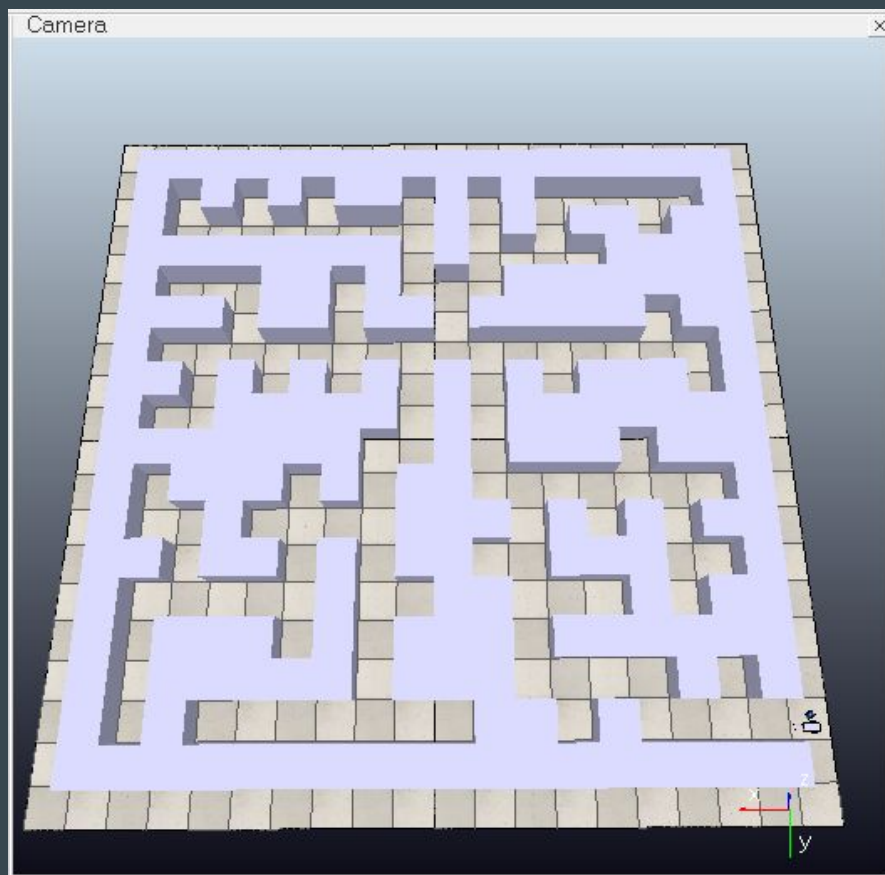


W.A.M.P.

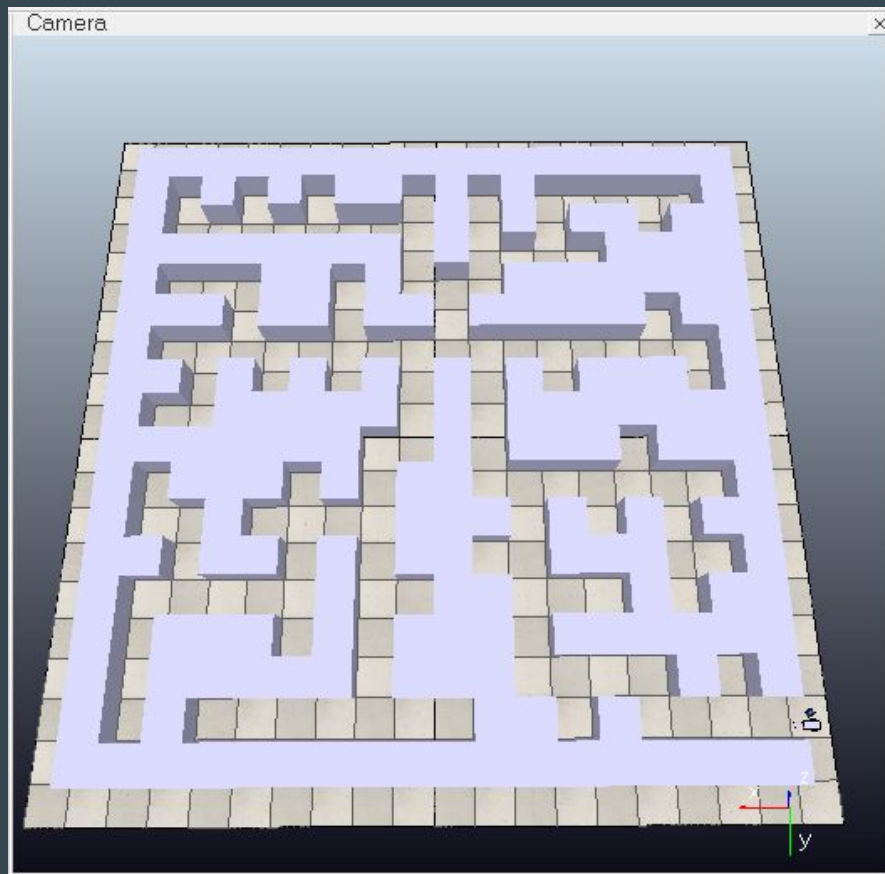
...

Team: Blue Jeans

By: Matthew Wesley-James, Tarun Kalikivaya, Martin Klamrowski, Angie Byun



Objective: Finding & Retrieving your pants from a maze

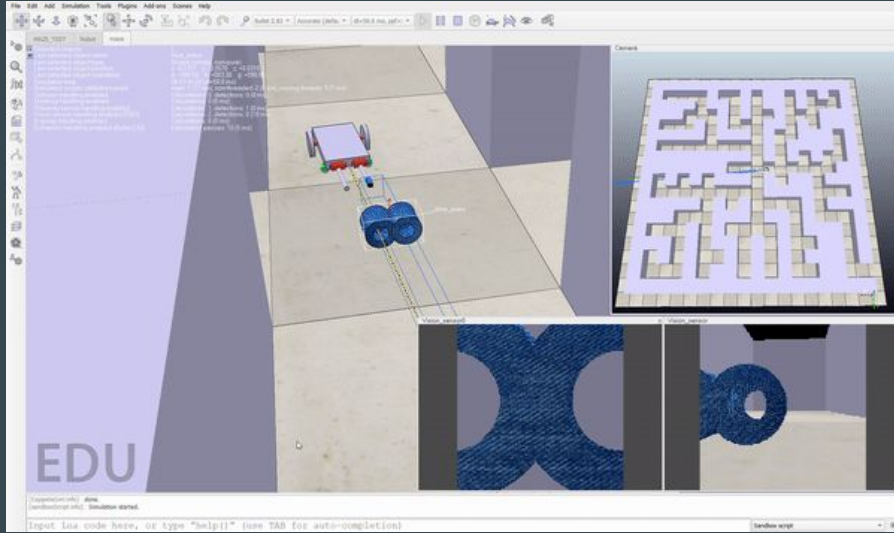


WAMP

W Where
A are
M my
P Pants?!?

WAMP

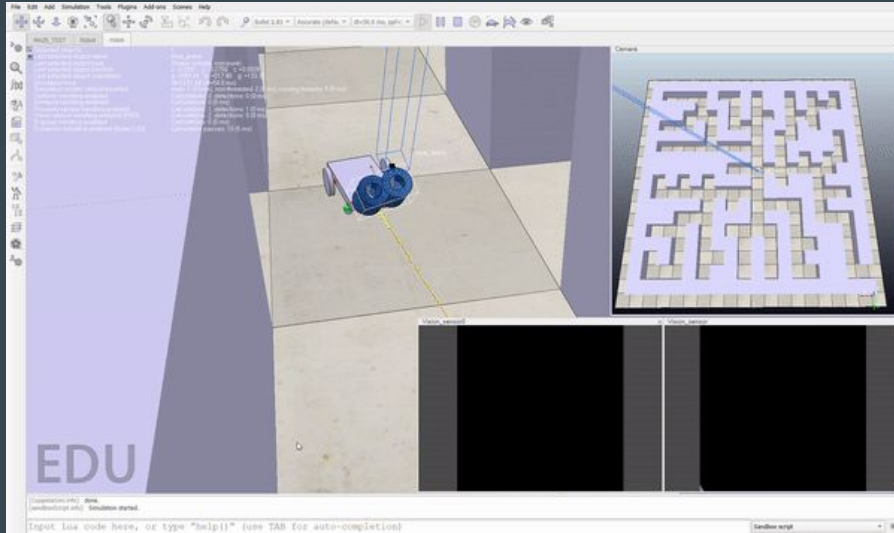
Demo:



Steps:

- Explore & Find the Pants
- Pick up the Pants
- Escape with the Pants

Demo:



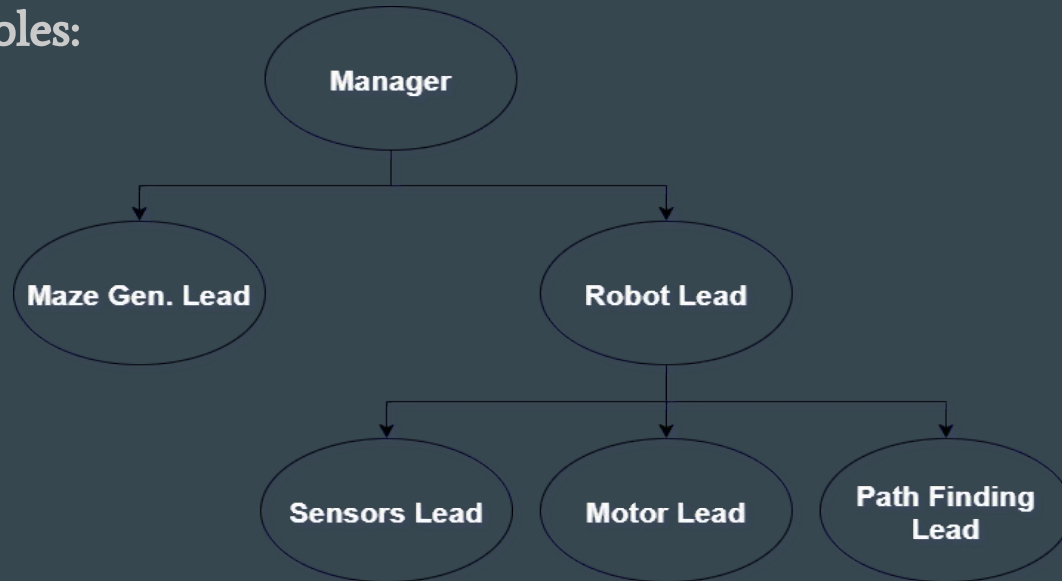
Steps:

- Generate Maze
- Explore & Find the Pants
- Pick up the Pants
- Escape with the Pants

Why WAMP? - a Managerial Perspective

- Can be broken down to problems with known solutions
 - More likely to stay on schedule
- Distributable between all 4 team members:

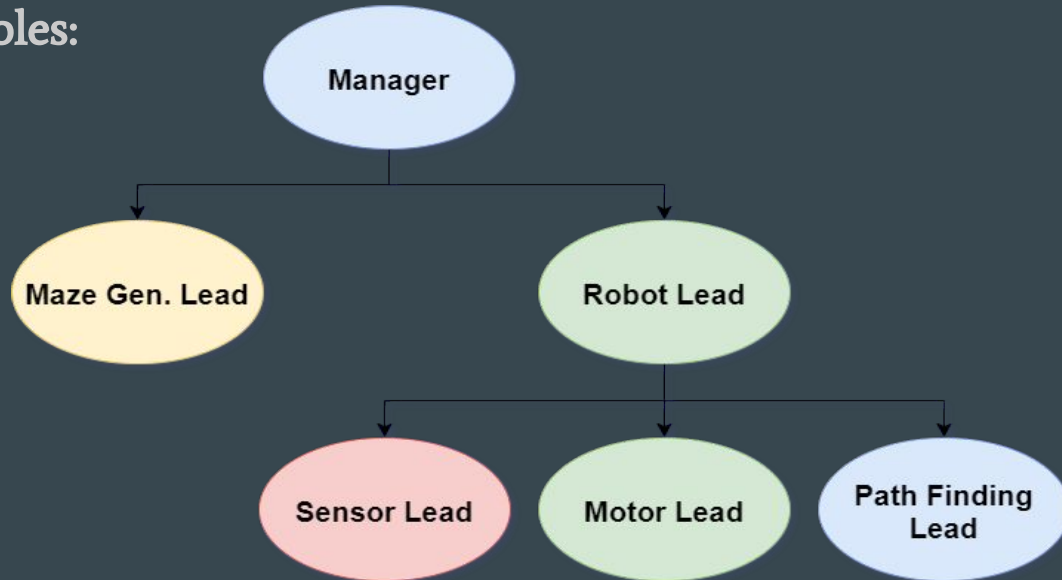
Roles:



Why WAMP? - a Managerial Perspective

- Can be broken down to problems with known solutions
 - More likely to stay on schedule
- Distributable between all 4 team members:

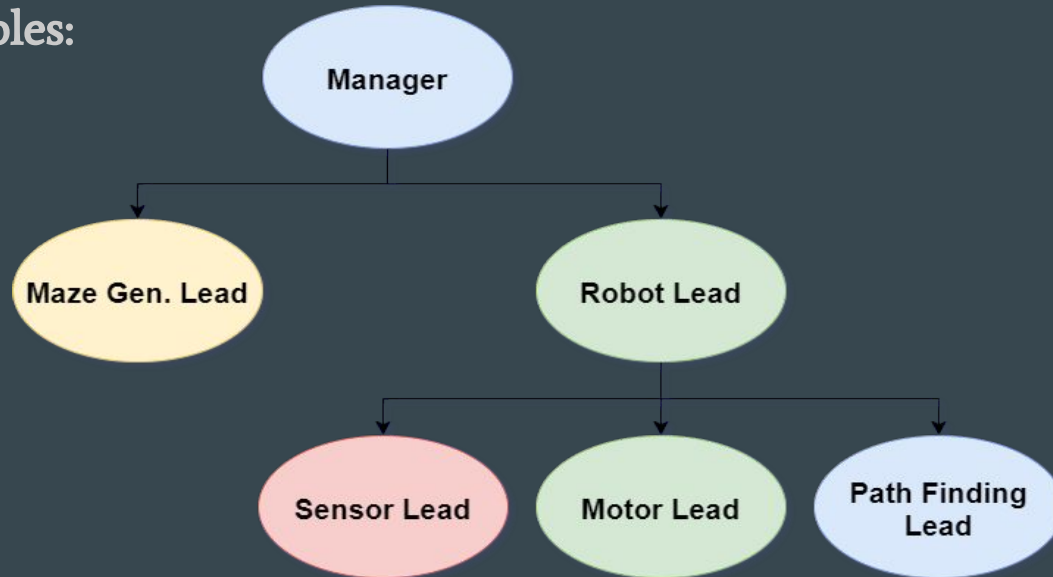
Roles:



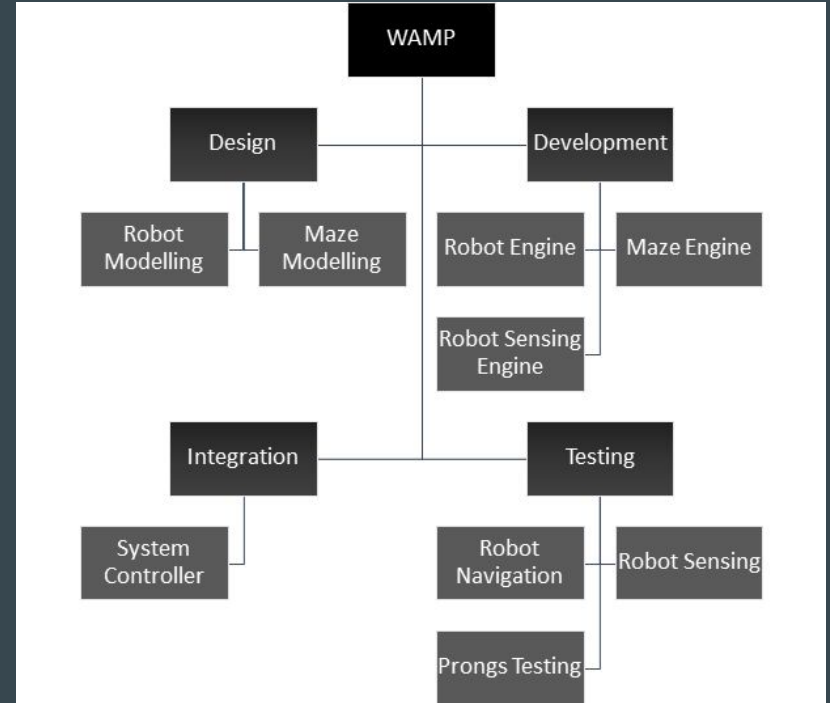
Why WAMP? - a Managerial Perspective

- Can be broken down to problems with known solutions
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- Distributable between all 4 team members:

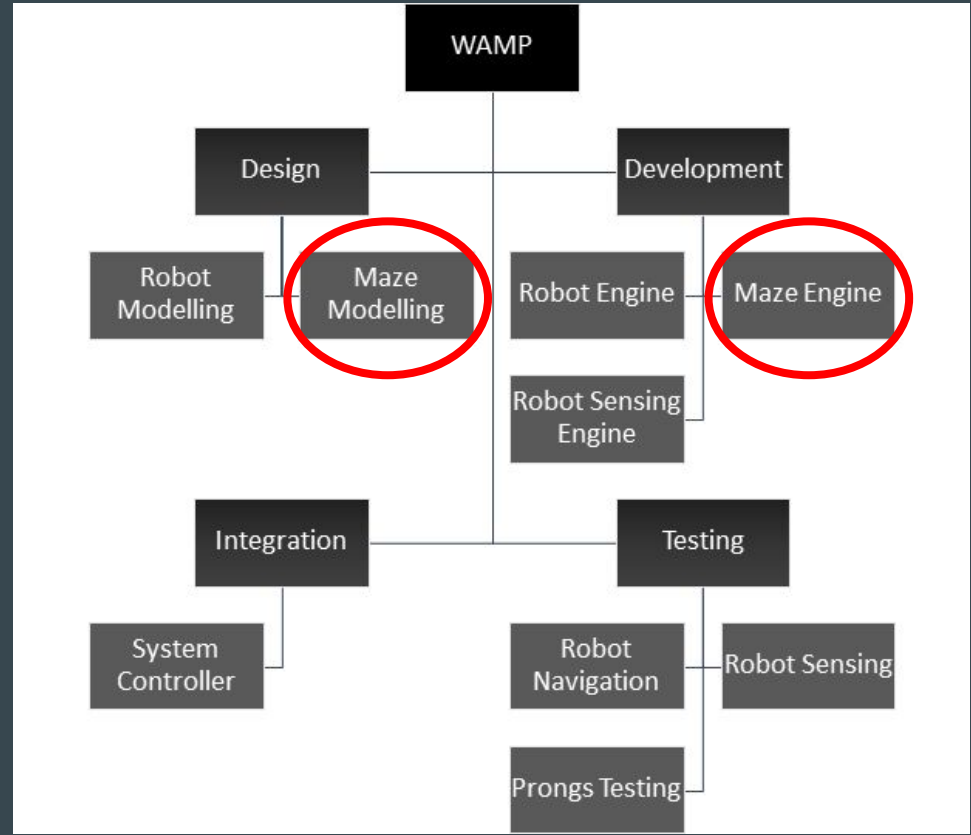
Roles:



WBS

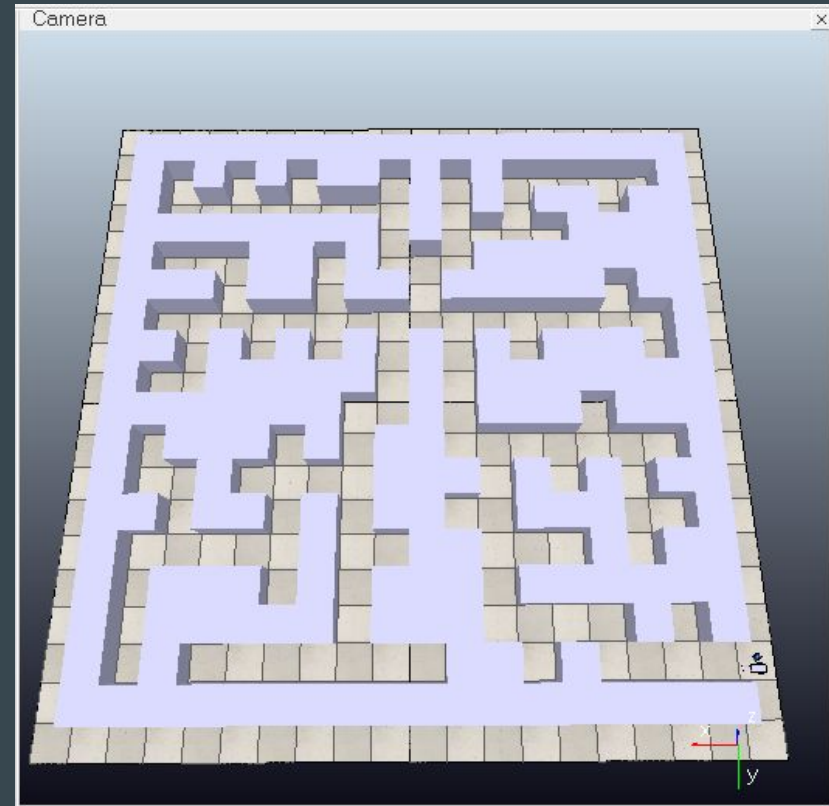


Maze

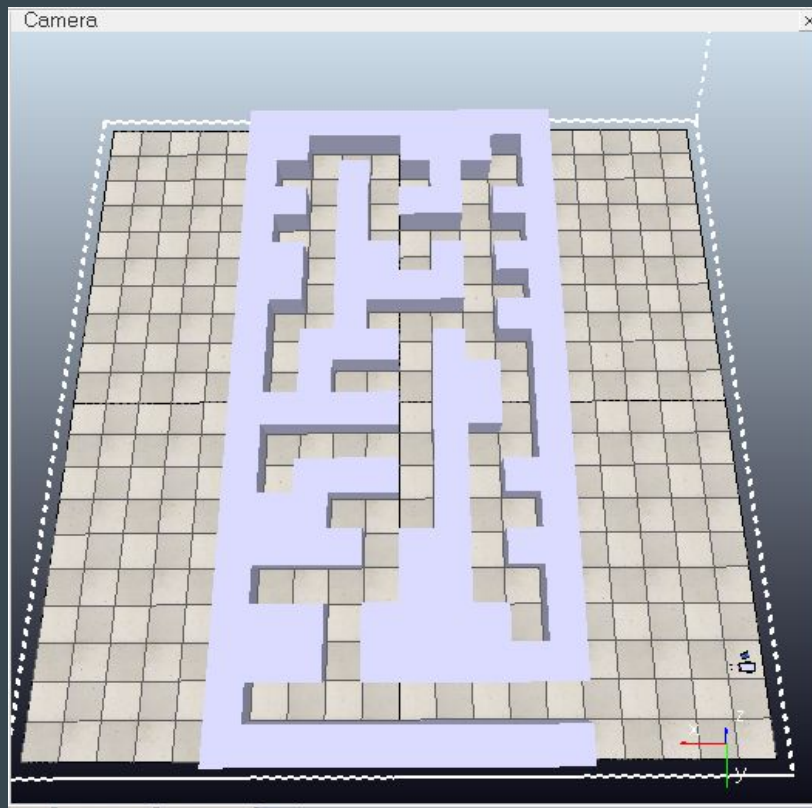
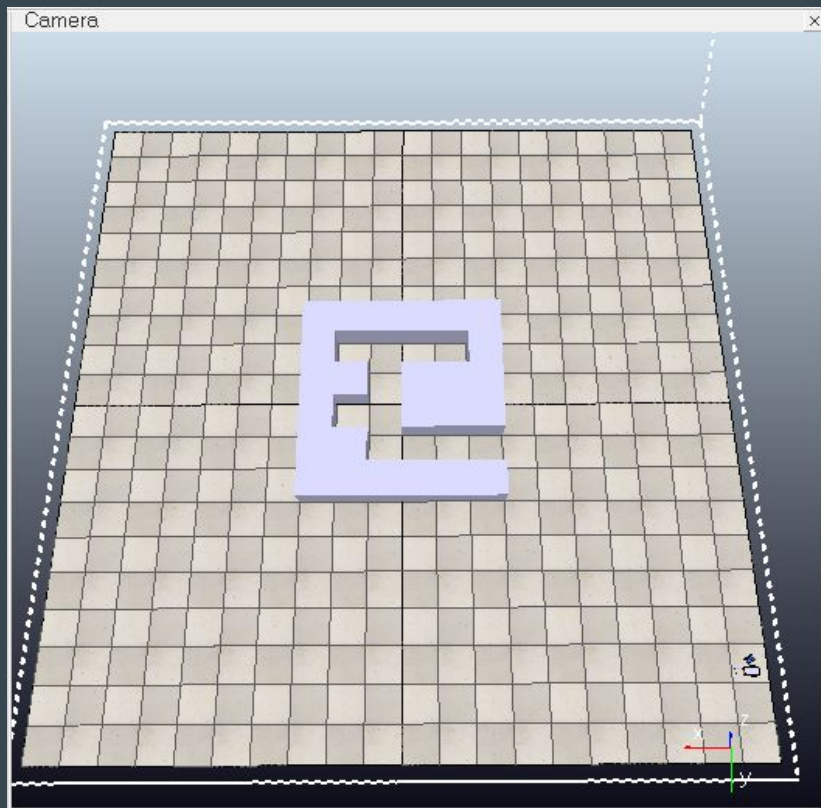


Maze Modelling

- 9 x 9 metre Square Maze
- Support for other complexities possible

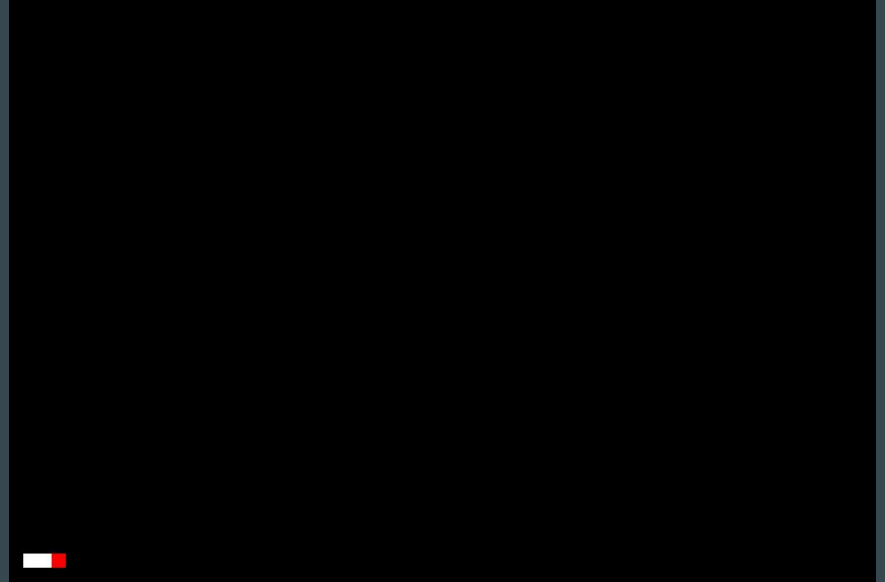


Maze Modeling

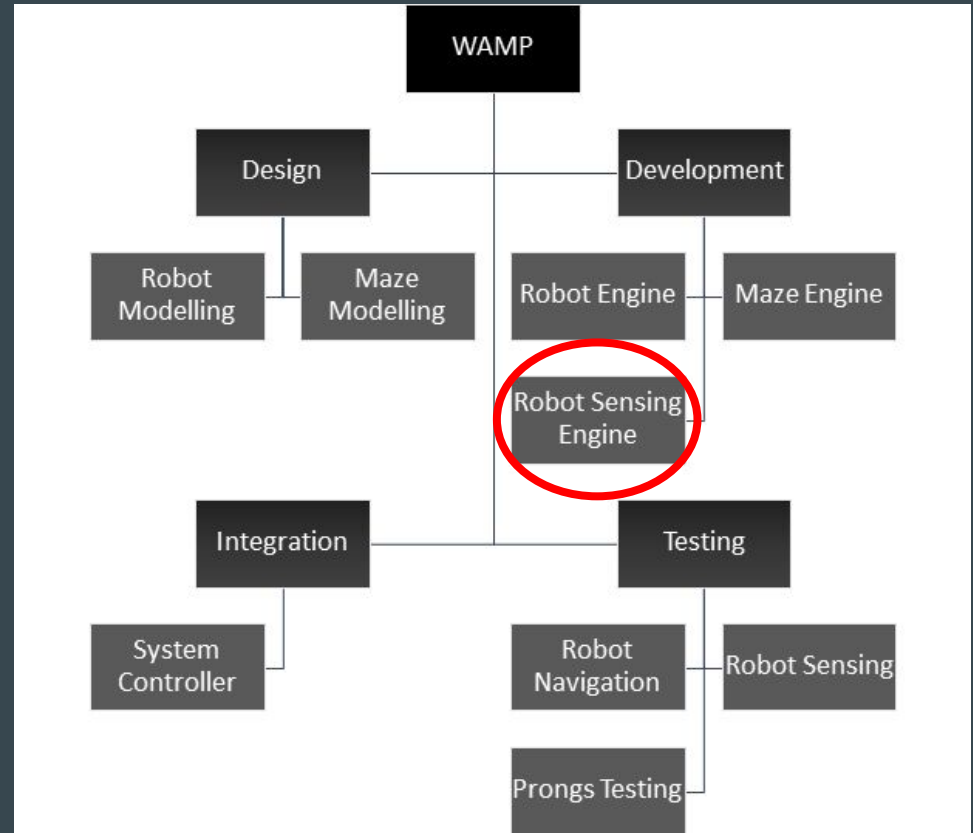


Maze Engine

- Prim's Random Maze Generation
- More blocks = Higher complexity

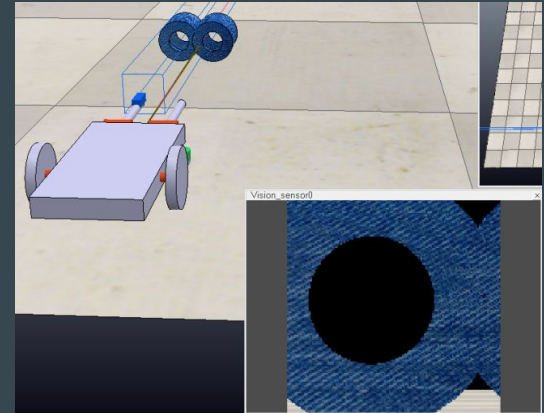
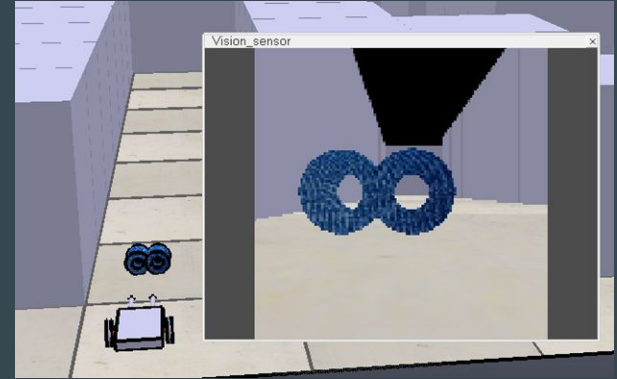


Sensors



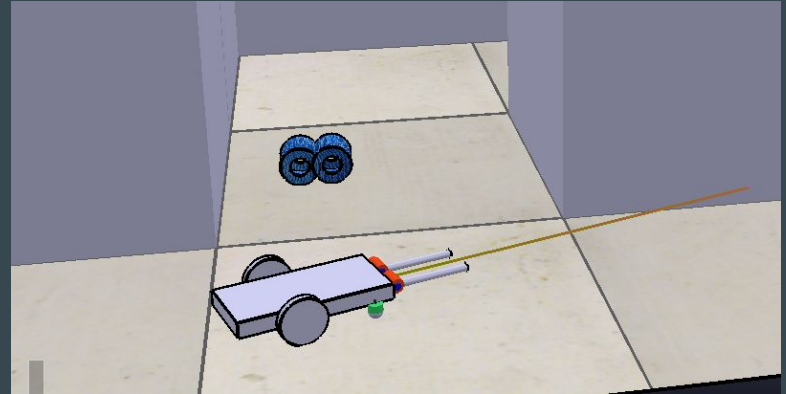
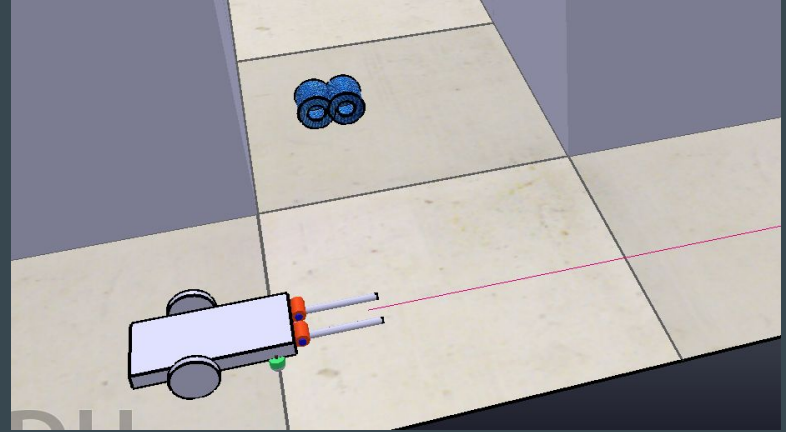
Sensing Engine: Vision Sensor

- 2 vision sensor at the front of the robot
- Projection Type: Orthographic and Perspective
- Detection range: 1 block

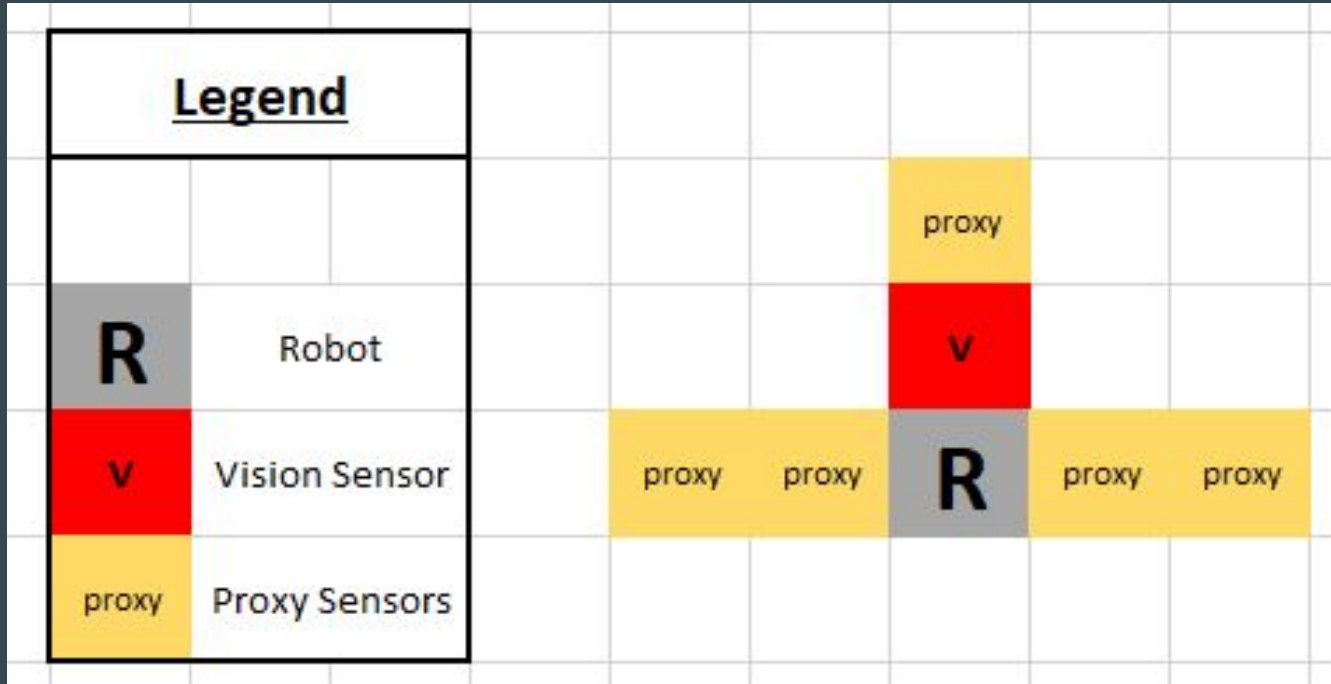


Sensing Engine: Proximity Sensor

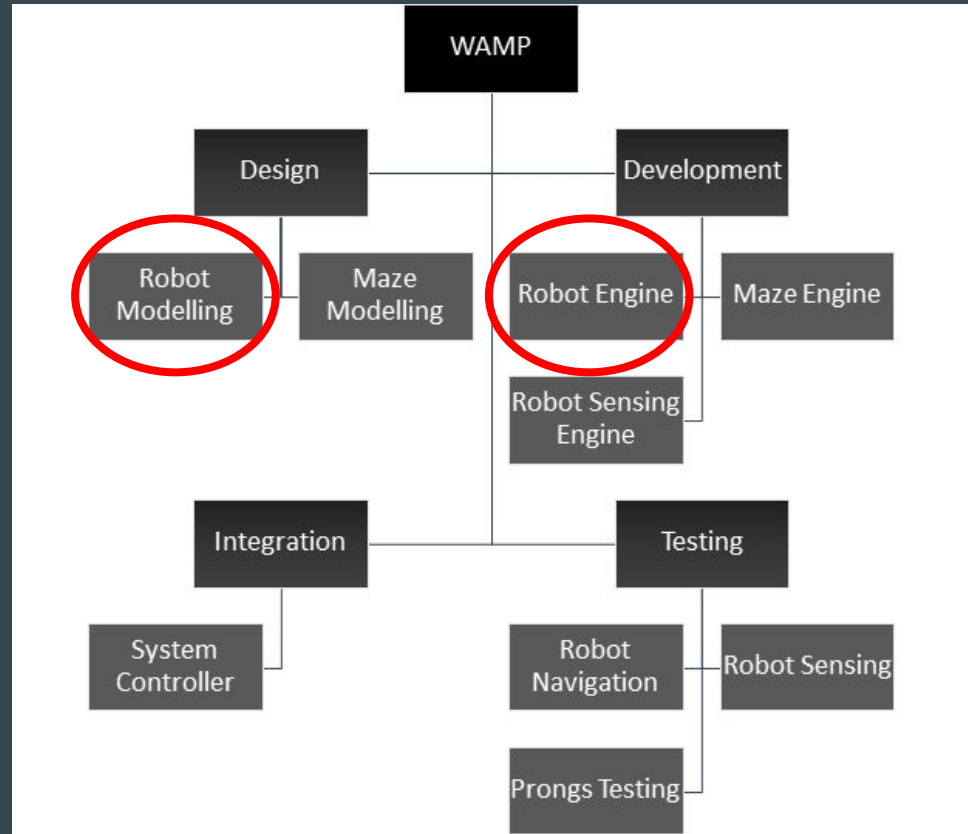
- 3 proximity sensors
- View Type: Ray
- Detection range: 2 blocks



Sensors Overview

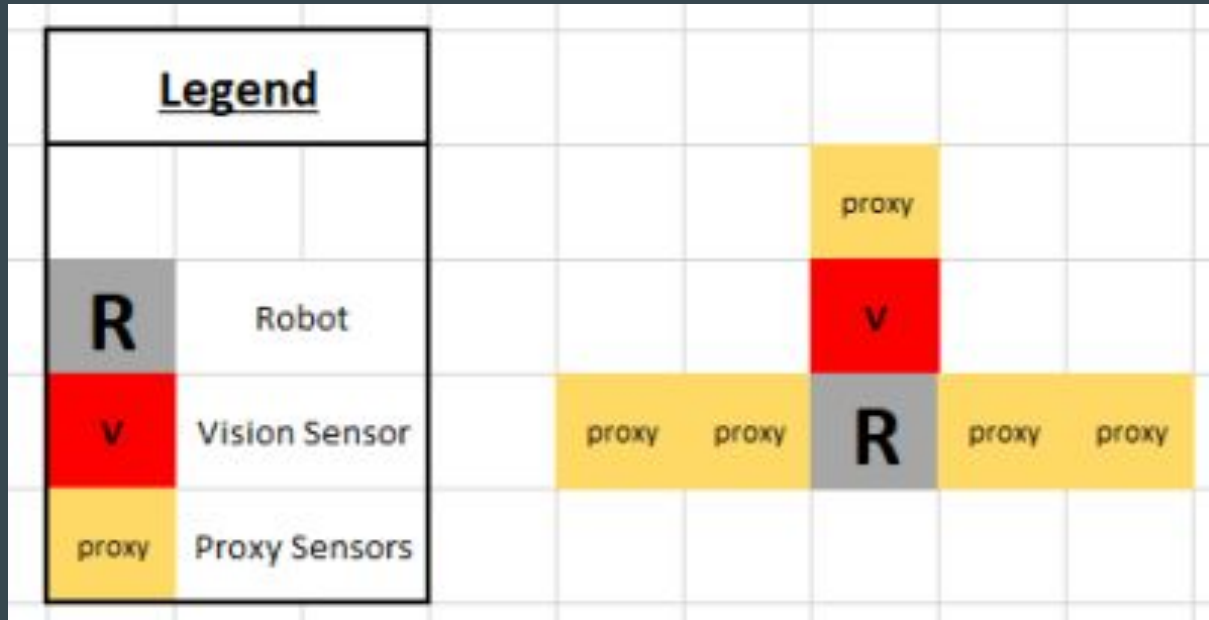


Robot



Pathfinding

- Givens:
 - Sensor Data

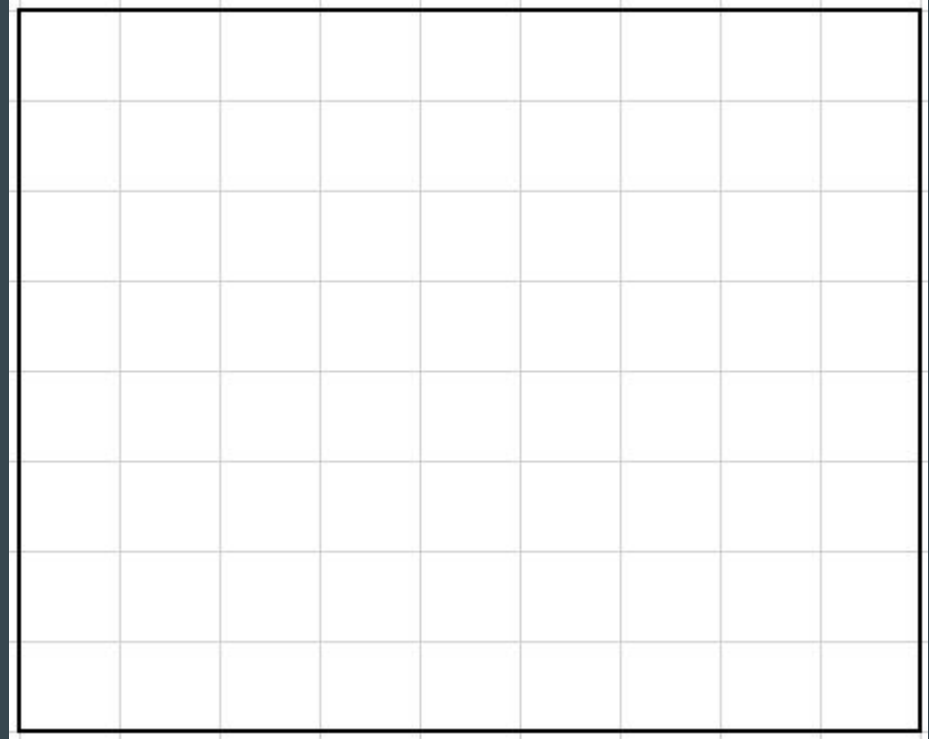


Pathfinding

- Givens:
 - Sensor Data
 - Entrance Data
 - Length & width of maze

Pathfinding

- **Givens:**
 - Sensor Data
 - Entrance Data
 - length & width of maze



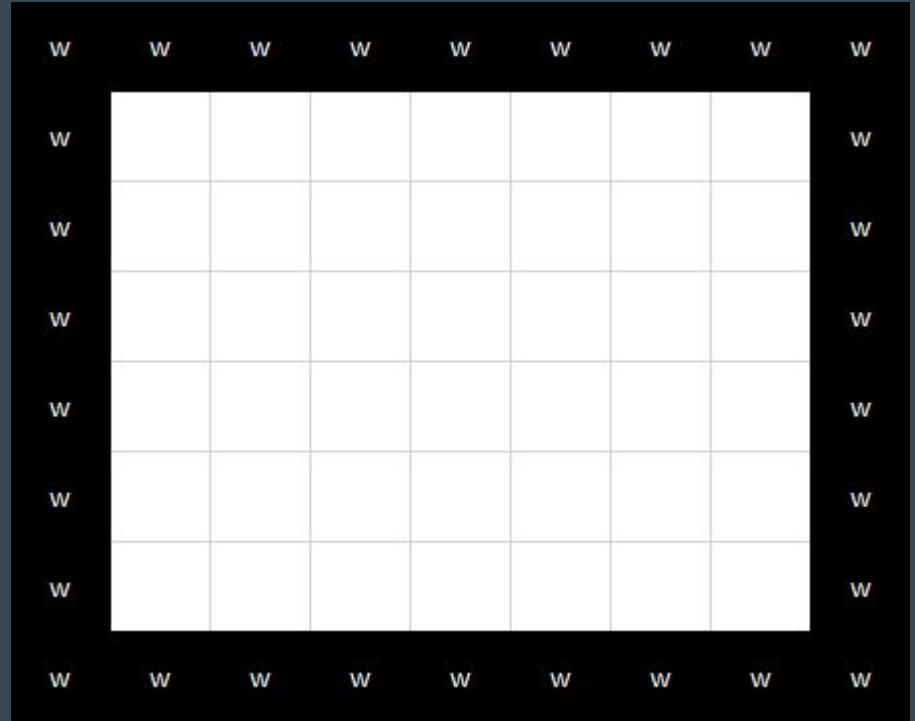
Legend

	Unknown
--	---------

Pathfinding

- **Givens:**
 - Sensor Data
 - Entrance Data
 - length & width of maze

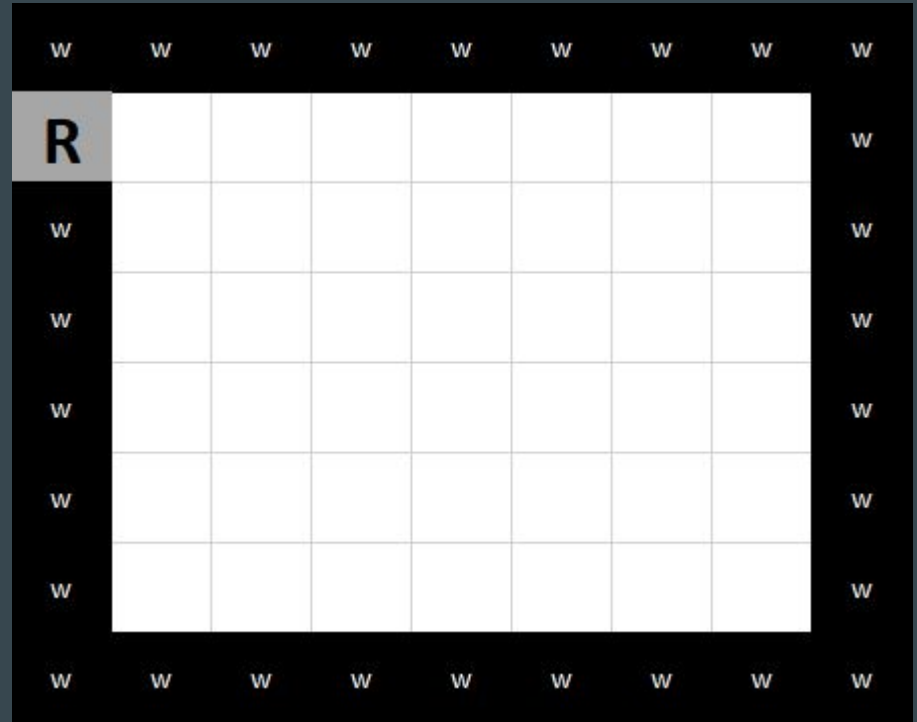
<u>Legend</u>	
	Unknown
w	Wall



Pathfinding

- **Givens:**
 - Sensor Data
 - Entrance Data
 - length & width of maze
 - Exit node = Starting node

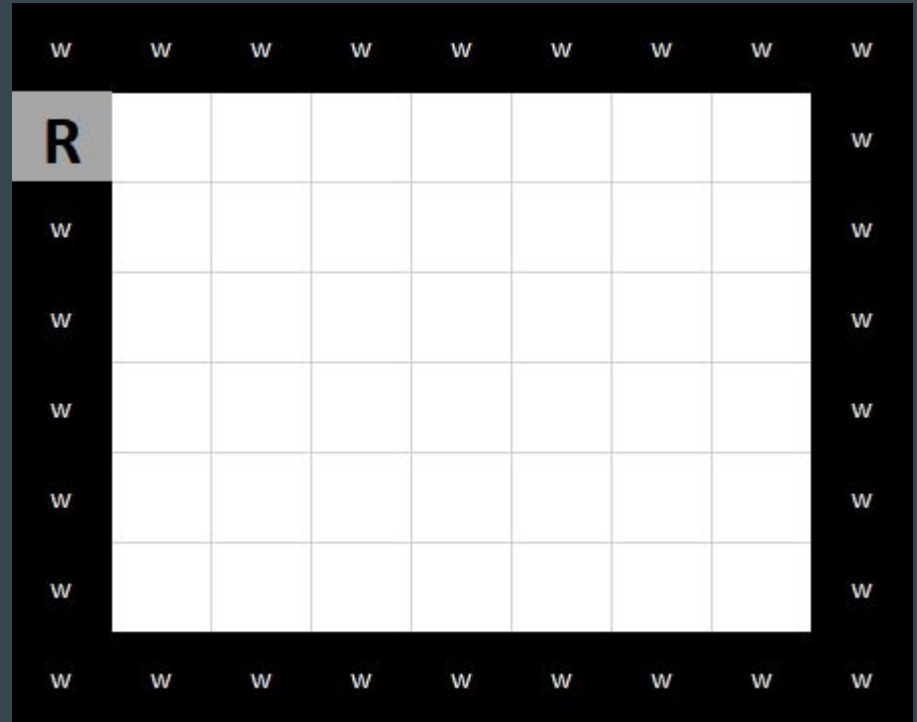
<u>Legend</u>	
	Unknown
w	Wall
R	Robot



Pathfinding

- Exploration Loop:

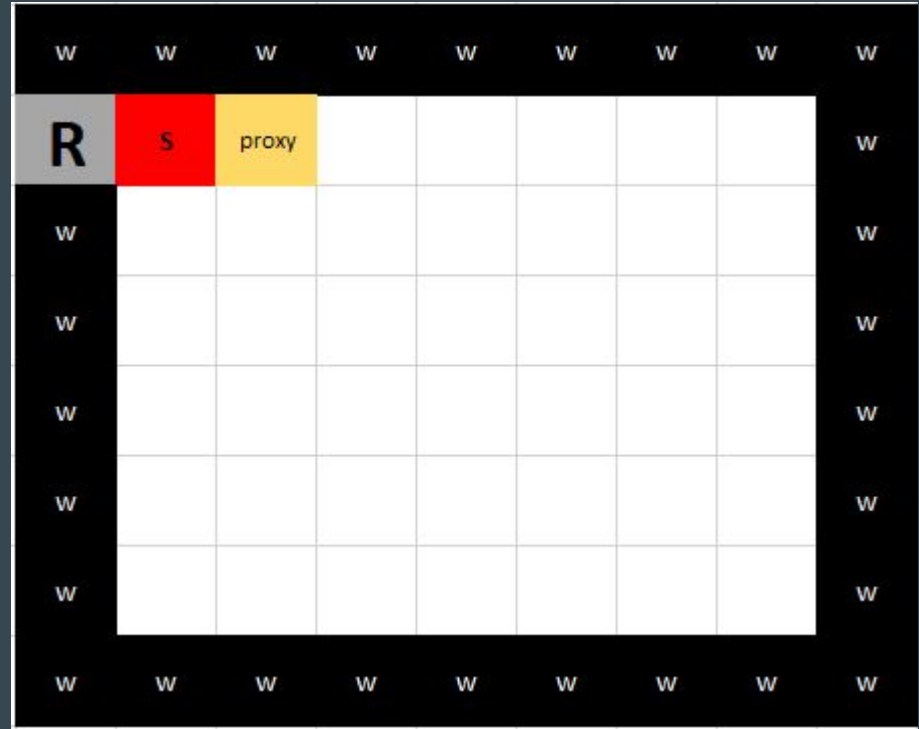
<u>Legend</u>	
	Unknown
w	Wall
R	Robot



Pathfinding

- **Exploration Loop:**
 - Pull Sensors

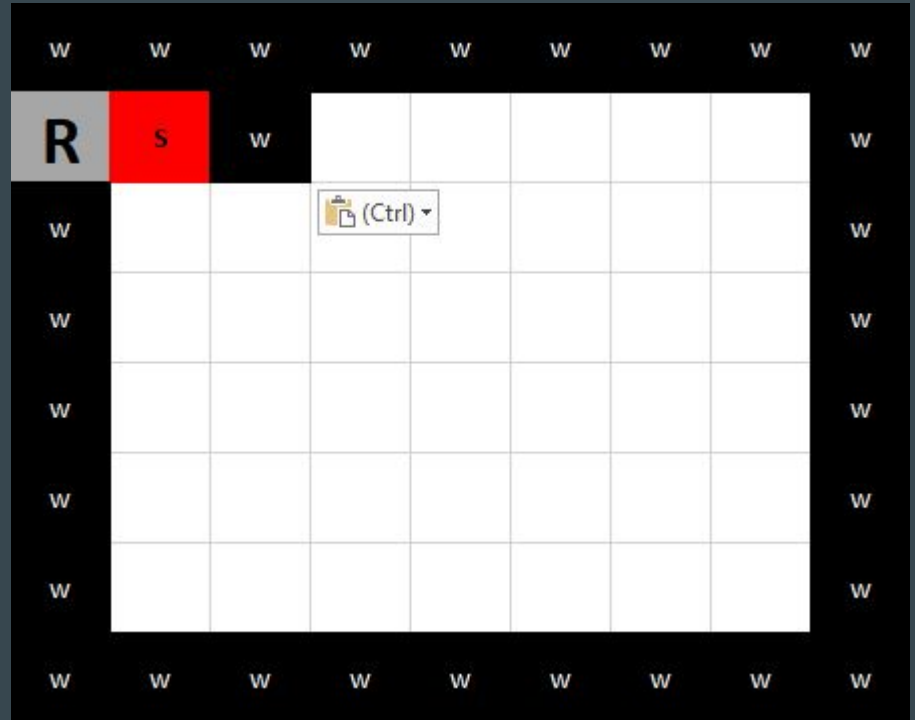
<u>Legend</u>	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map

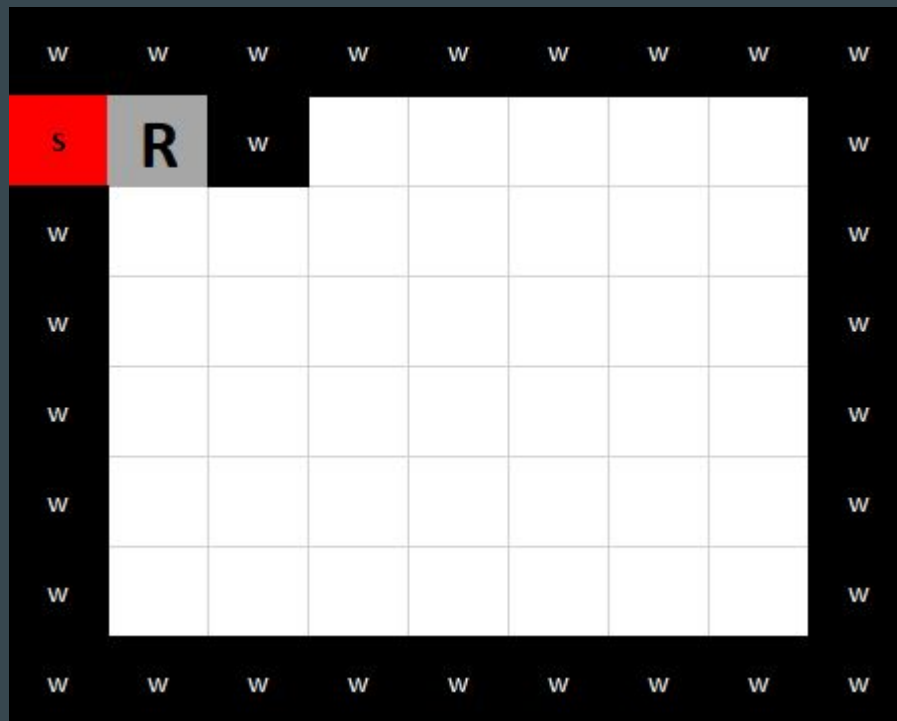
<u>Legend</u>	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

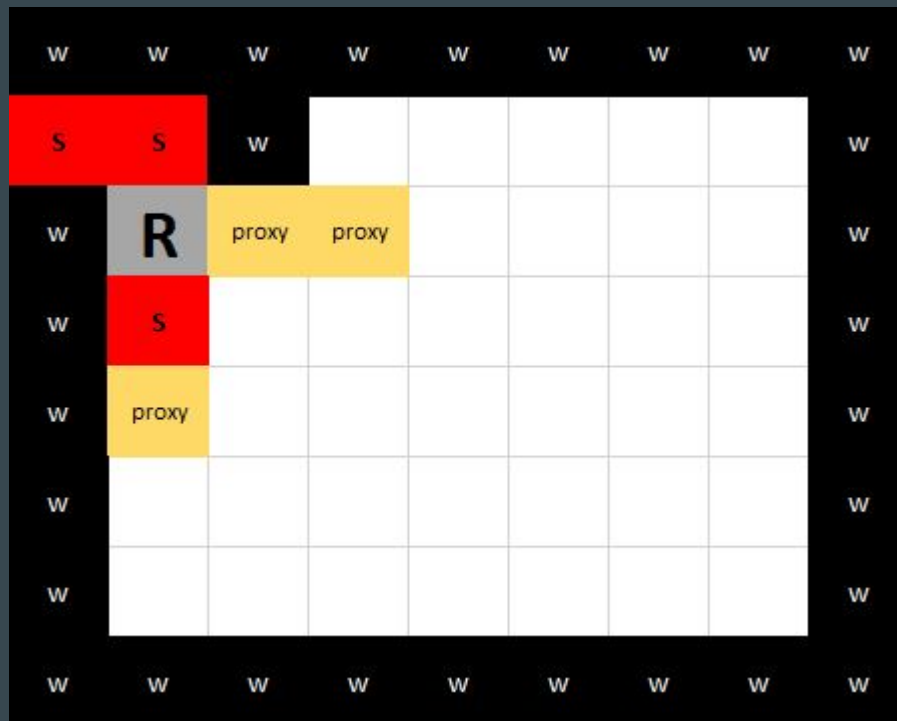
Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

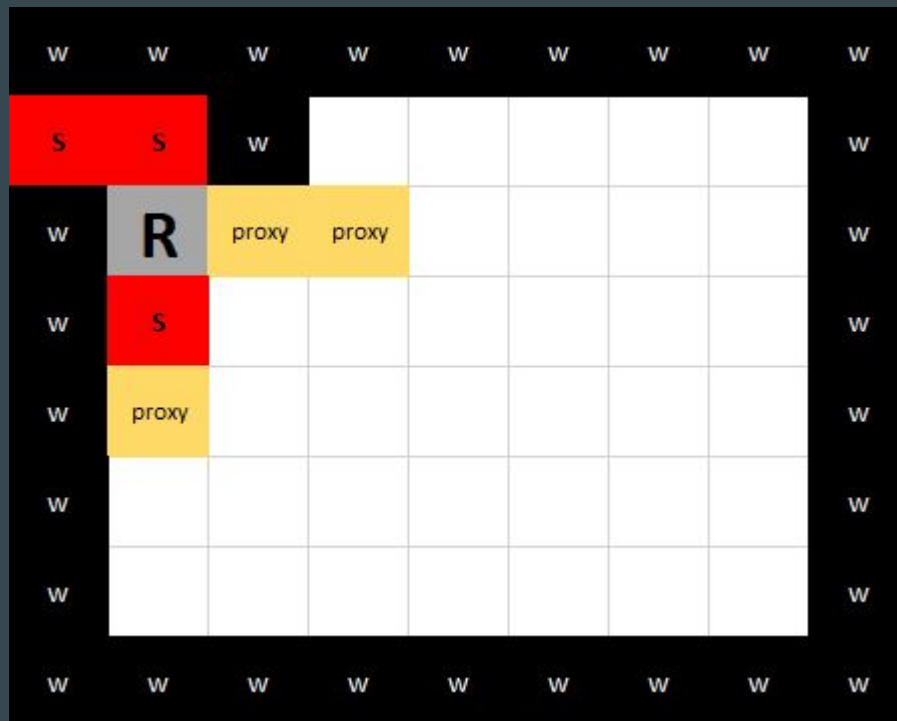
Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

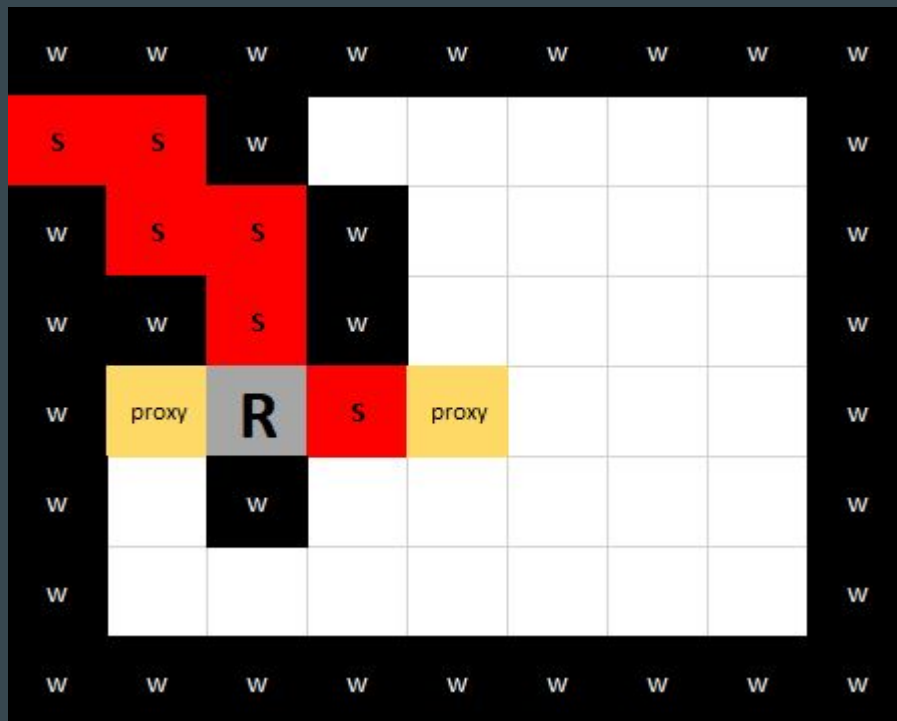
Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

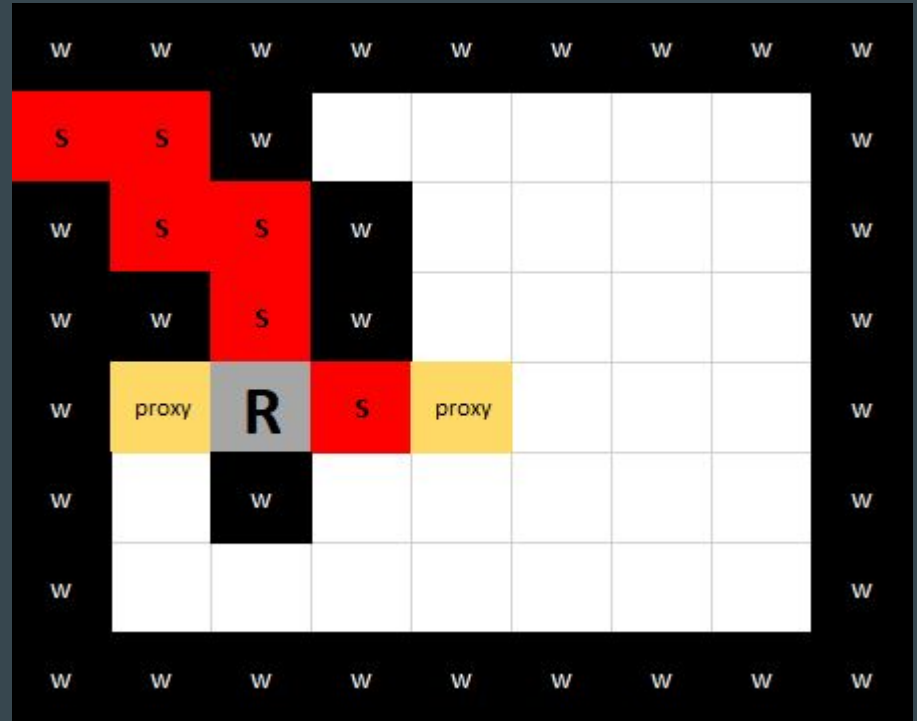
Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

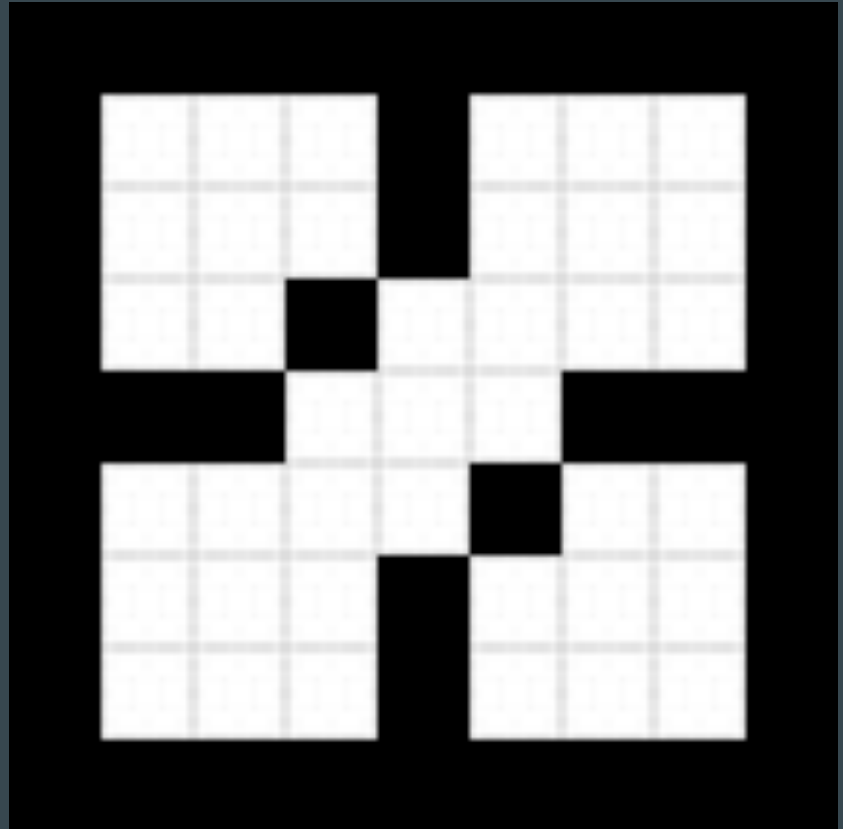
- **Decide Next Move(s)**
 - Flood Fill (with ranking system)

Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

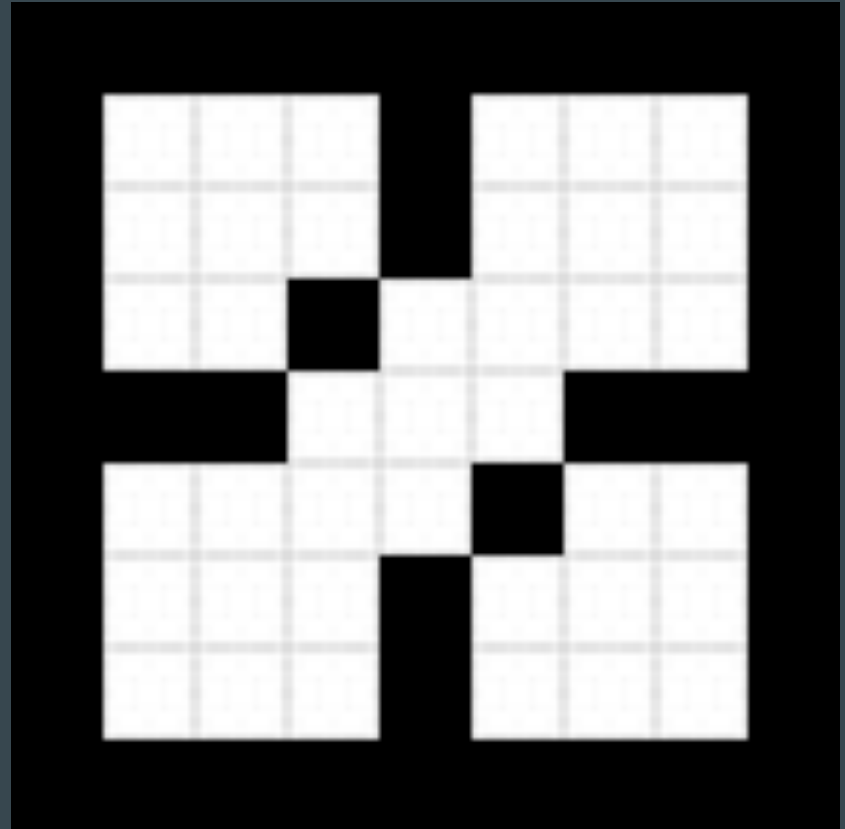
- **Decide Next Move(s)**
 - Flood Fill (with ranking system)



Pathfinding

- **Decide Next Move(s)**
 - Flood Fill (with ranking system)

Type			Valid?	Points
	Unknown	=	yes	2
w	Wall	=	NO	
S	Seen by Vision & Proxy	=	yes	0
proxy	ONLY Seen by Proxy	=	yes	1

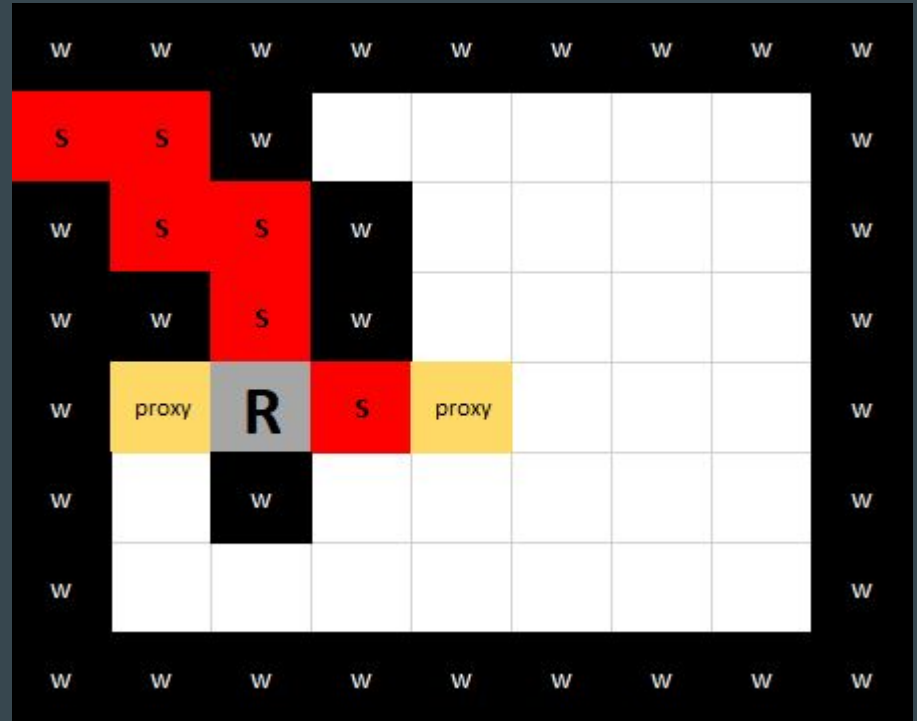


https://en.wikipedia.org/wiki/Flood_fill

Pathfinding

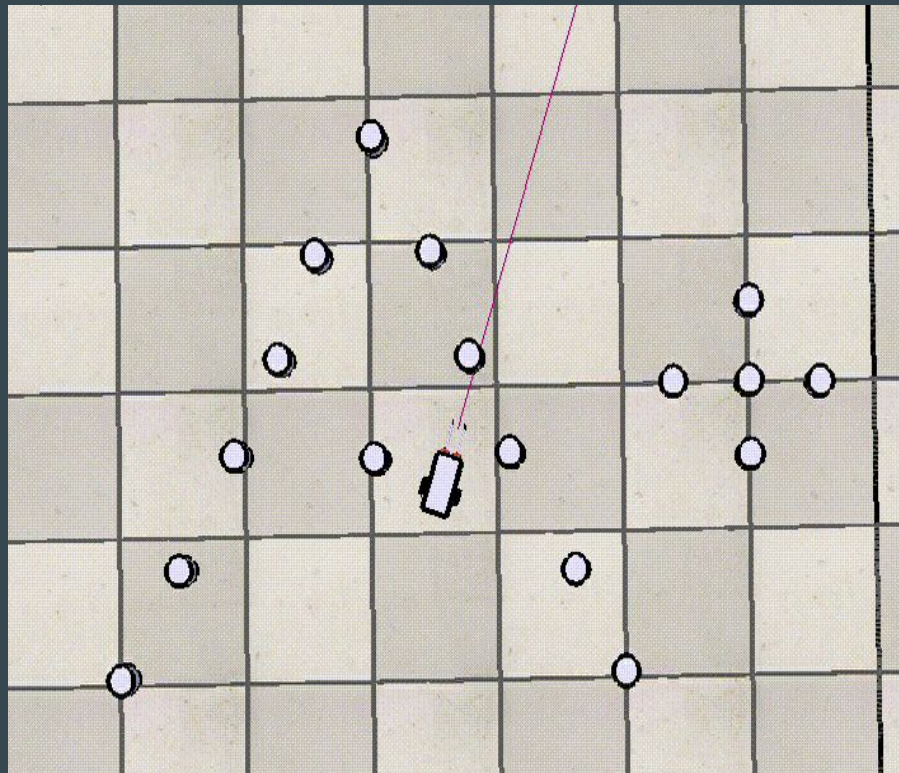
- **Decide Next Move(s)**
 - Flood Fill (with ranking system)
 - IF tie then move away from middle

Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



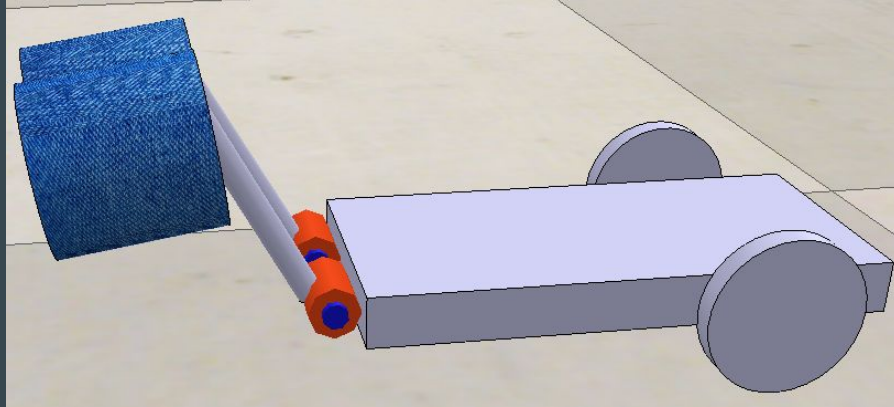
Motor Functions : Steering

- Remote controlled for streamlined testing
- Brought to you in part by Pythagoras



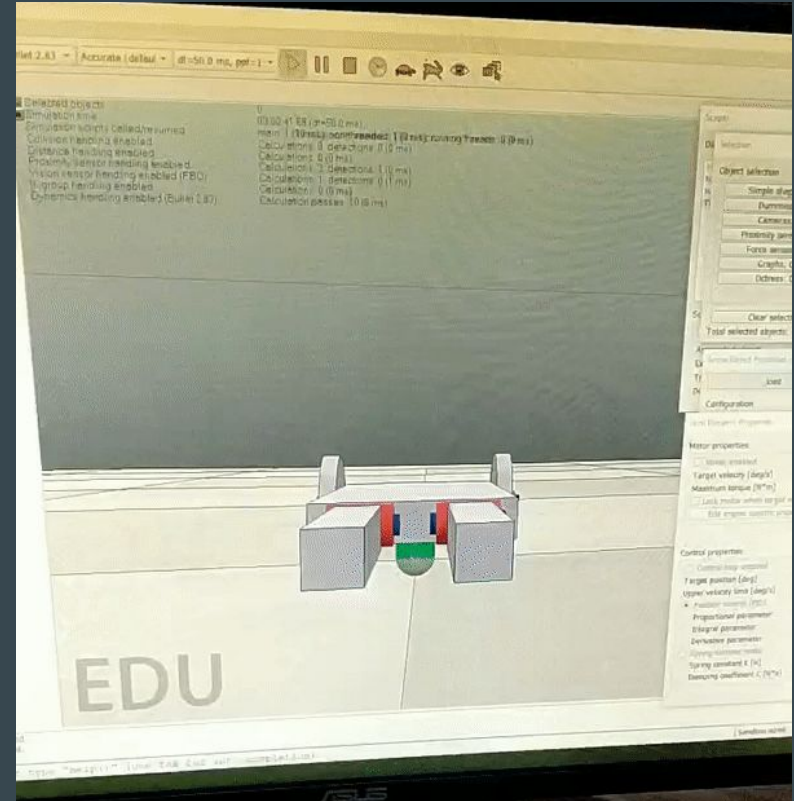
Motor Functions : Prongs

- Objective securing
- Simplicity over complexity
- Sensors are not obstructed, maneuverability is maintained



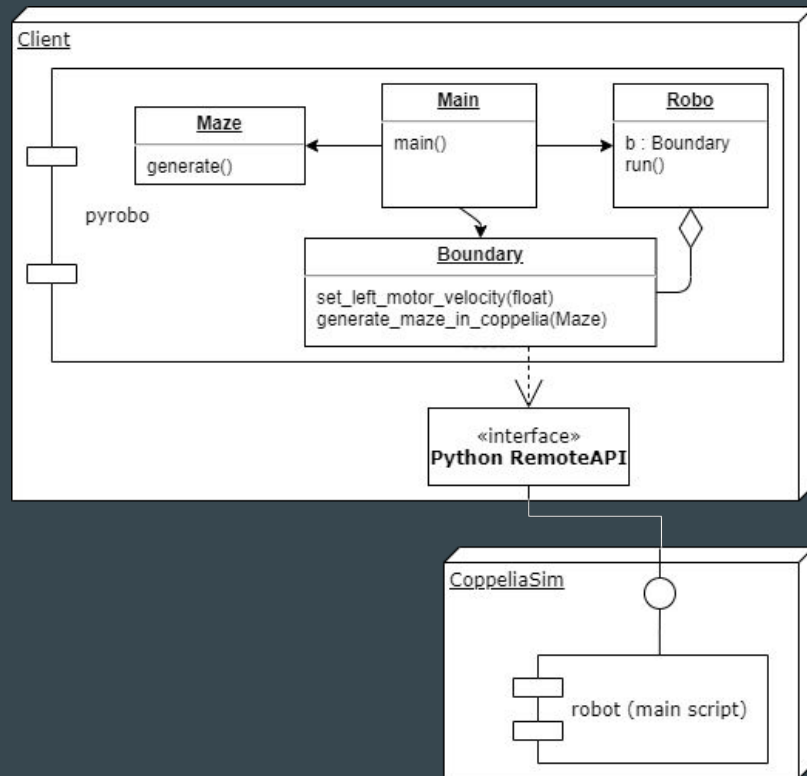
Challenges

- Strange behaviour
 - Imprecise shape dimensions
 - Physics engines
 - Thanks Jasleen
- Project management
 - Development coordination
 - Git
 - Project scheduling; deadlines

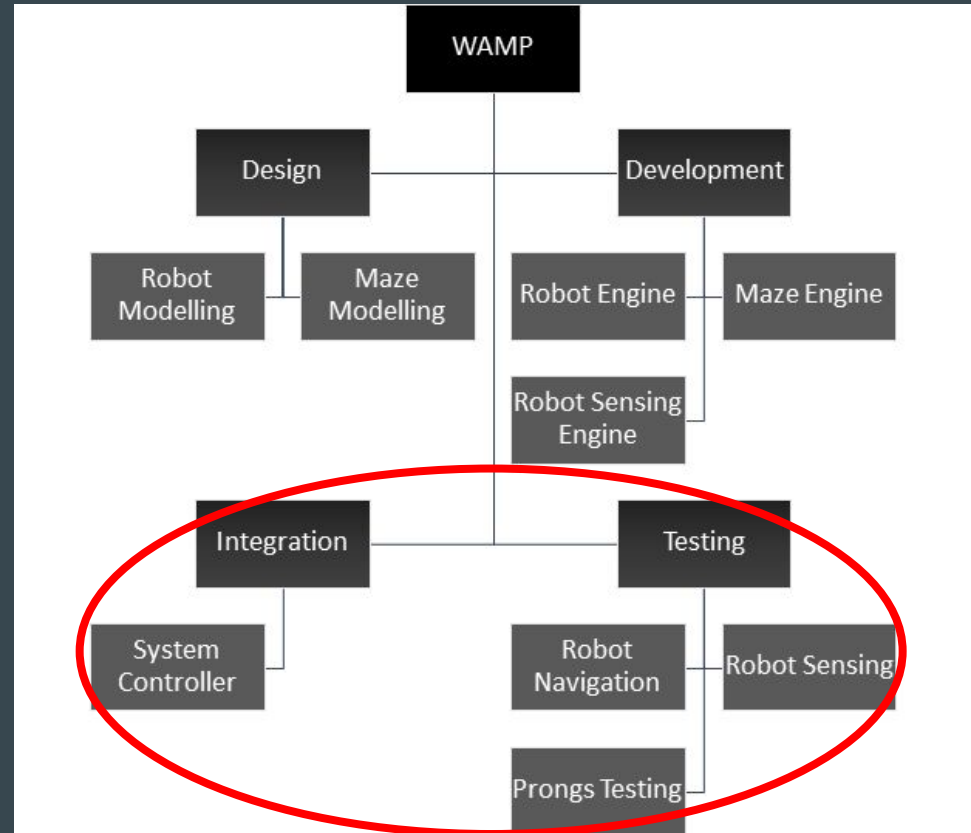


Achievements

- Pseudo-random maze generation
- Robust motor and prong function
- Successful integration of all major components

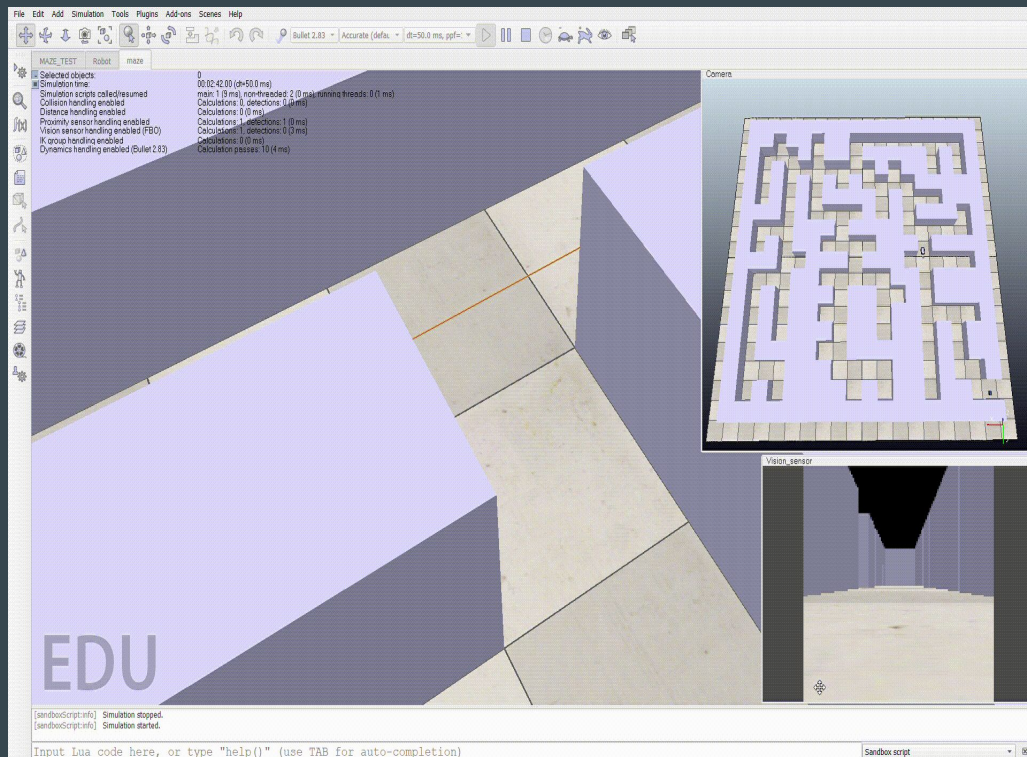


To Do



To Do

- Autonomous operation
- Objective alignment
- End-to-end testing



Future Plans

- Create more complex mazes
- Improve the forking functionality
- Get funding from NASA
- Build robot
- Sell to NASA :)



Thank you!

...

Questions?

ROUGH WORK

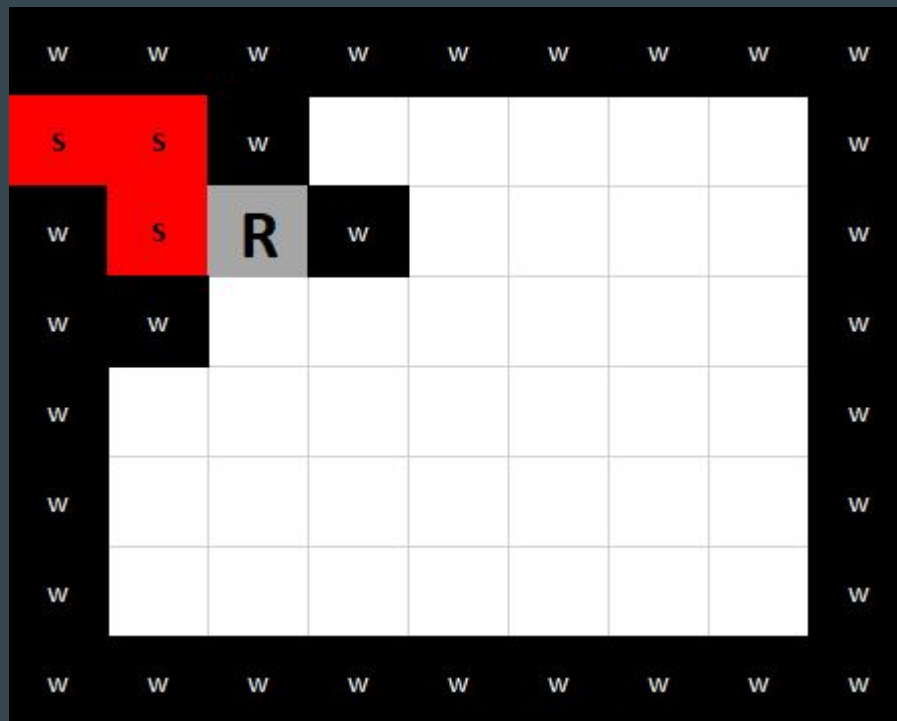


Questions?

Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

Legend	
	Unknown
w	Wall
R	Robot
s	Seen by Vision & Proxy
proxy	ONLY Seen by Proxy



Pathfinding

- **Exploration Loop:**
 - Pull Sensors
 - Update Map
 - Decide Next Move(s)
 - Move

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	Unknown
w	Wall
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