Autonomous Mobile Robot Navigation Methods

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Mentor: Joey Durham

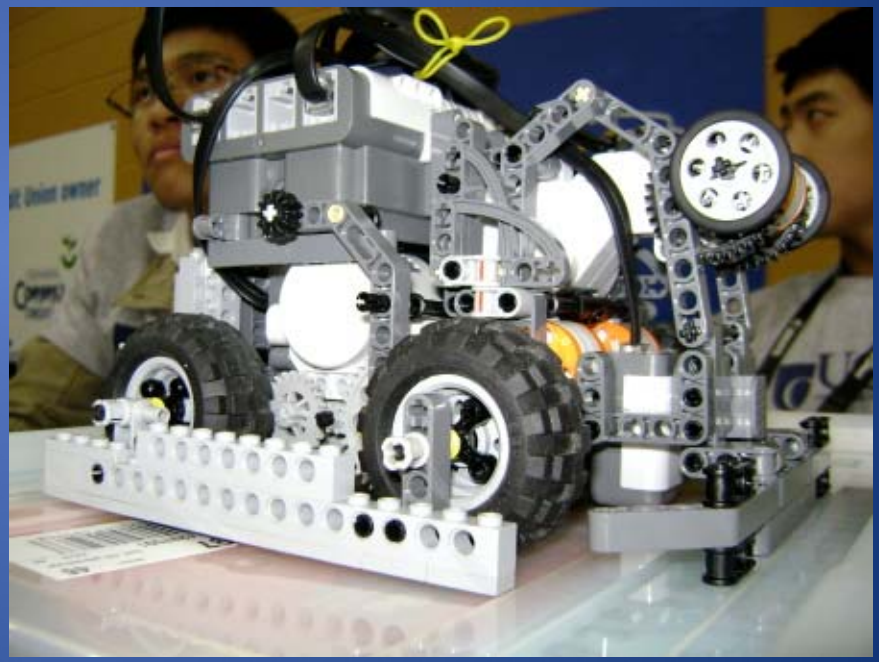
Advisor: Francesco Bullo

The Big Picture of Autonomous Robots

http://www.starstore.com/acatalog/Starstore_Catalogue_STAR_WARS_COOKIE_JARS_5525.html

The Big Picture of Autonomous Robots

- What are autonomous robots?



http://adamw523.wordpress.com/2007/12/13/annual-uoit-robotics-competition/

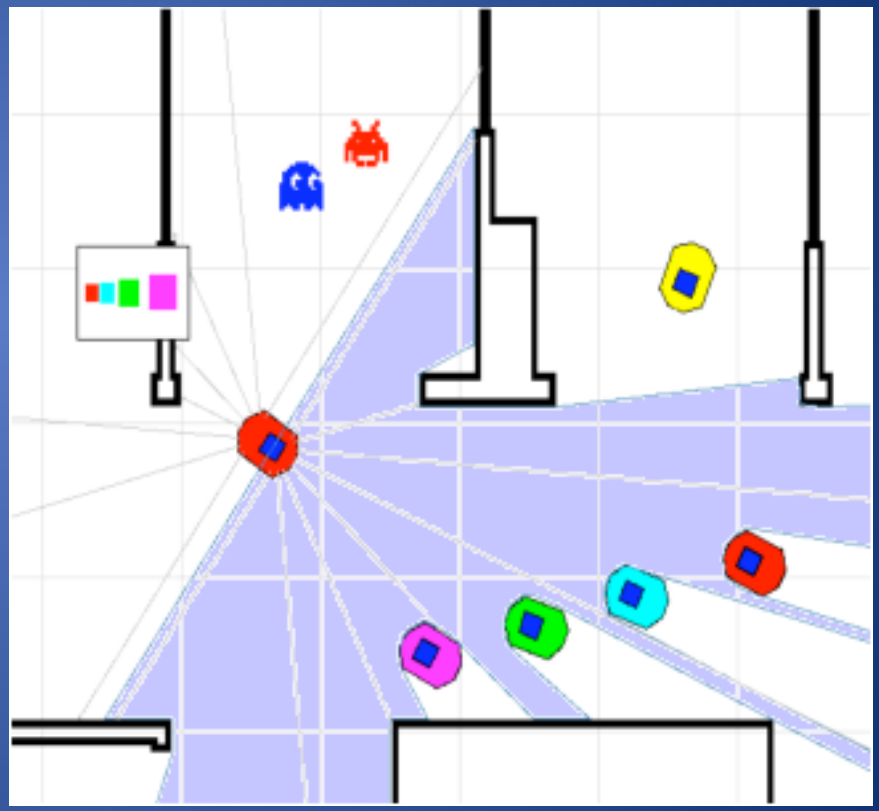
The Big Picture of Autonomous Robots

- What are autonomous robots?
- The laboratory's focus.

http://upload.wikimedia.org/wikipedia/commons/thumb/d/dd/Industrial_Robotics_in_car_production.jpg/300px-Industrial_Robotics_in_car_production.jpg

The Big Picture of Autonomous Robots

- What are autonomous robots?
- The laboratory's focus.
- The current challenge at hand.



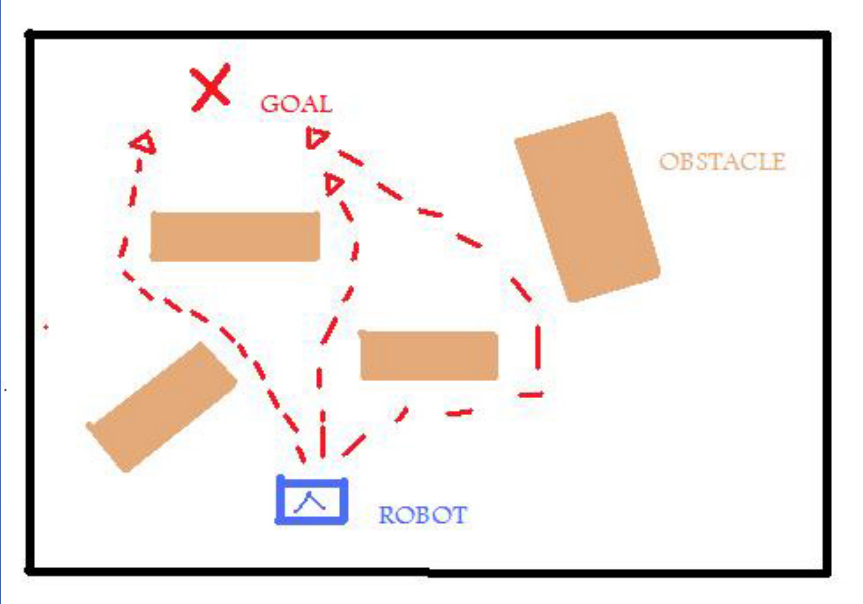
http://www.cs.sfu.ca/~vaughan/img/stage-2.0.0a.1.png

Project Goals

http://news.webclicshoppingmall.com/content/view/23/1/

Project Goals

- Compose an algorithm for robots to maneuver around their environment.



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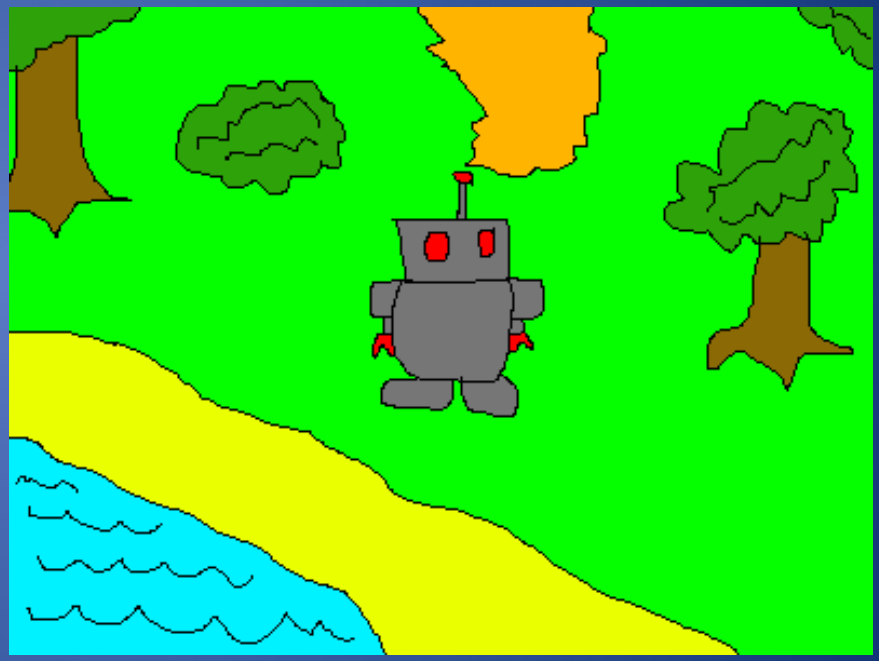
- Compose an algorithm for robots to maneuver around their environment.
- Develop an understanding of how the robot sees it's environment.



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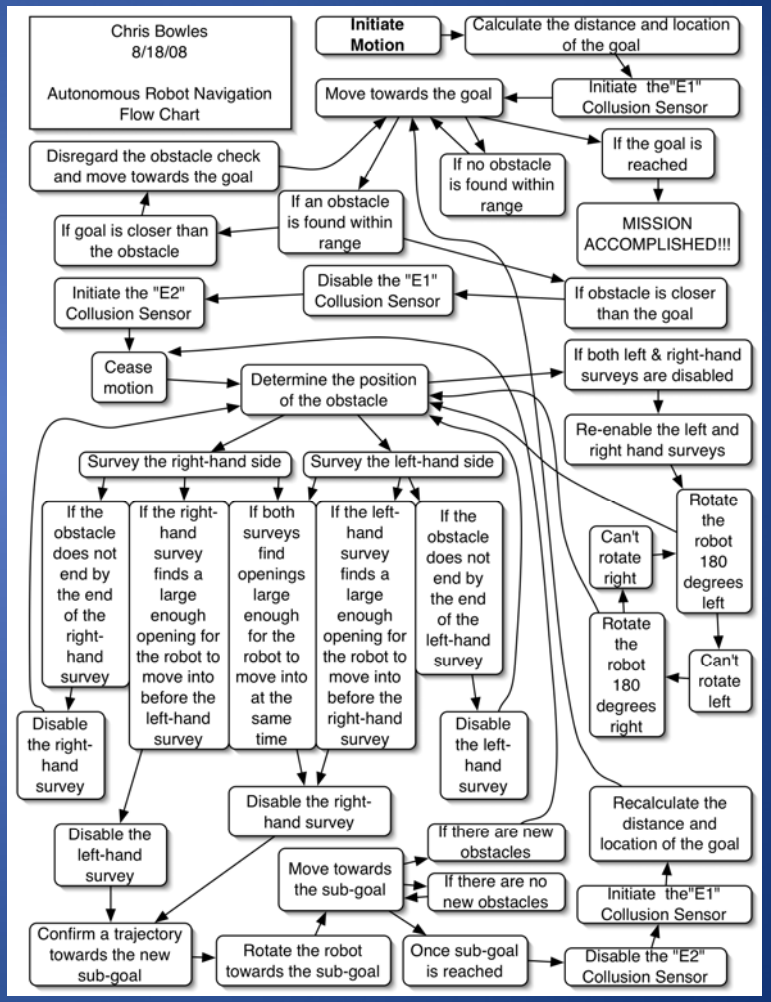

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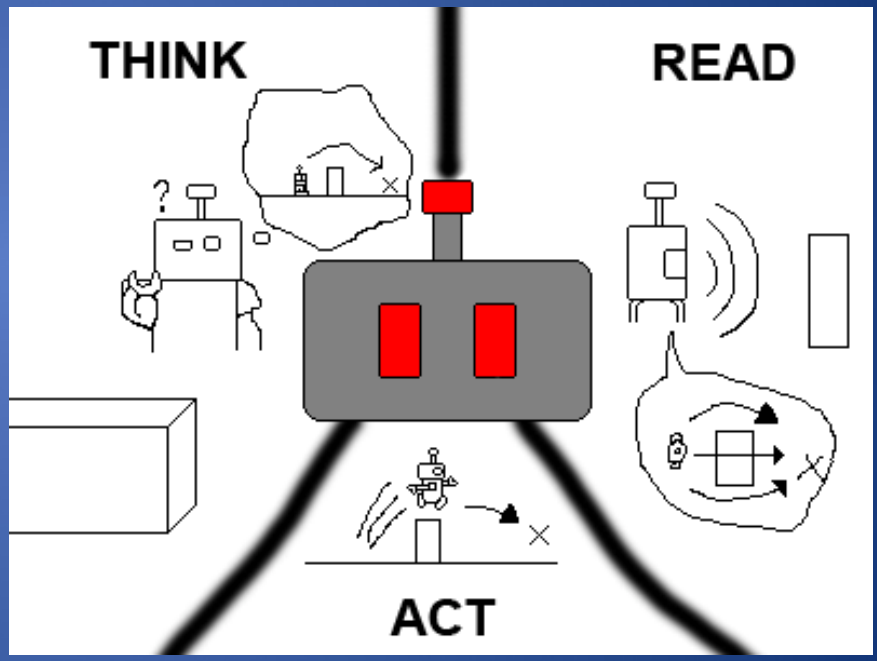
- Develop an understanding of how the robot sees it's environment.
- Assemble a flowchart with different possibilities and outcomes.
- Improve the robot's backbone structure of "Think, Read, & Act."



Experimental Methods

$$NaOH + HCl \rightarrow H_2O + NaCl$$

Experimental Methods

- Designing Algorithms

Experimental Methods

- Designing Algorithms
- Running Tests on the Algorithms

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- Designing Algorithms
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- Refining errors within the Algorithms

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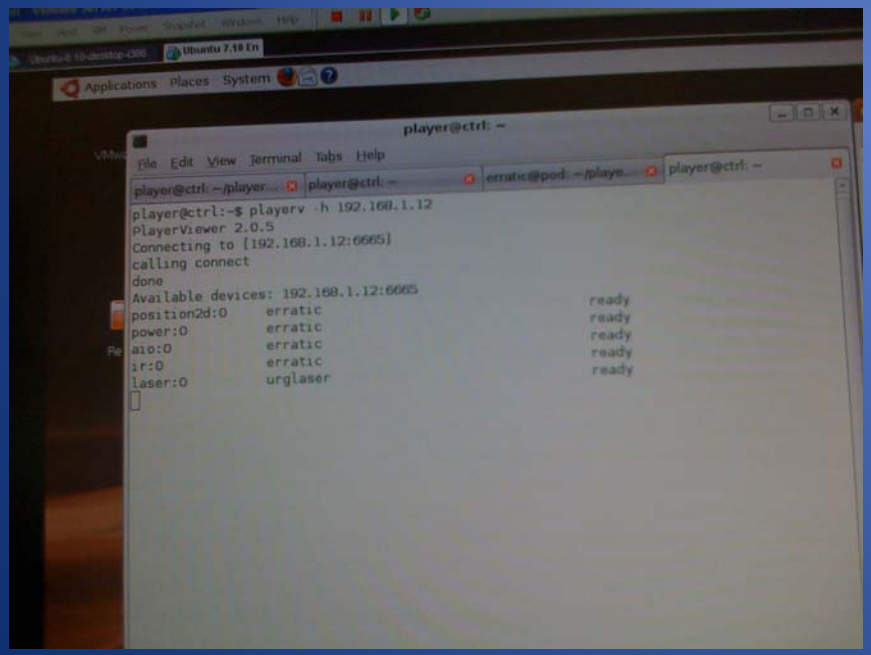
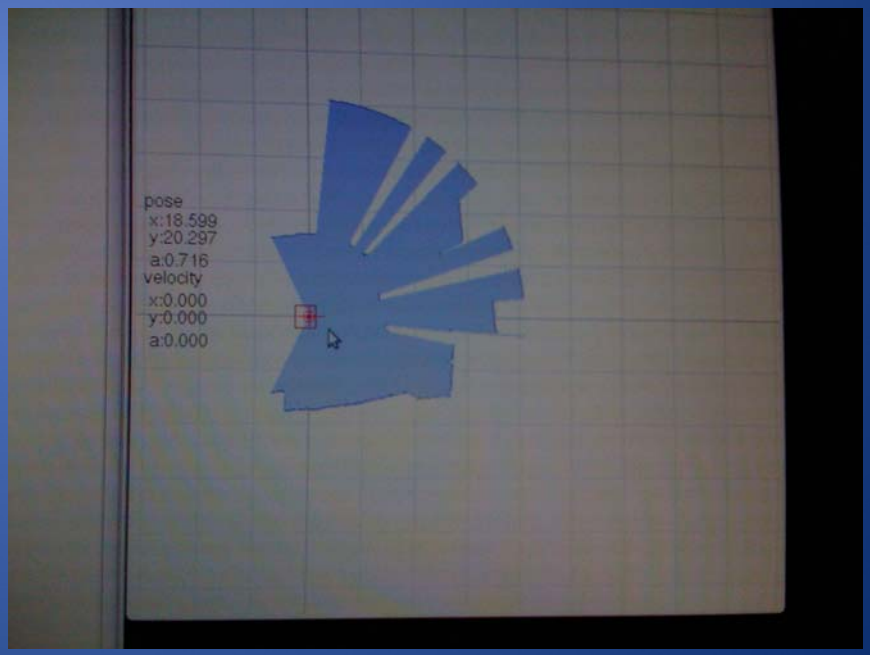
- Designing Algorithms
- Running Tests on the Algorithms
- Refining errors within the Algorithms
- Repeating Steps 1 through 3

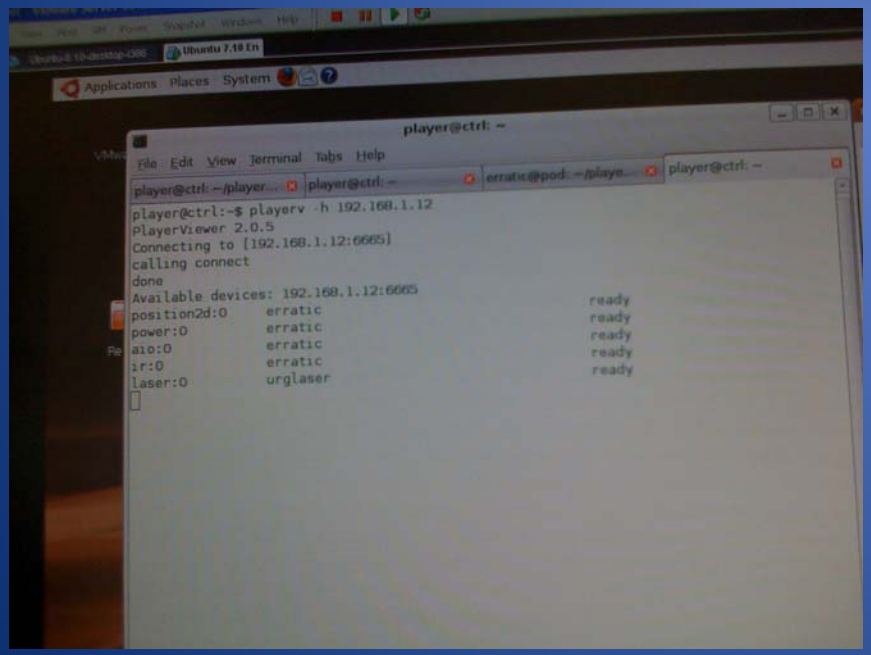
Designing Algorithms

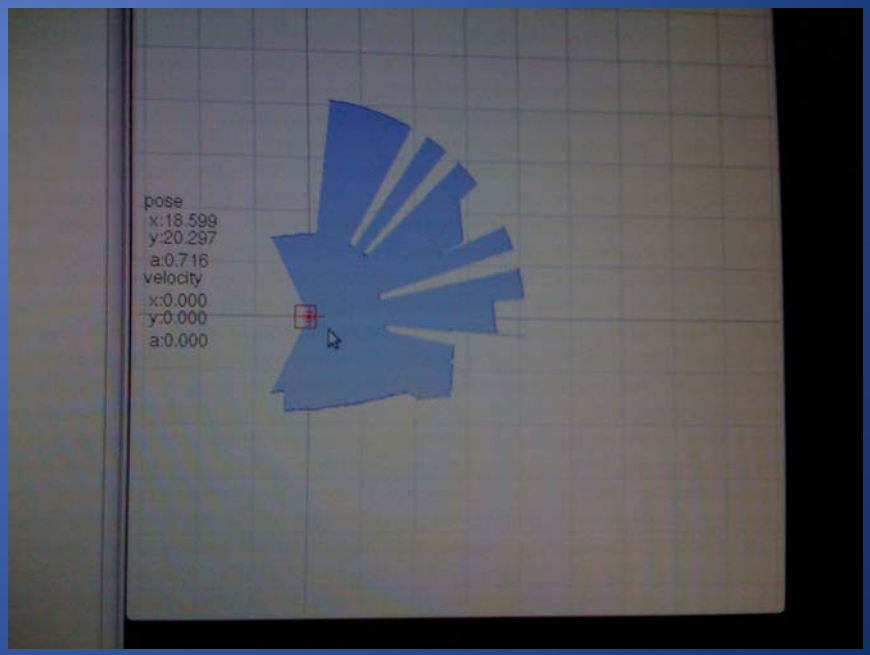




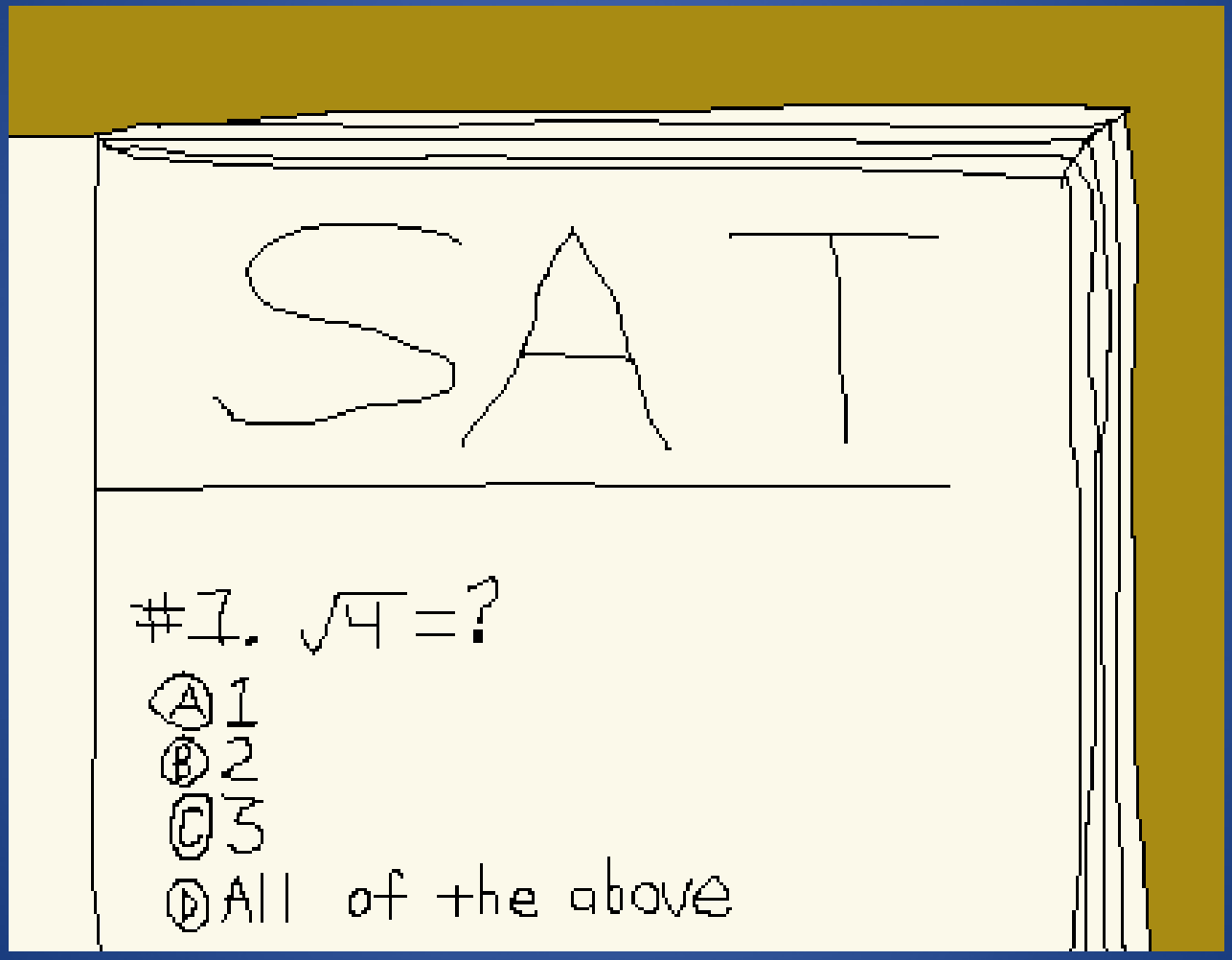
Designing Algorithms

- Algorithms will be written with C++ using the Player/Stage interface.



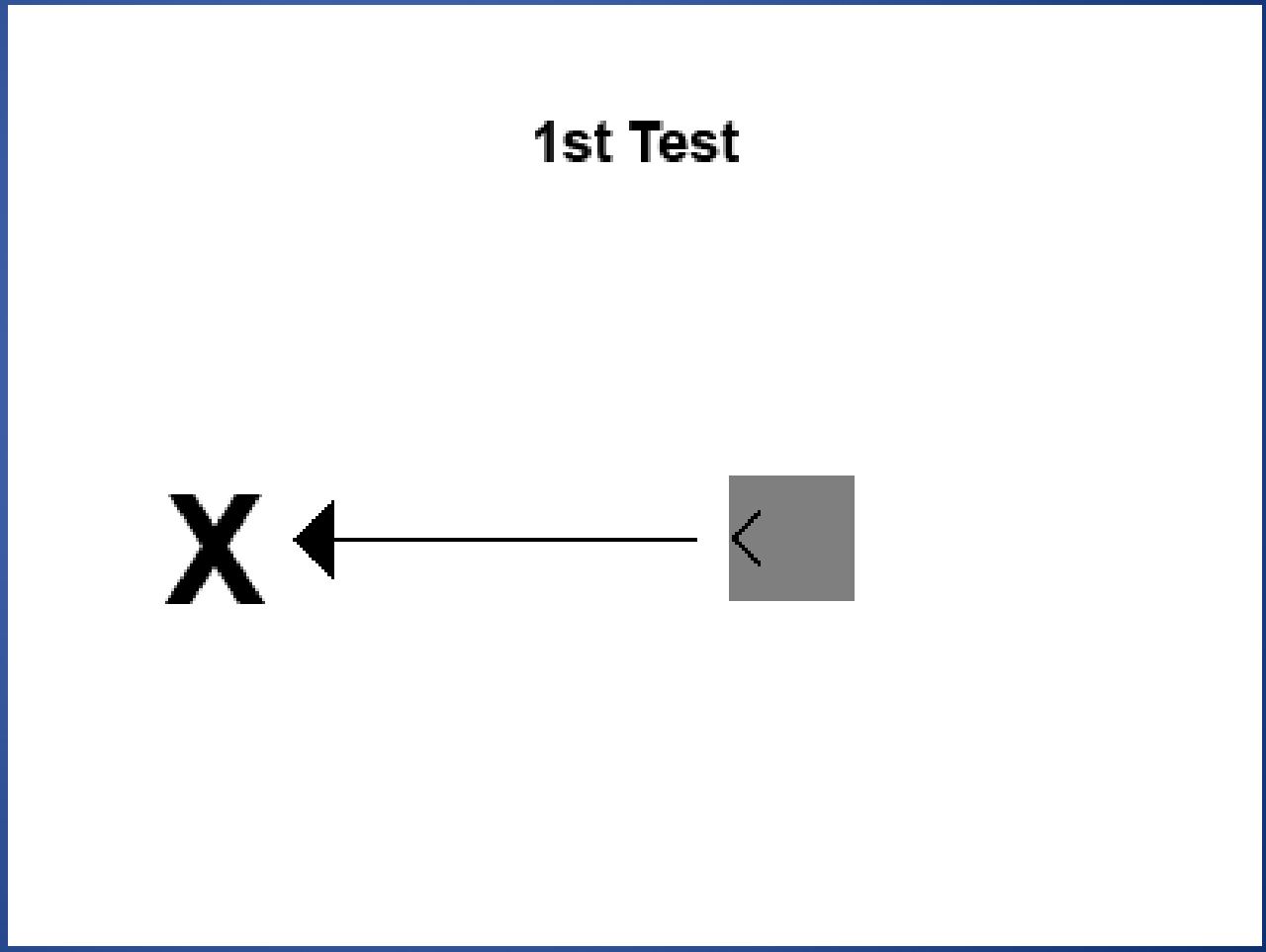


Diagnostic Tests



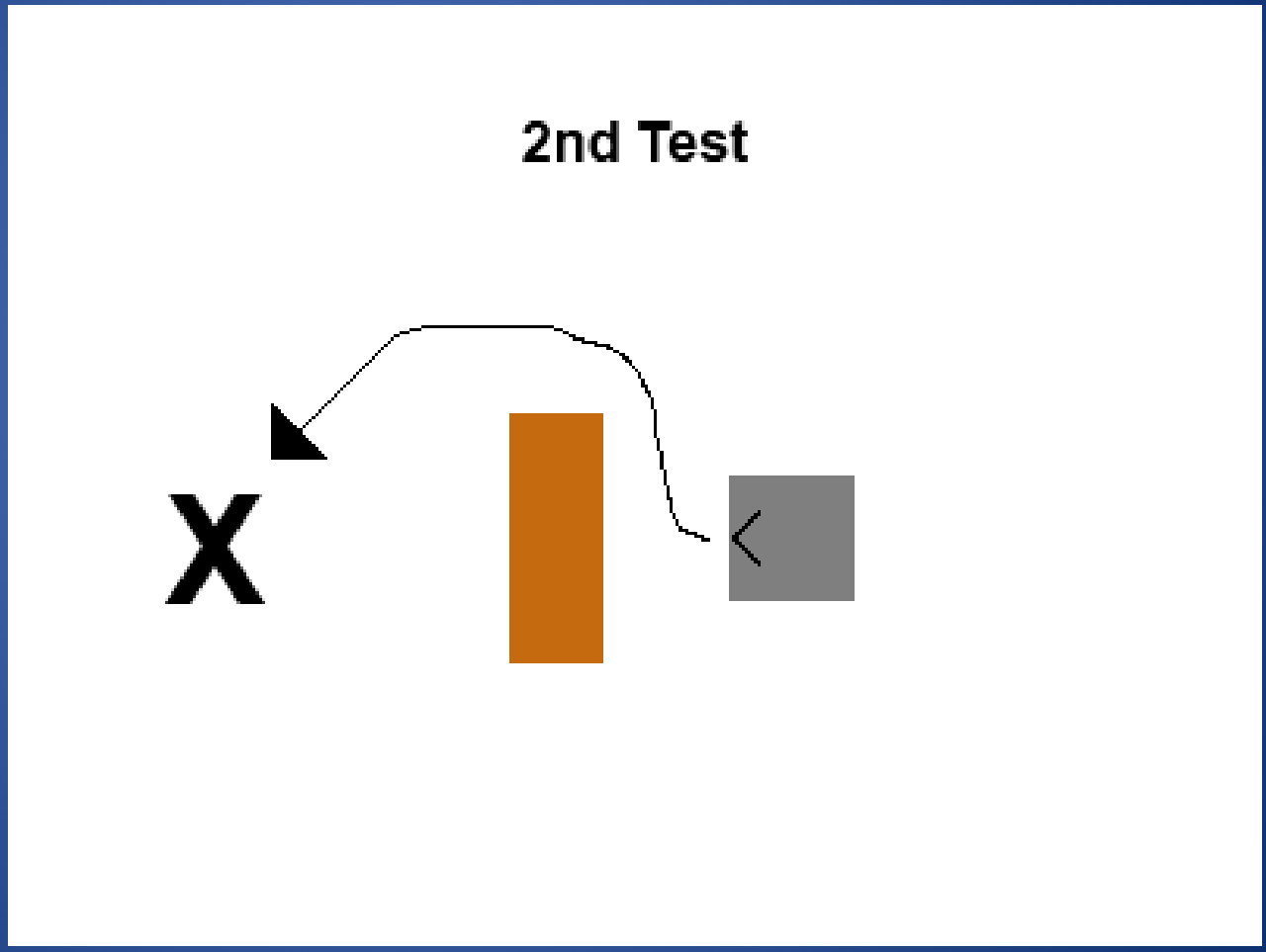
Diagnostic Tests

- Test #1



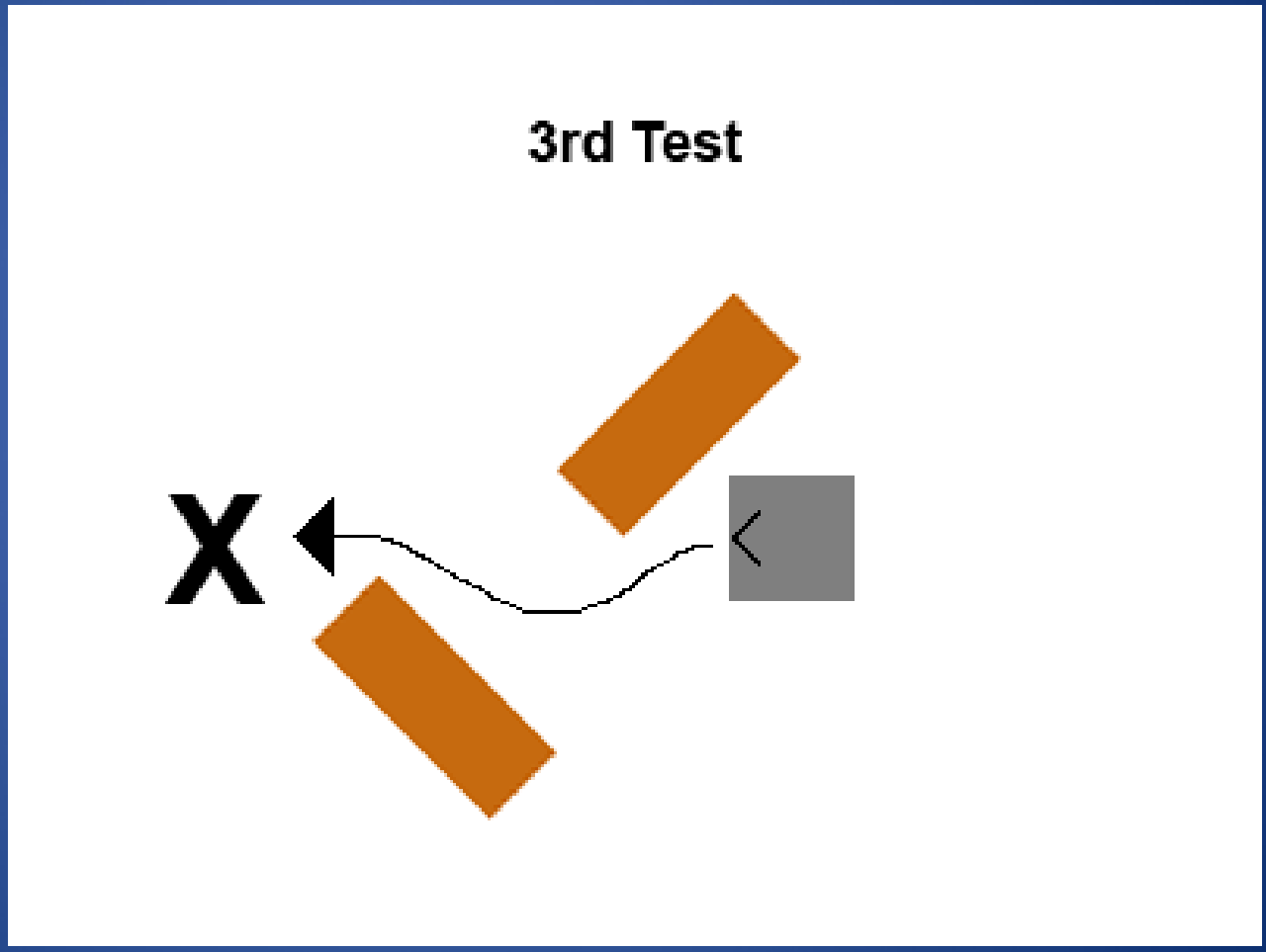
Diagnostic Tests

- Test #1
- Test #2



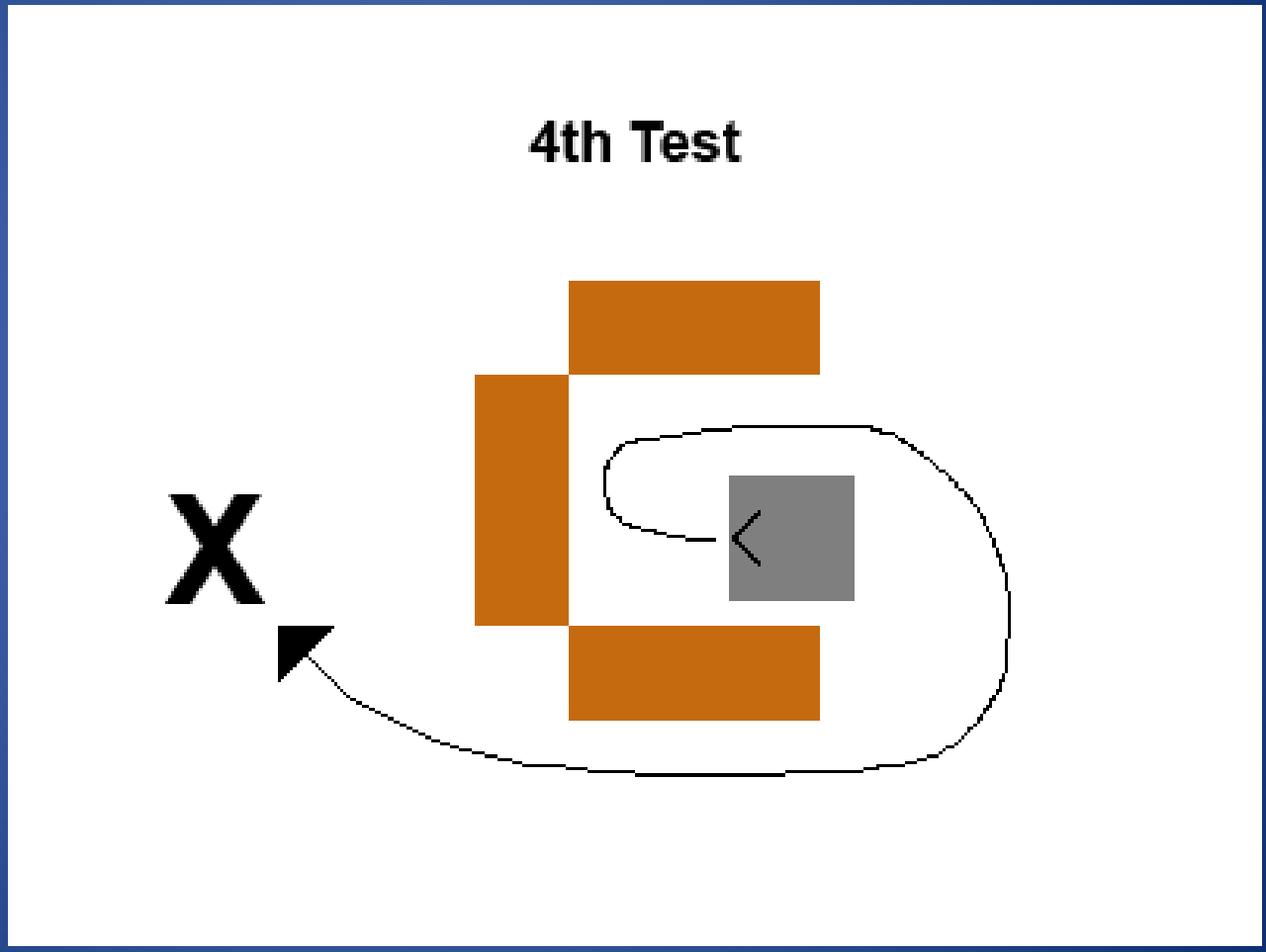
Diagnostic Tests

- Test #1
- Test #2
- Test #3



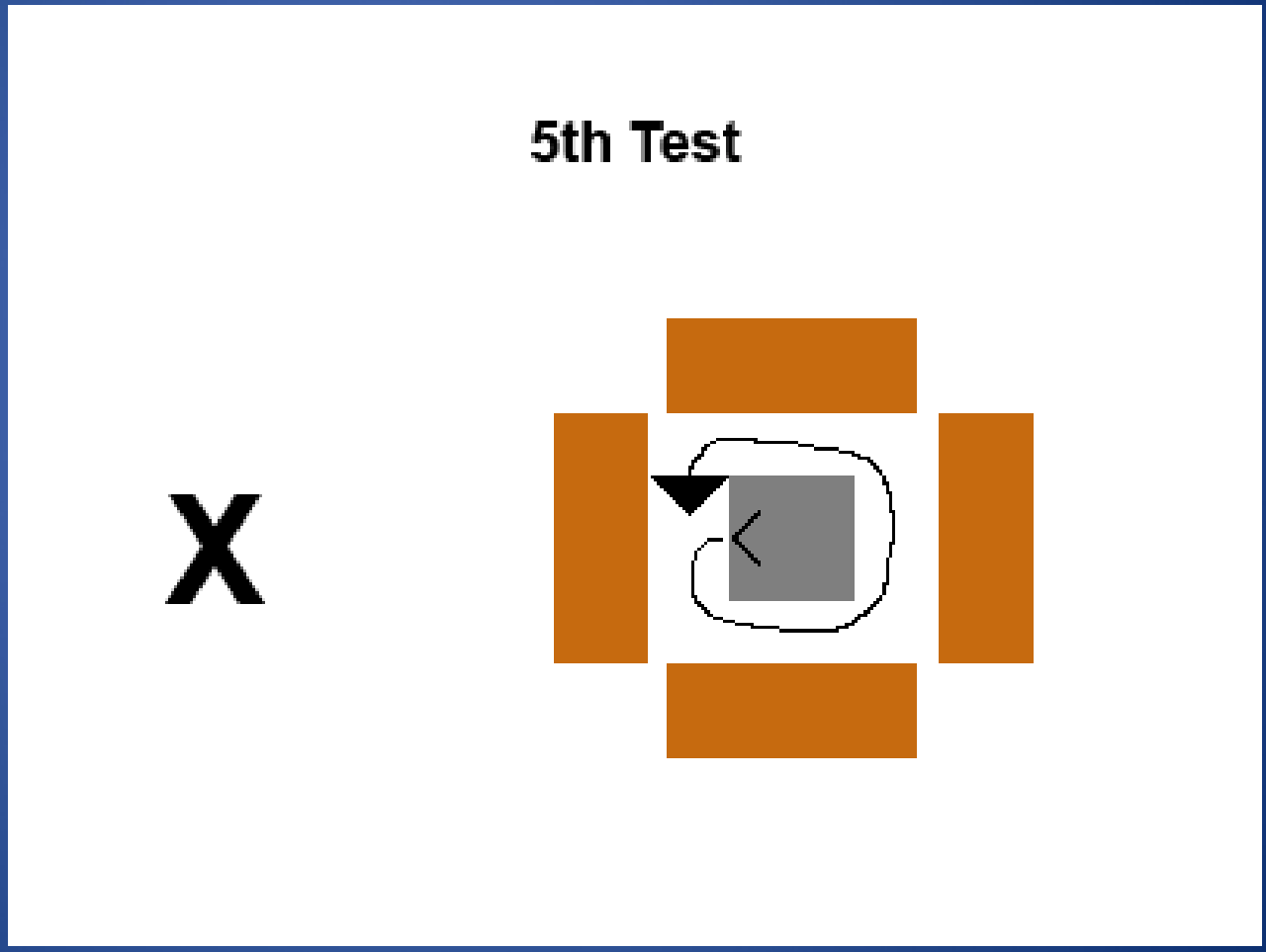
Diagnostic Tests

- Test #1
- Test #2
- Test #3
- Test #4



Diagnostic Tests

- Test #1
- Test #2
- Test #3
- Test #4
- Test #5



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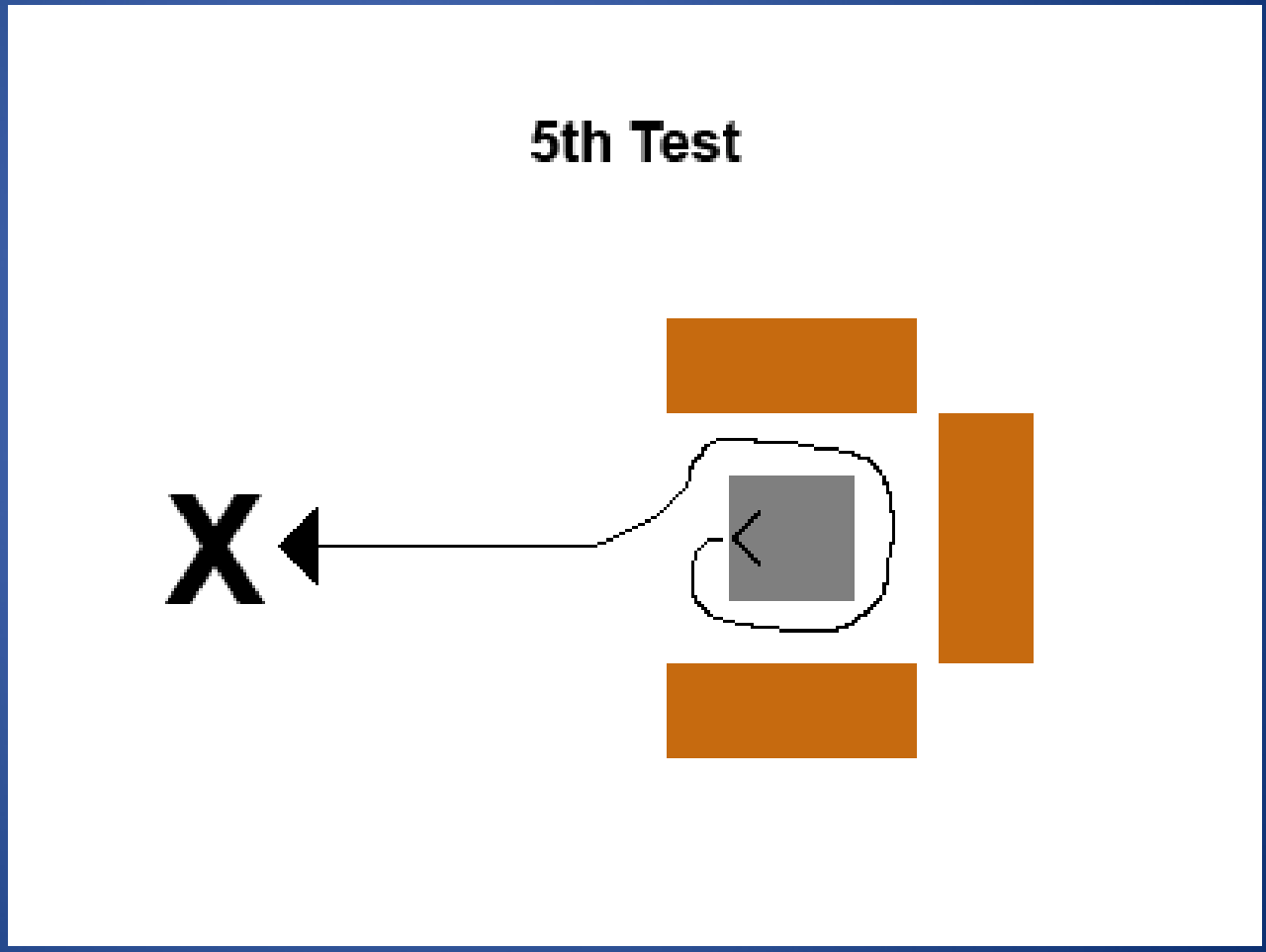
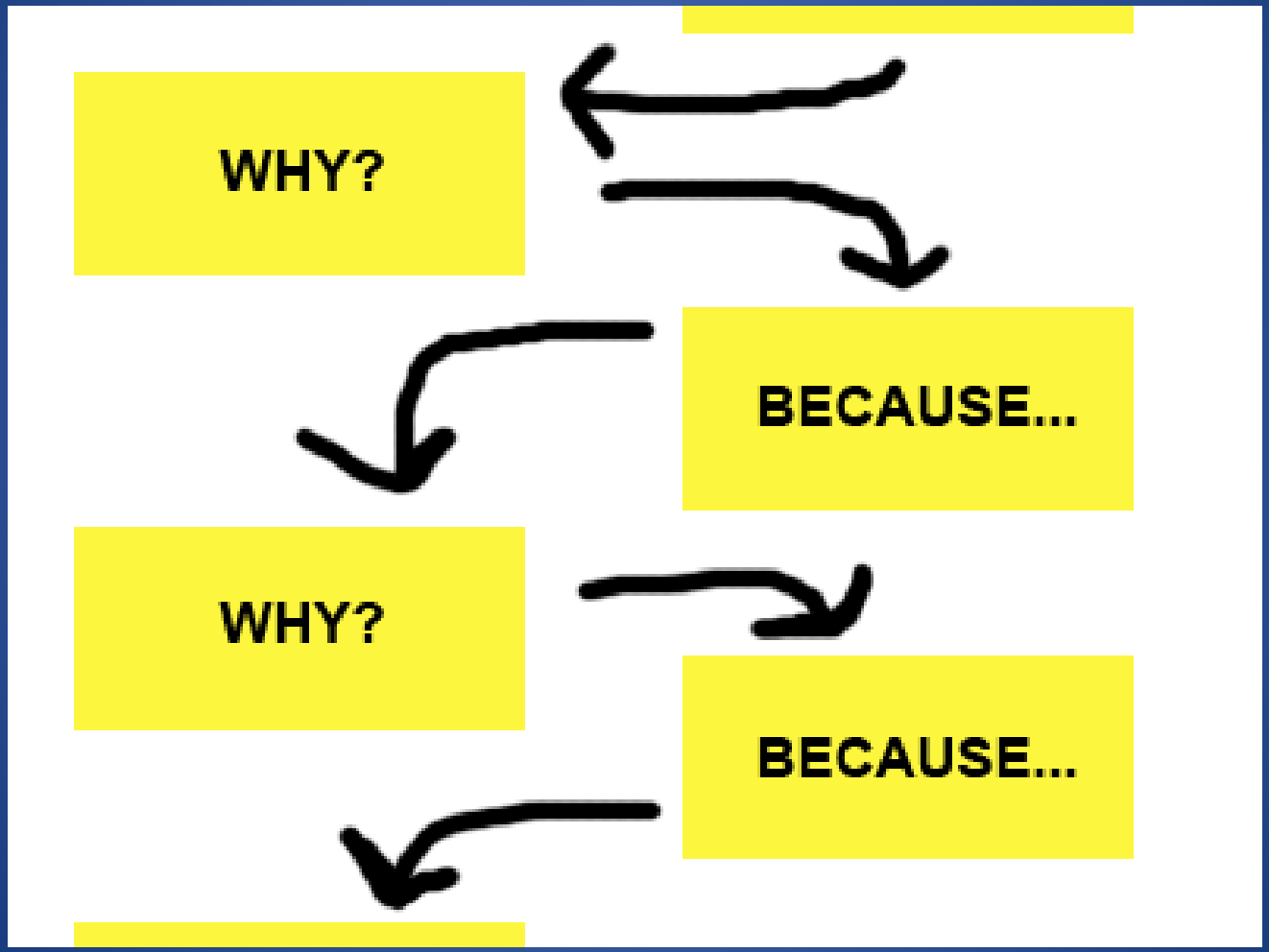
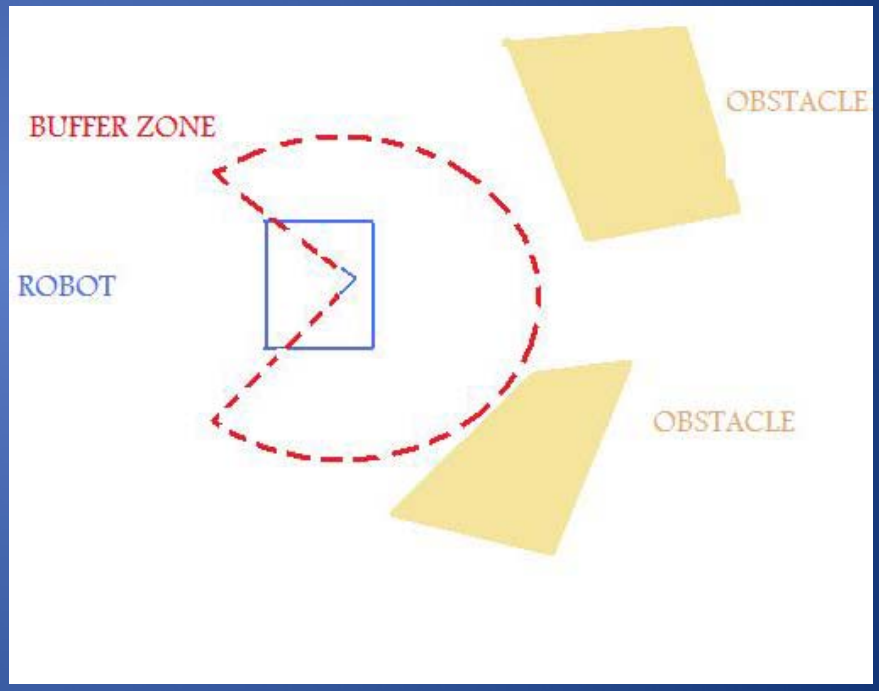


Algorithmic Principles



Algorithmic Principles

- Alex & Silviano's – Buffer zone



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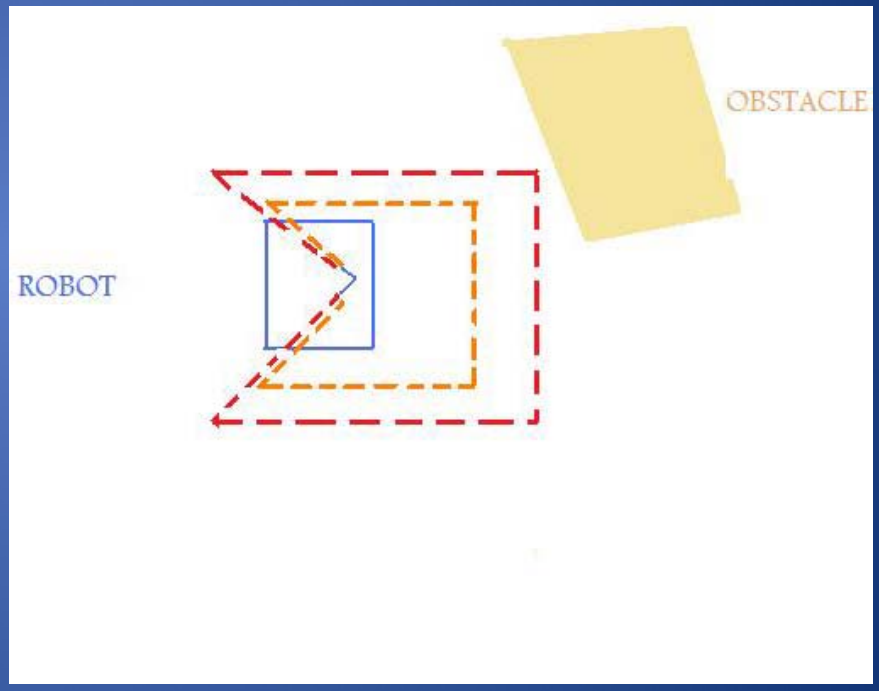

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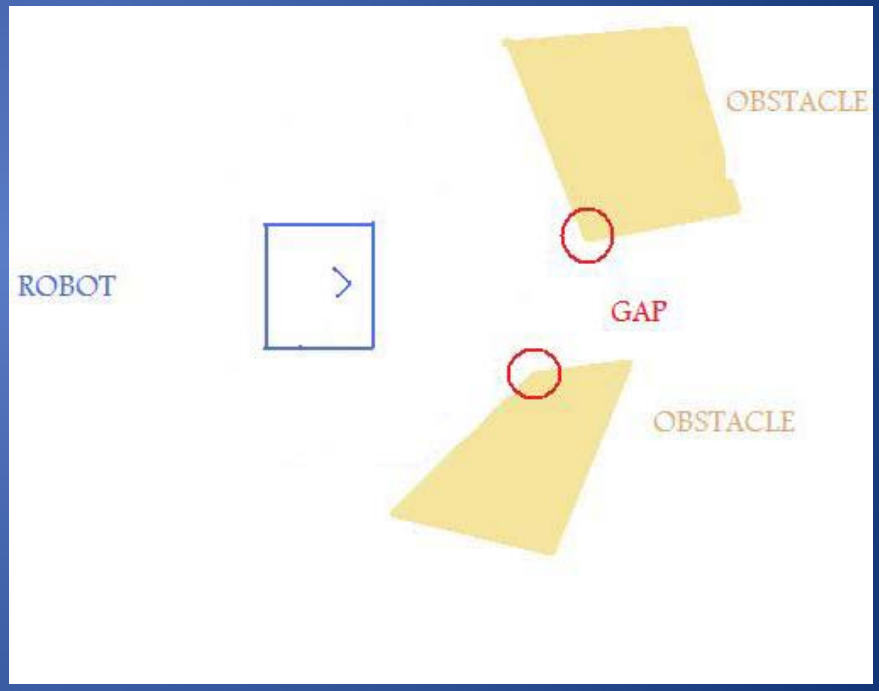

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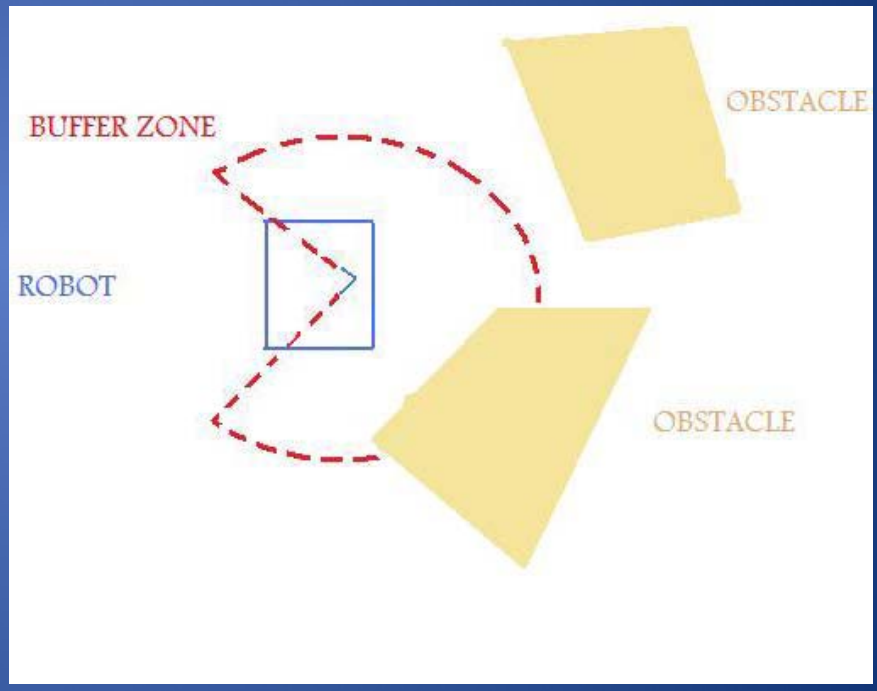
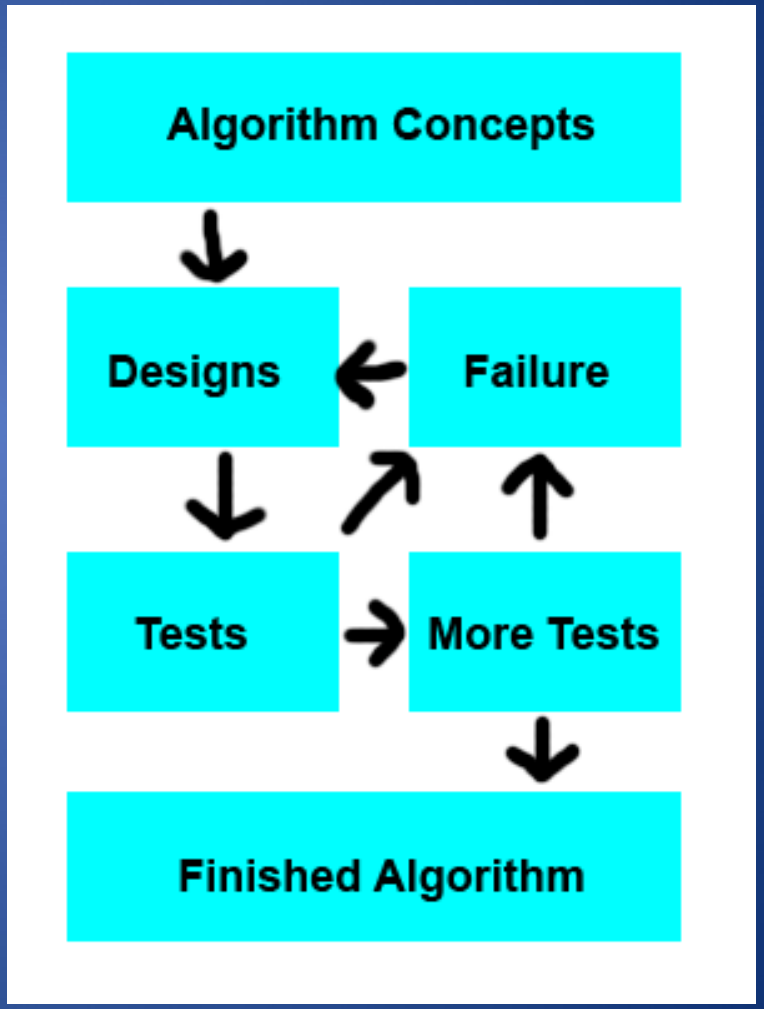
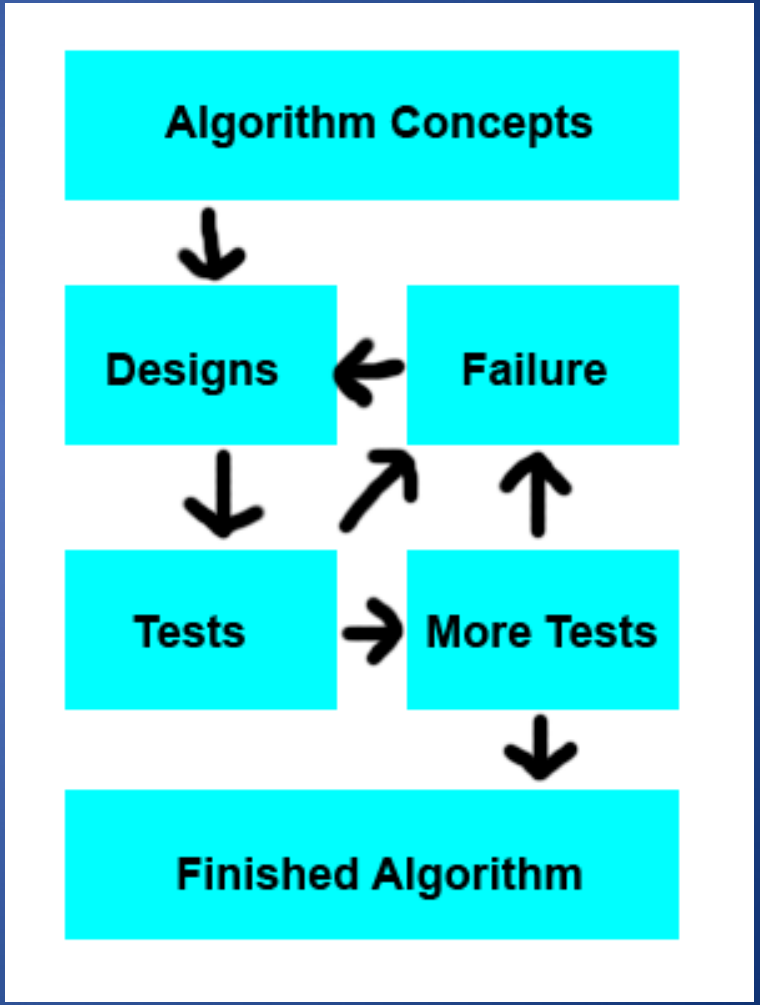


Refining Errors



Refining Errors

- Analyzing the robot's implementation of the Algorithm.



Refining Errors

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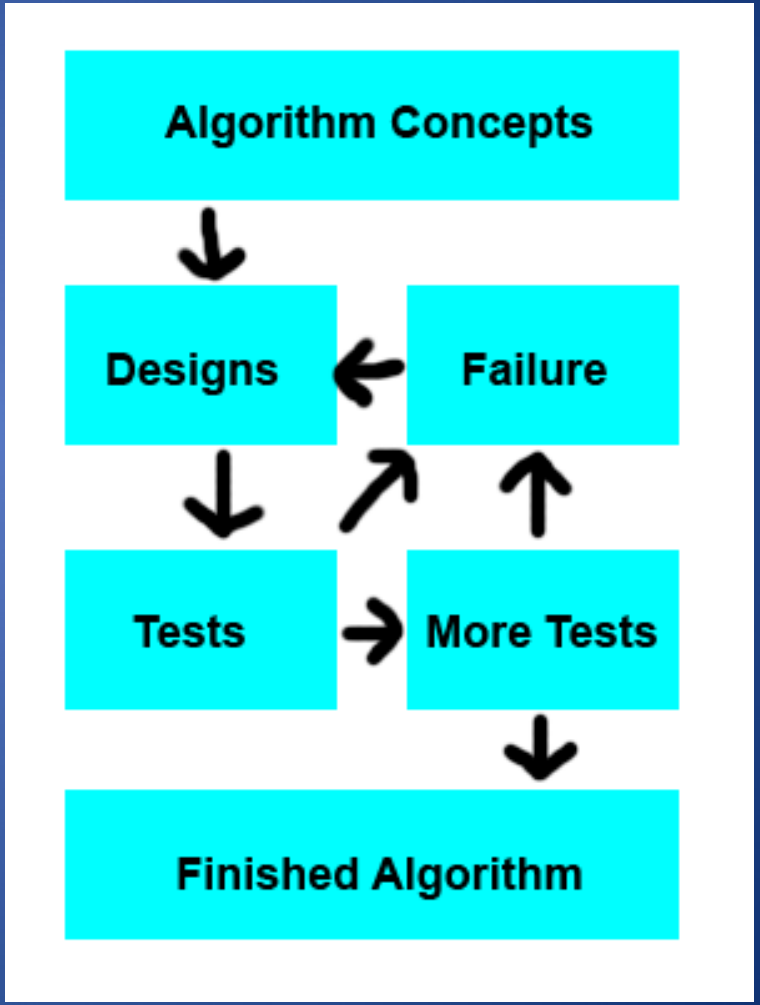
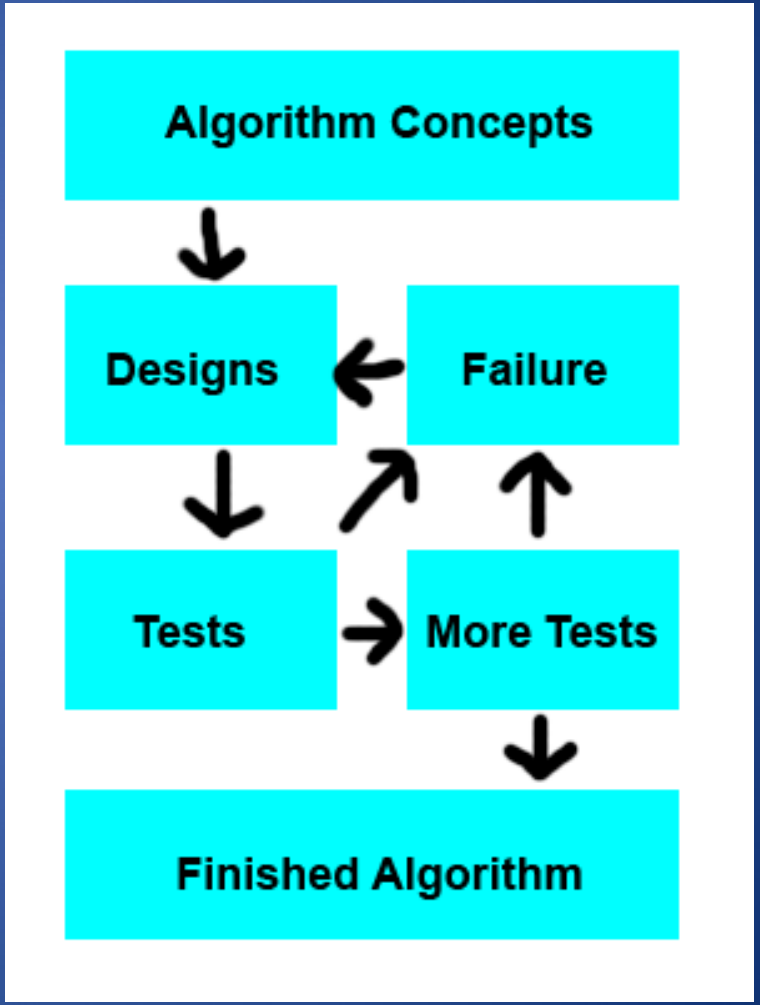


Refining Errors

- Analyzing the robot's implementation of the Algorithm.
- Detect all errors within the 1st phase of tests.
- Correcting the errors & running additional tests.



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Legend:

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Three trials per test. 15 trials per algorithm. 25 tests total, consisting of 75 trials.

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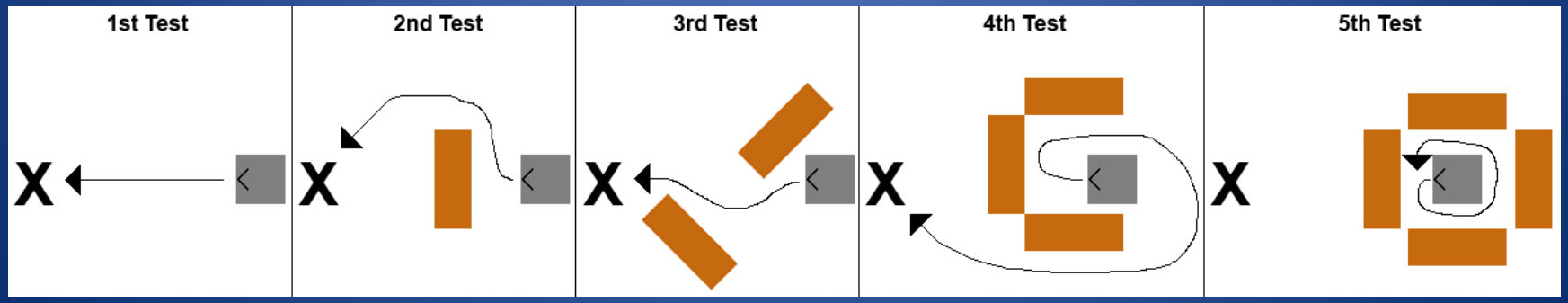

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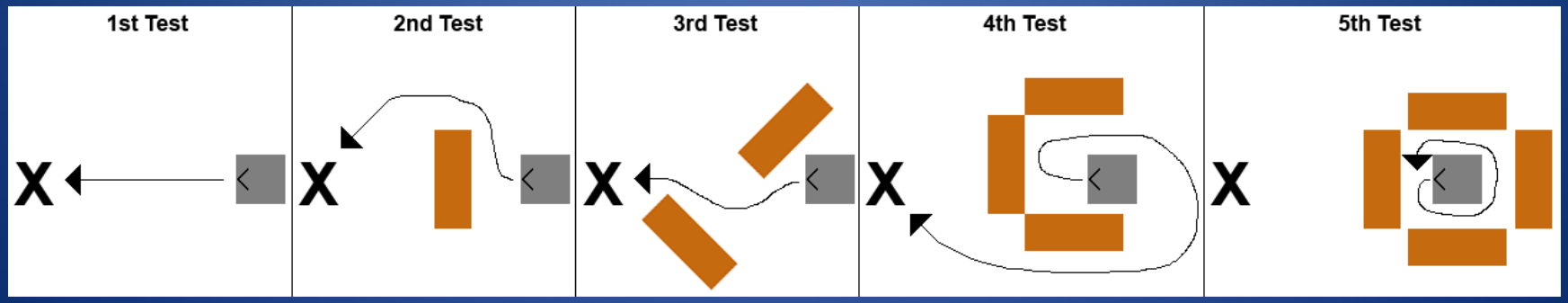

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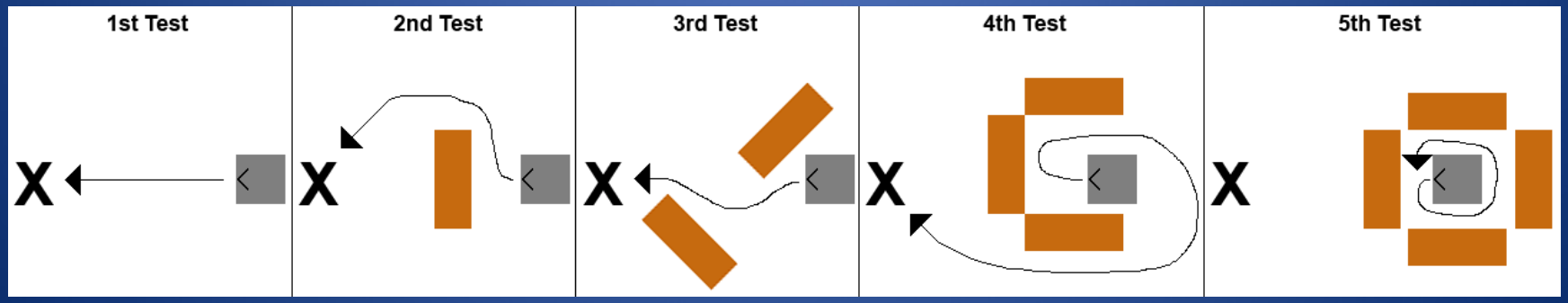

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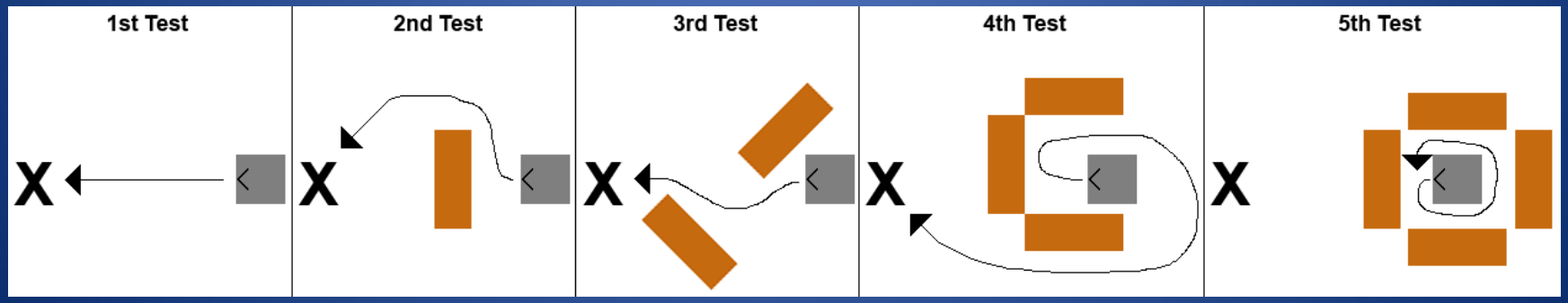

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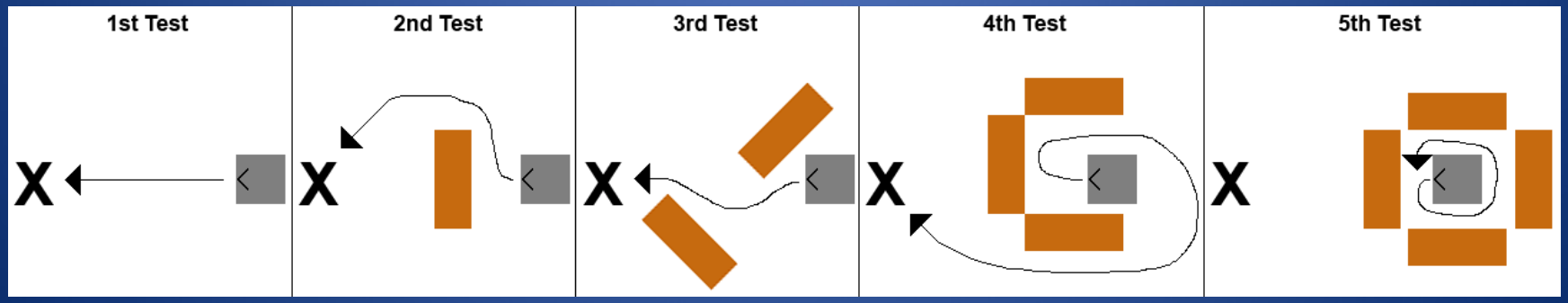

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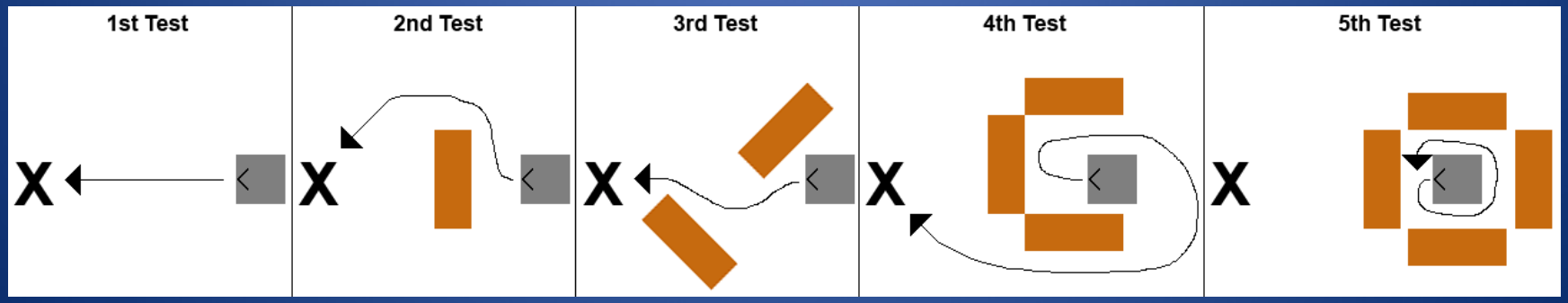

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- Anthony's Algorithm – Passed the first 3 tests; 4th & 5th tests passed, but with technical difficulties.
- Joey's Algorithm – Also passed all 5 tests flawlessly!

Acknowledgements

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- S.I.M.S. Program Staff
- “Pod” the Robot

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- Thank you for watching our