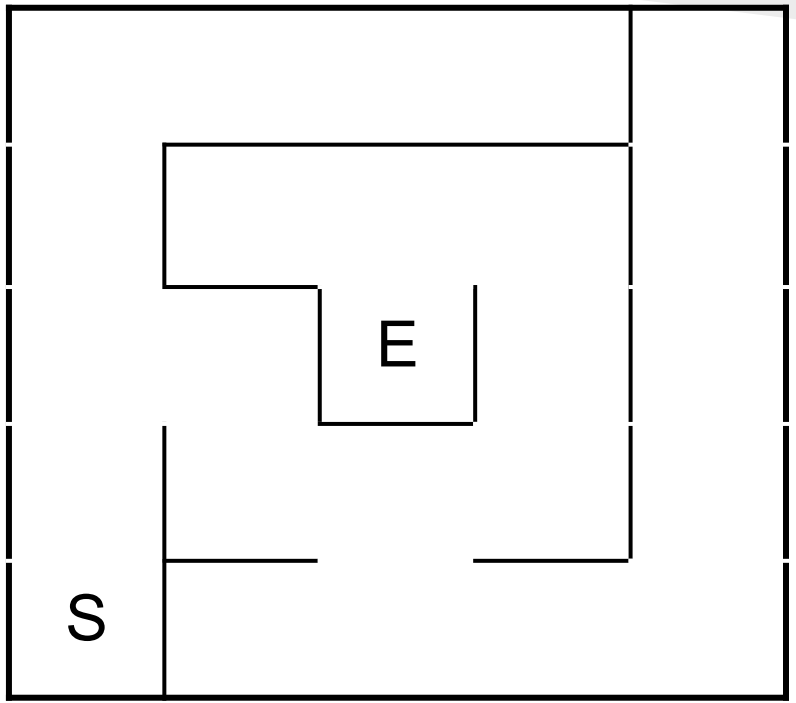


Floodfill

Mouse memory

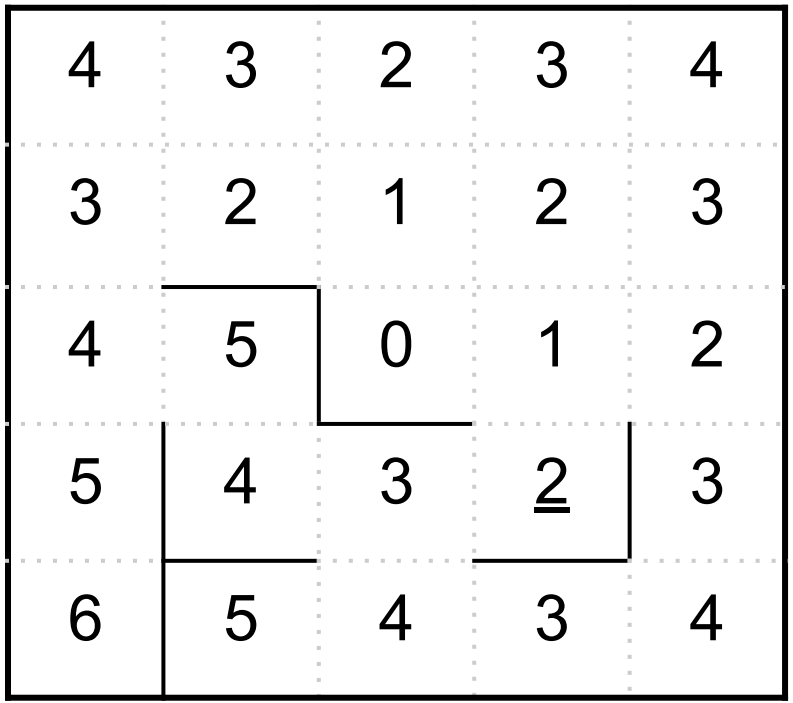


Physical maze



Floodfill

Mouse memory



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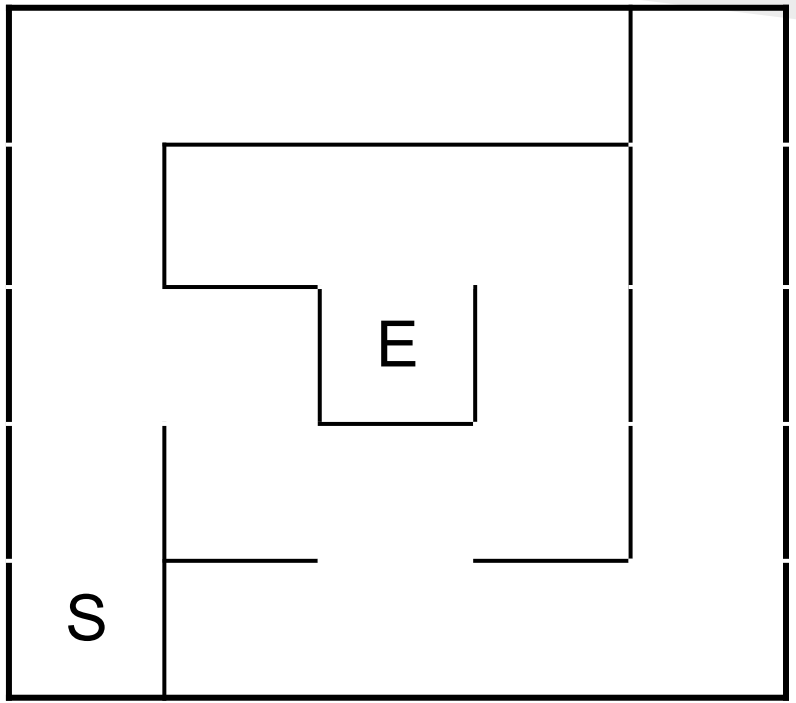
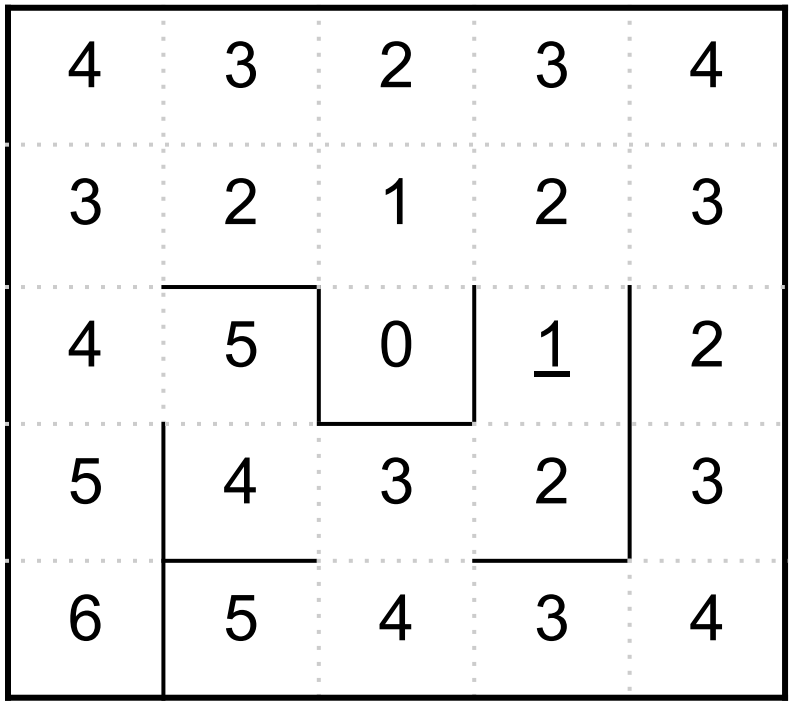
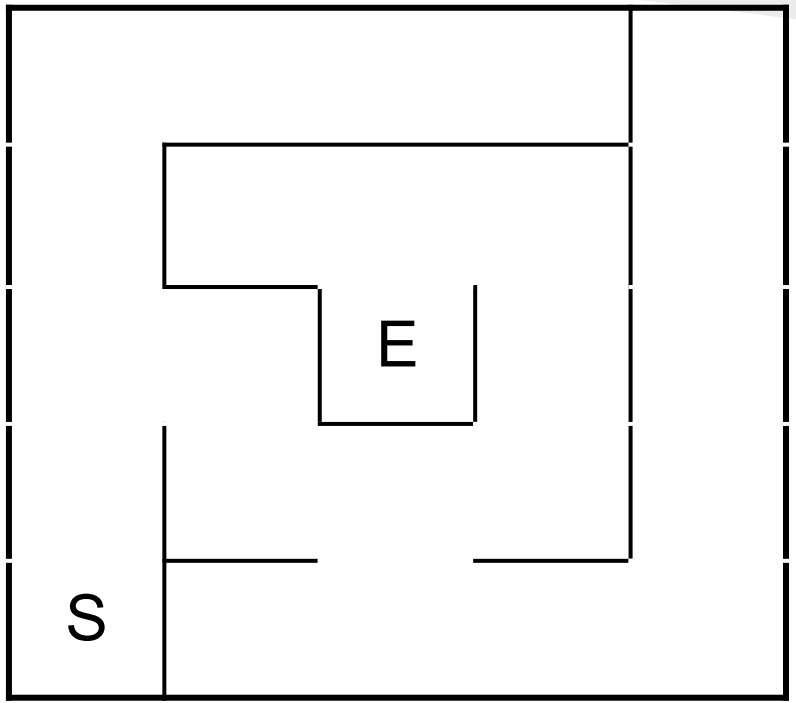


Floodfill

Mouse memory

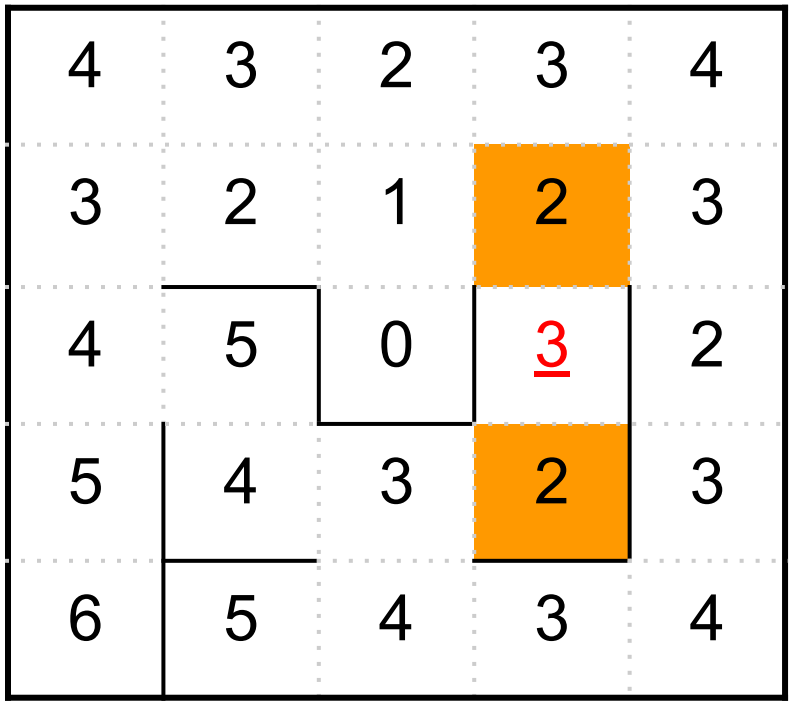


Physical maze



Floodfill

Mouse memory



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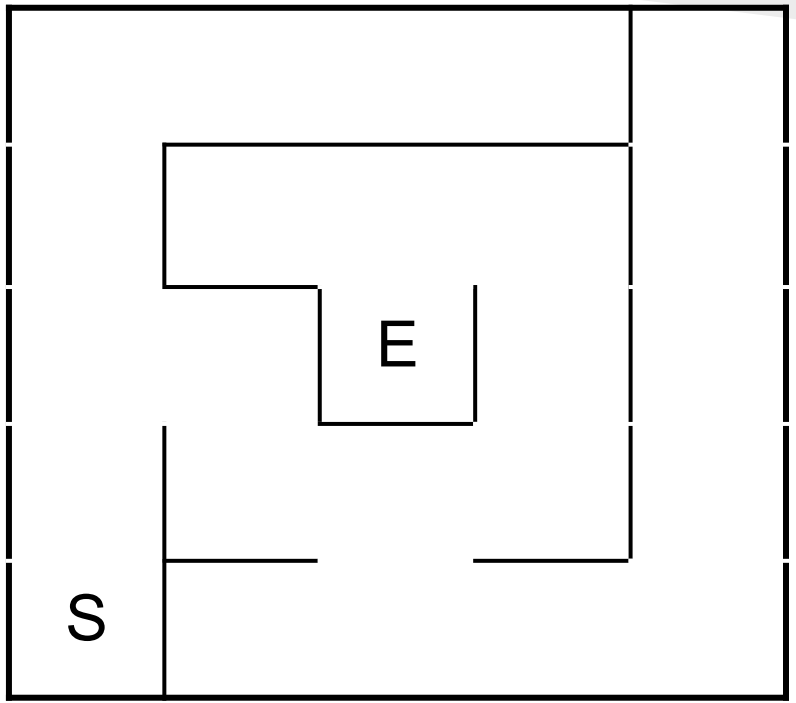
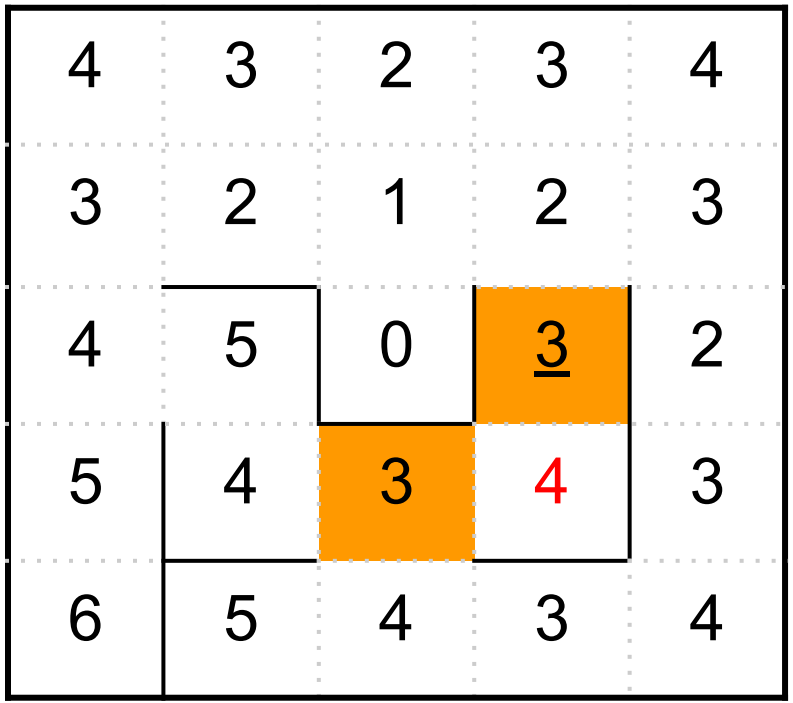


Floodfill

Mouse memory



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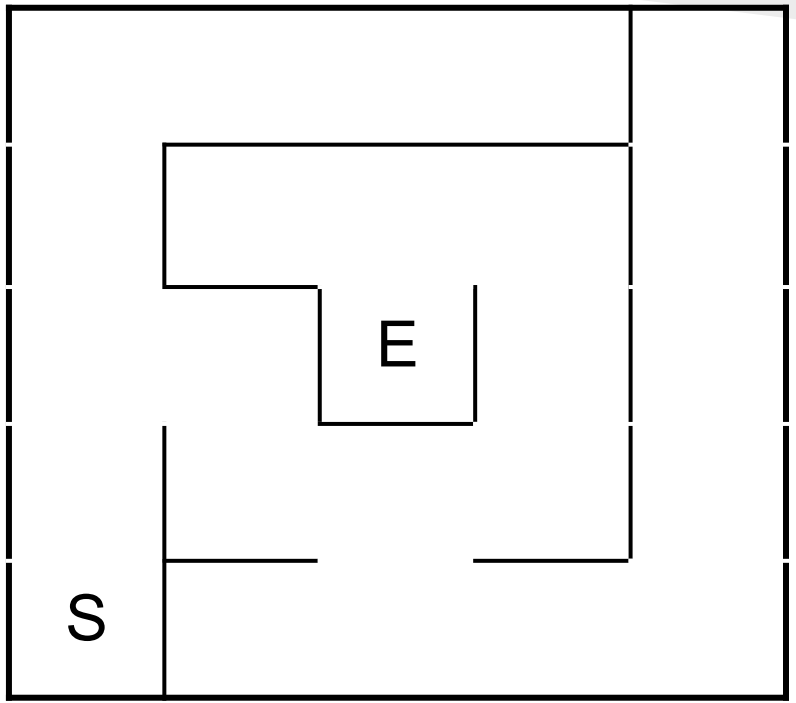

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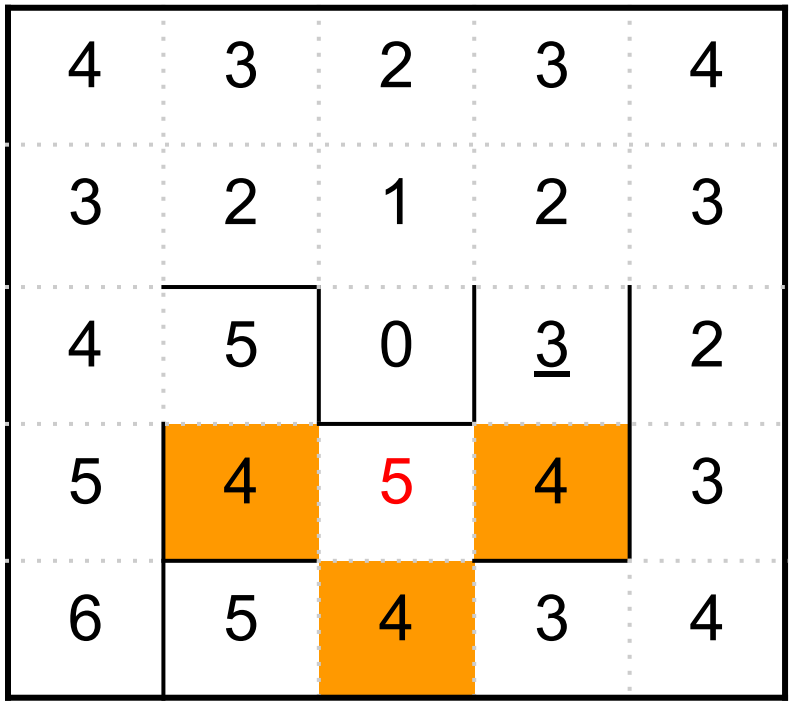
Mouse memory



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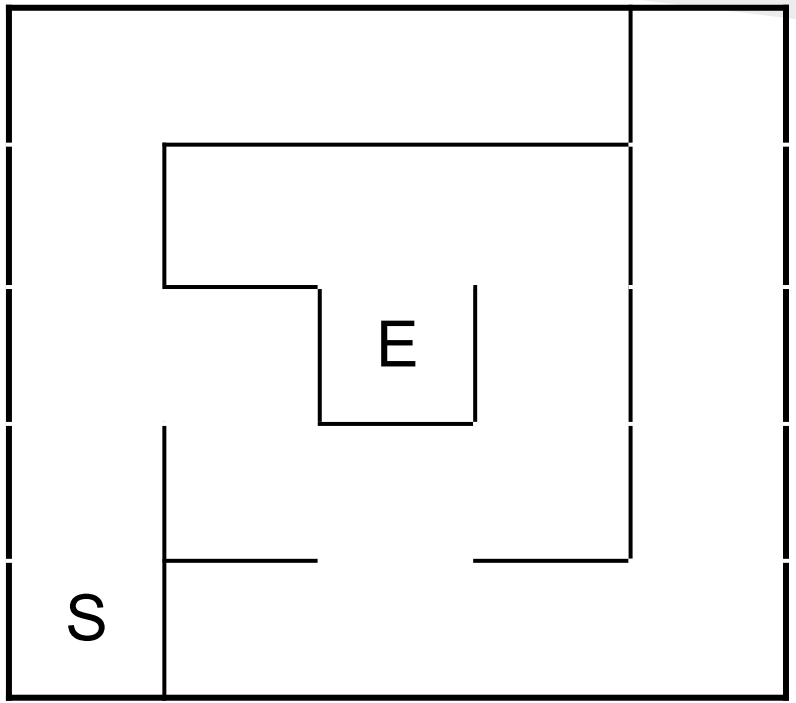
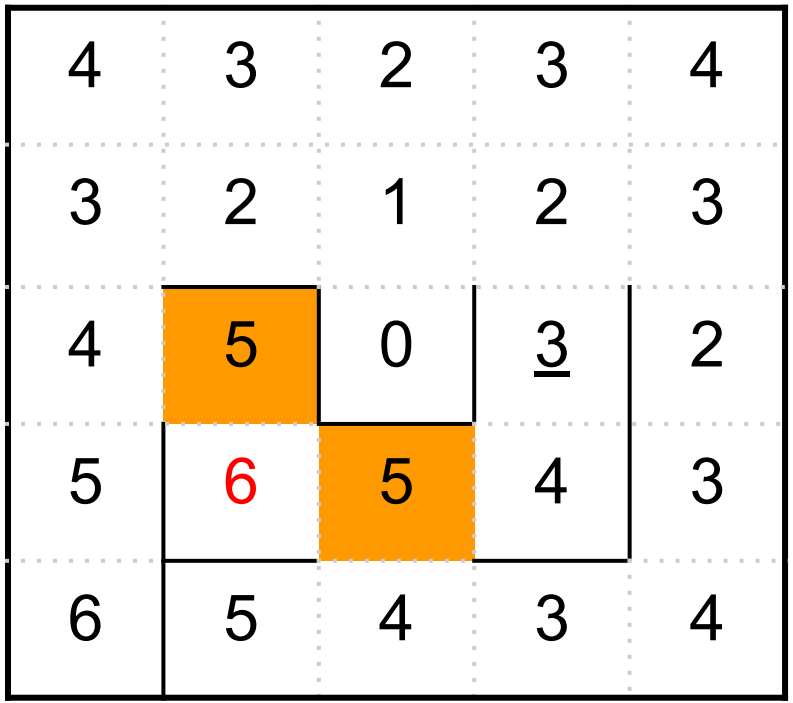


Floodfill

Mouse memory



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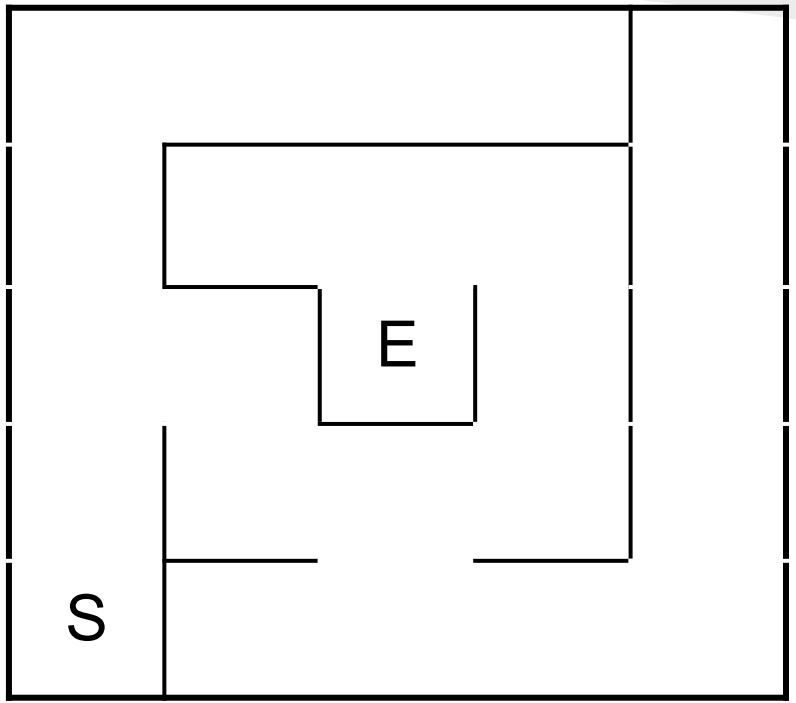
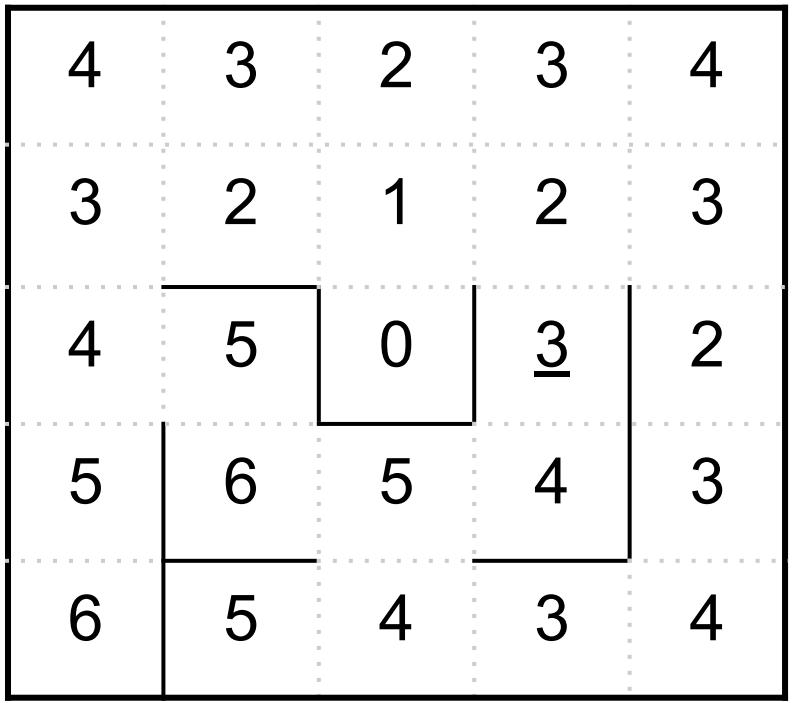


Floodfill

Mouse memory



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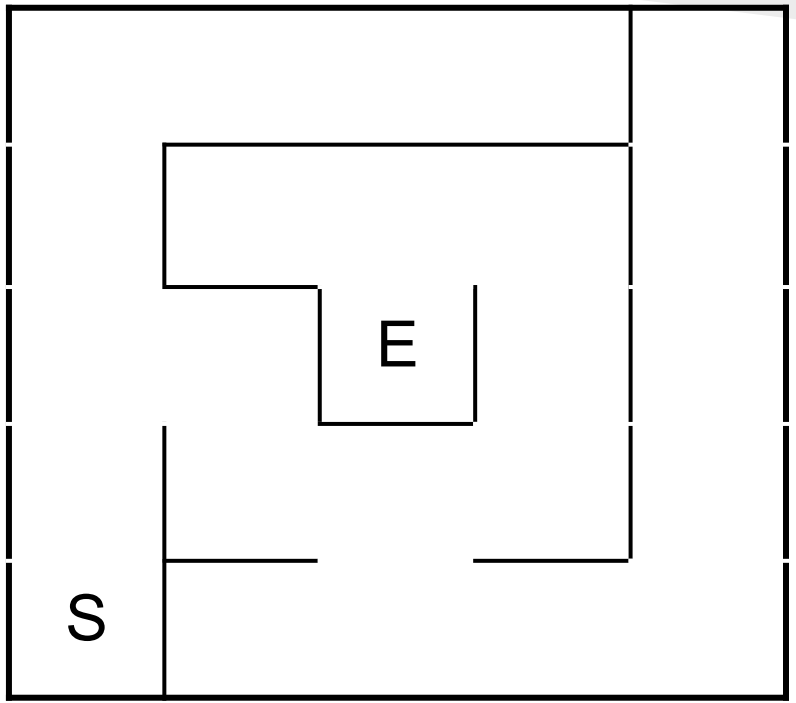
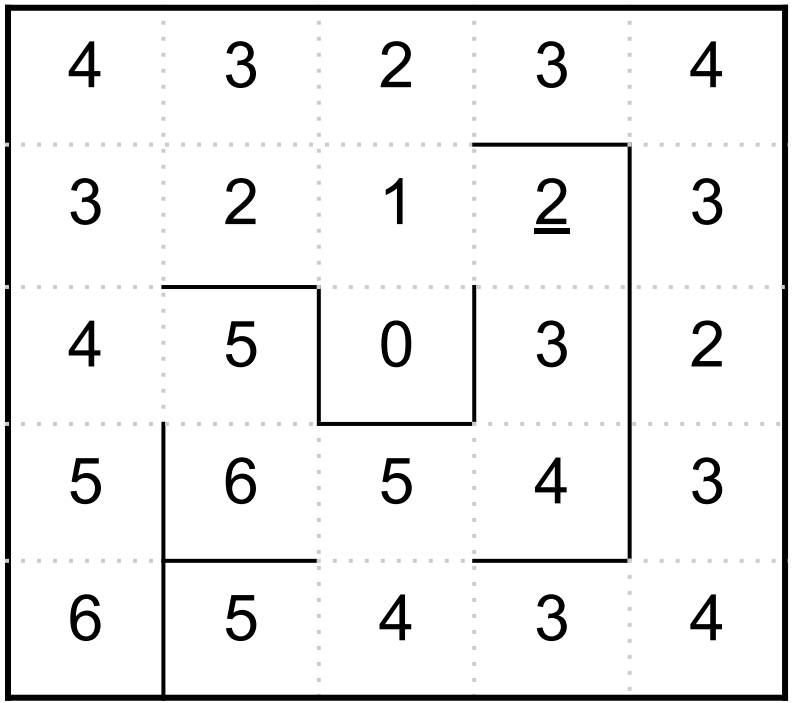
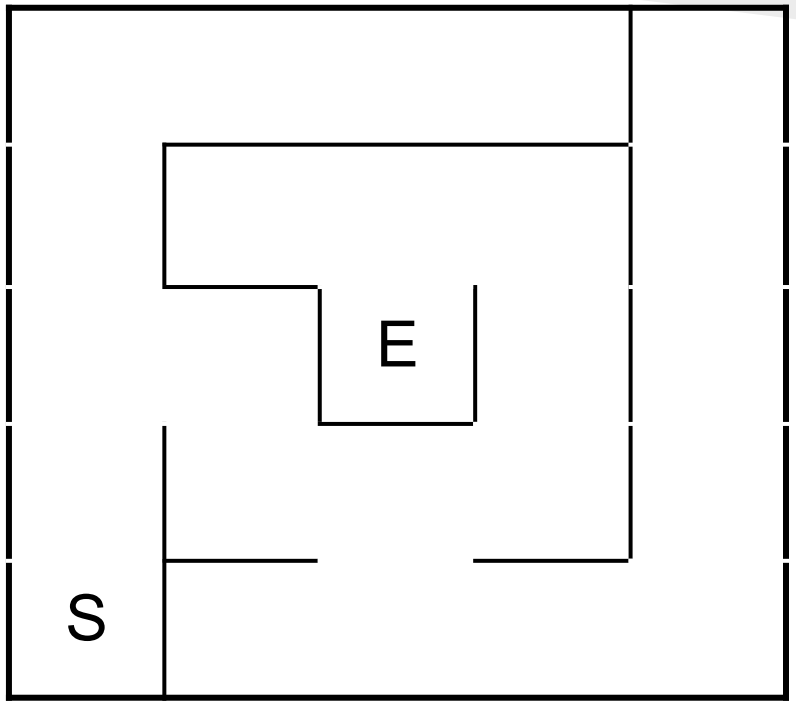


Floodfill

Mouse memory

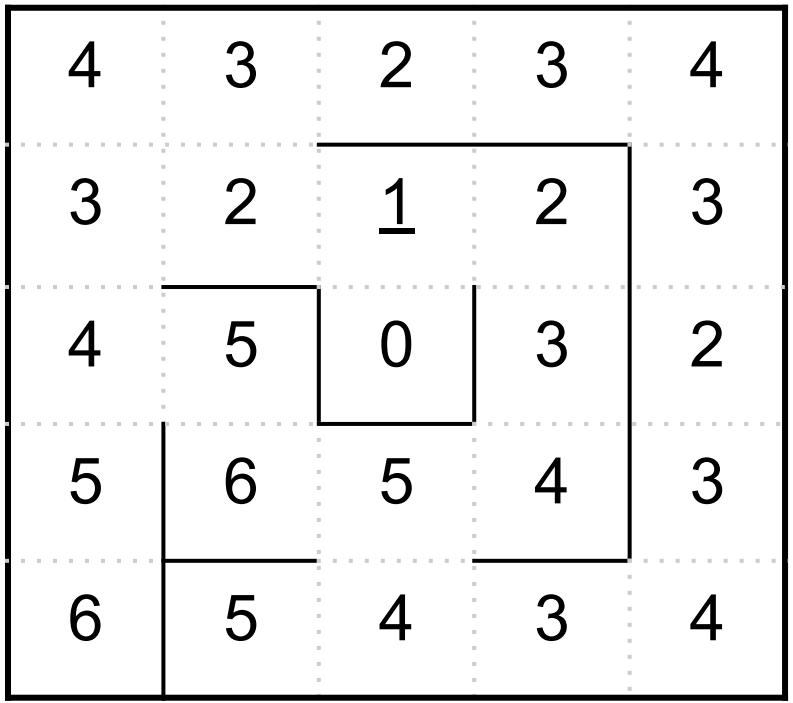


Physical maze

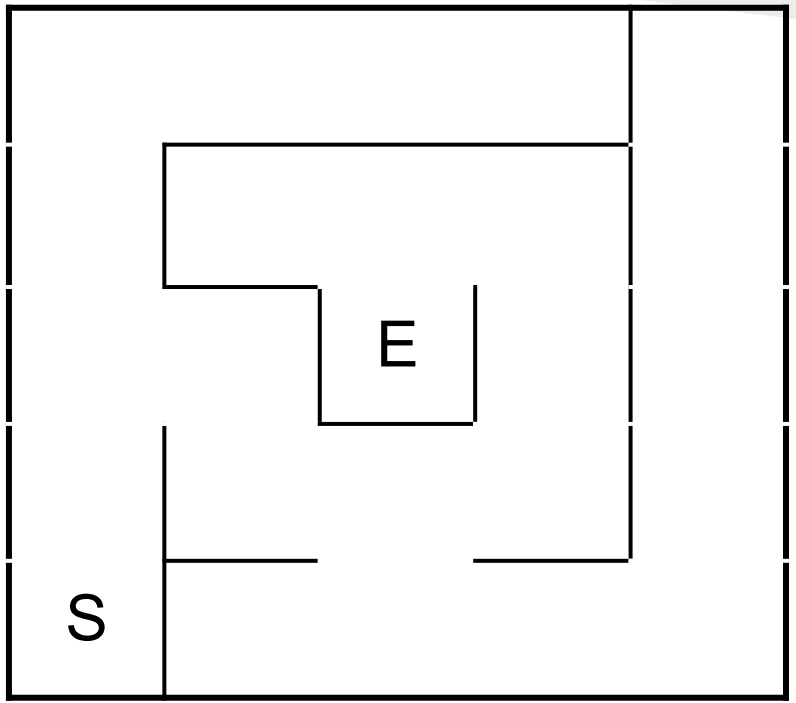


Floodfill

Mouse memory

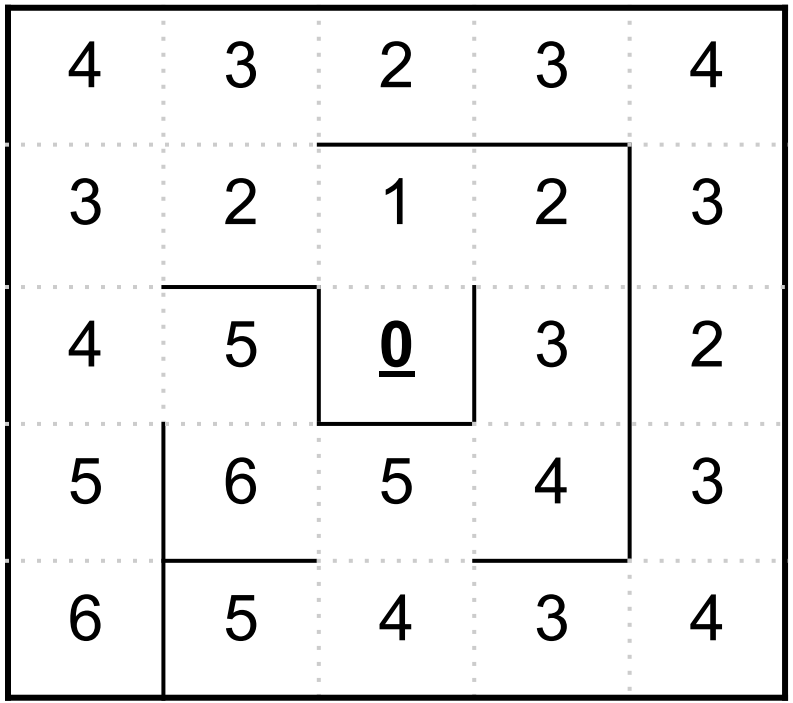


Physical maze

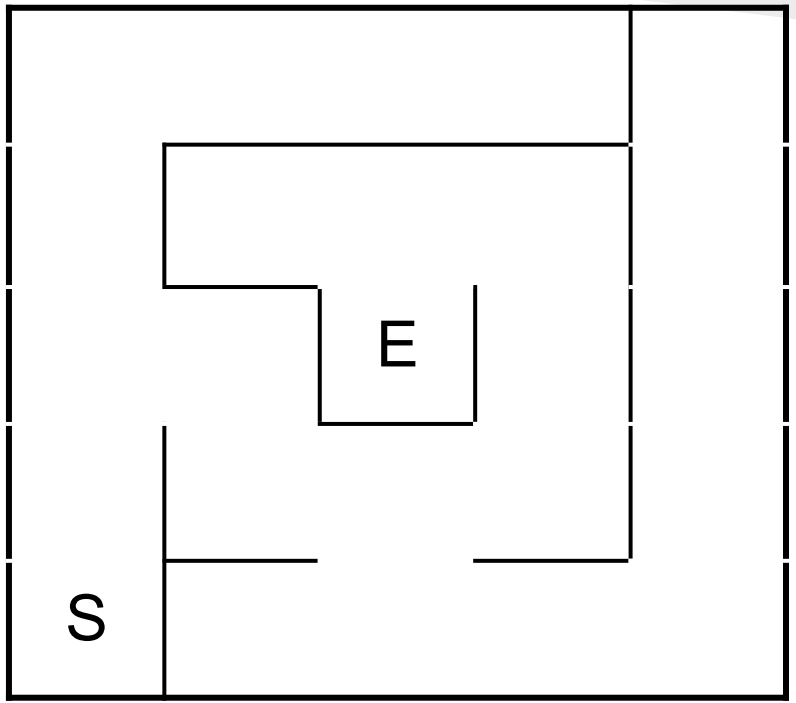


Floodfill

Mouse memory

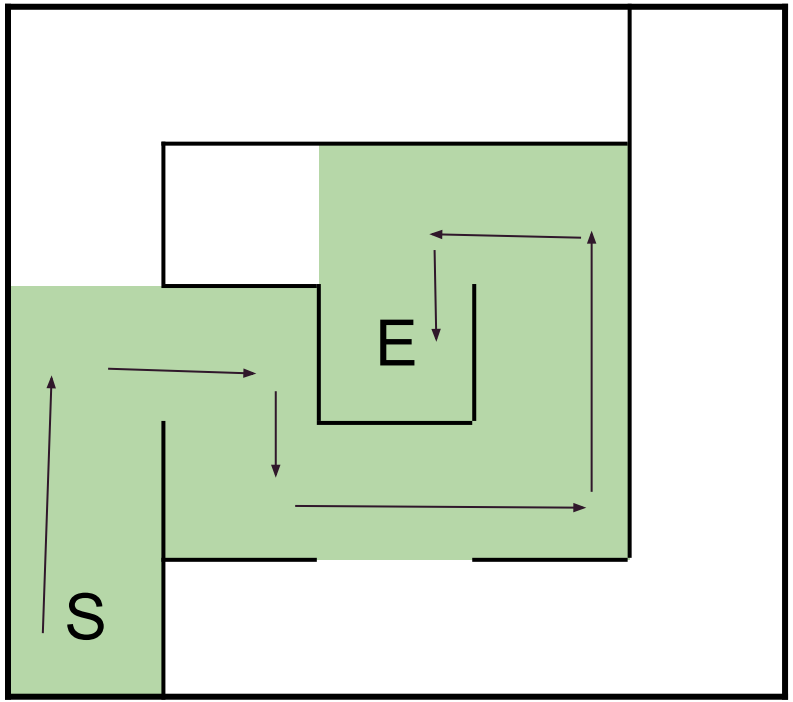


Physical maze

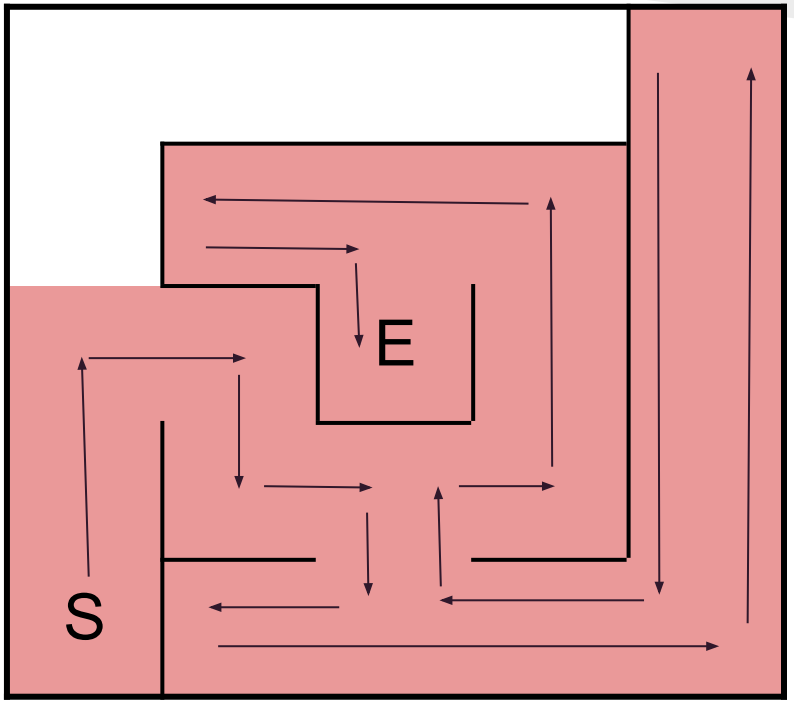


Floodfill

Floodfill

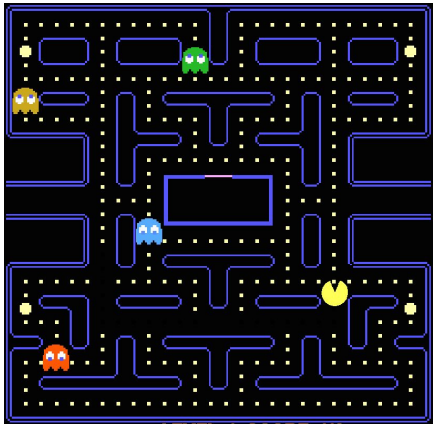


Right Wall Follow



More Algorithms?

- What if we didn't know the maze beforehand?
- What if our maze wasn't shaped like a grid?
- What if Pacman is chasing our robot around and wants to eat it?



Final Deliverables

- Grading will be based on the following categories:
  - 50% - Labs
  - 30% - Milestone Completion
  - 20% - Attendance and Participation
- A grade of 70% or higher is considered a pass.

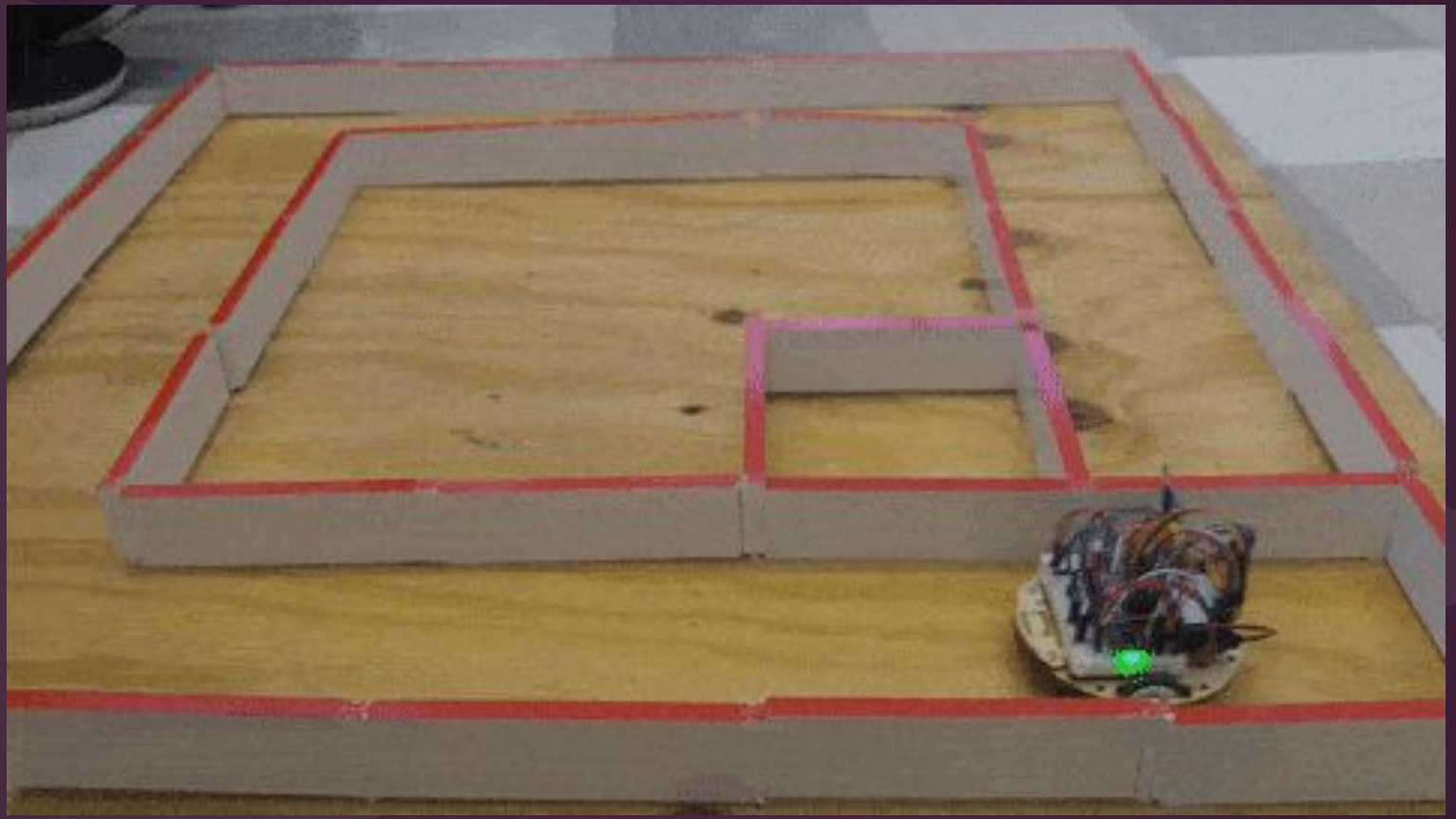
Final Competition

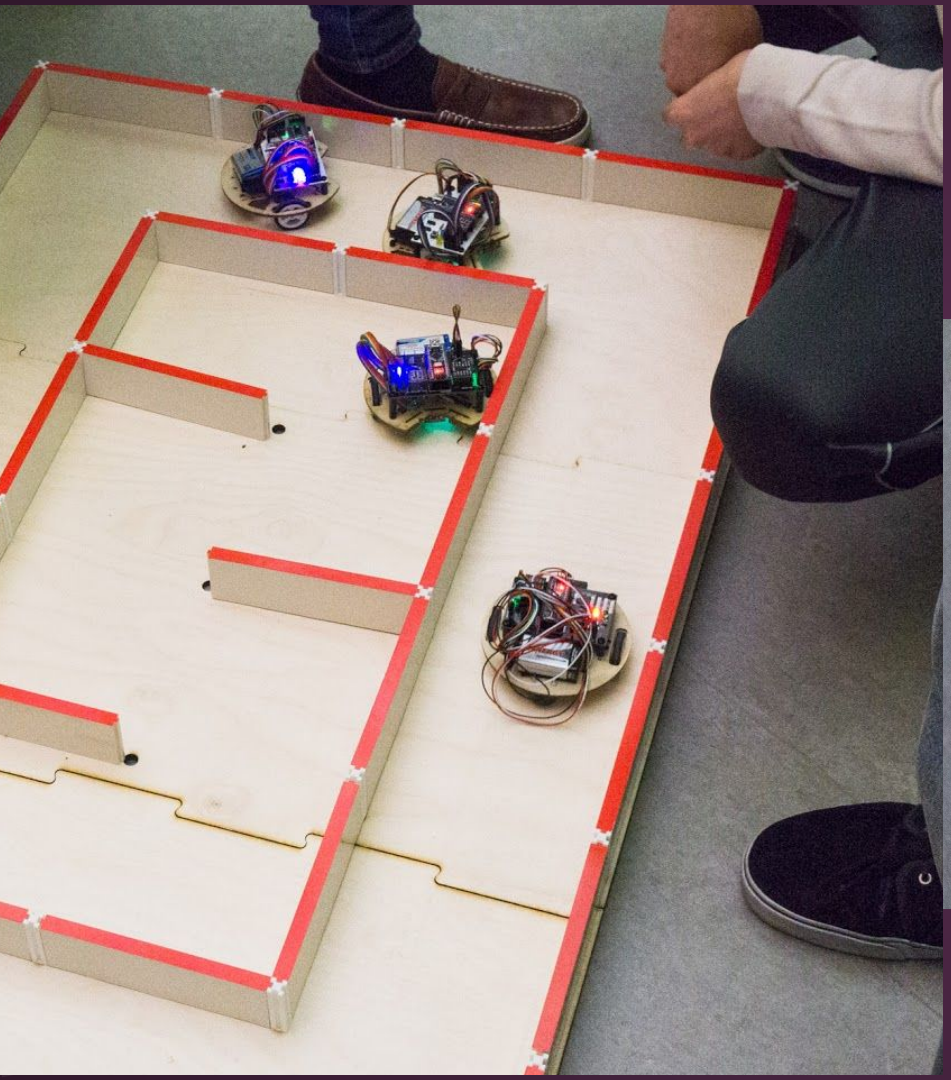
- Our final class will be next week (same time, same place)
- Race your robots!
  - There will be food :D
  - There will be prizes

{___/}

(• - •)

/ ⊃ ??






IEEE
University of California
Berkeley
EBL
600
6F22
9V


Staff
Team Jerry
Team Kawri
Team Robby 243
Team Vishmi 1764
Team Claudia 1453

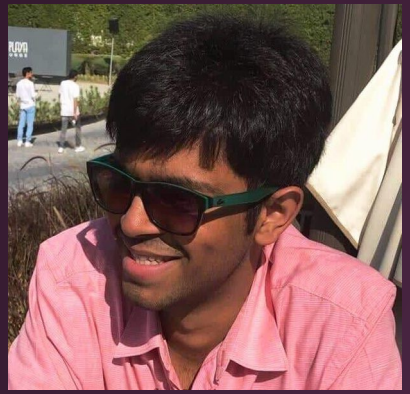
Introductions







Introductions






Introductions


THIS IS THE END OF THE PRESENTATION
ANY QUESTIONS?
IF NOT, JUST CLAP!