

Amazon Robotics: Micro-fulfillment Architectures



Providing recommendations to Amazon Robotics for robot algorithm pathfinding and order fulfillment workstation components of micro-fulfillment

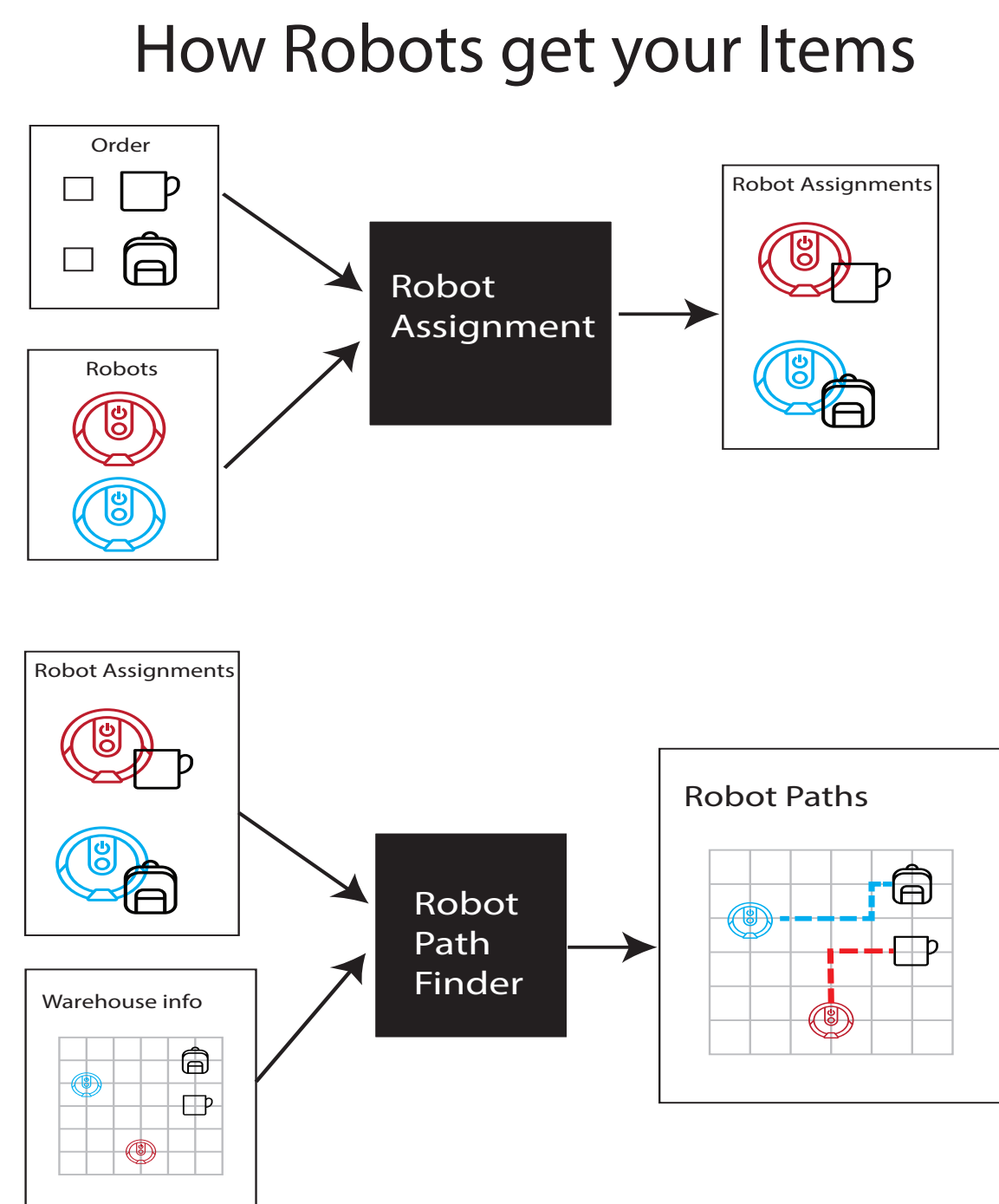
Micro-fulfillment is a new model for online commerce in which small, distributed fulfillment centers are used to gather customer orders at stores near their homes, allowing delivery within hours. Our team adapted current fulfillment technologies to fit the needs of micro-fulfillment strategies. We identified and created potential solutions for Amazon, helping shape their vision of future micro-fulfillment centers.

Micro-fulfillment Process



Algorithms Subteam

We explored how to maximize efficiency in the warehouse using different assignment frameworks. By simulating different assignment algorithms, we identified key algorithmic and systemic components needed for increasing efficiency.



Process

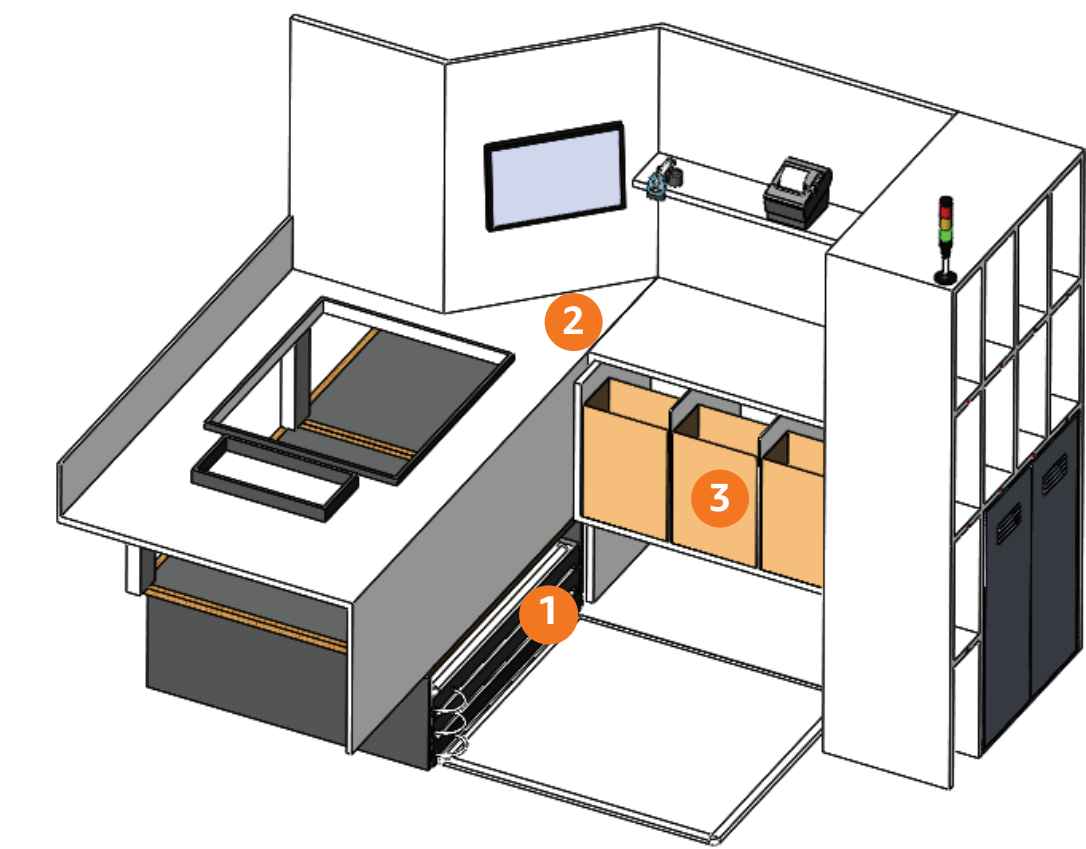
- Research** - Researched existing algorithms and frameworks, and selected algorithms that were most applicable to our problem.
- Simulation** - Made a discrete simulation to model the micro-fulfillment center.
- Assignment and Path-finding Algorithms** - Implemented algorithms that could assign items to robots to fulfill orders, and navigate those robots to their goals.
- Comparison** - Tested each algorithm by running it with different parameters to compare each algorithm's advantages and disadvantages.
- Recommendations** - Identified system components that have a significant impact on the efficiency of the micro-fulfillment center.

Workstation Subteam

We made a workstation prioritizing efficiency, ergonomics, and reliability. It excels by taking a simple, reliable concept and modifying it to meet micro-fulfillment needs.

Process

- Research** - Learn from current workstations and workstation users to inform design considerations and showcase potential solutions.
- Ideation** - Create as many configurations as possible. Break the traditional workstation paradigm to create a unique, specialized solution.
- Prototyping** - Build life-sized models and physically validate design configurations, evaluate layouts and better understand 3D make-up.
- Testing** - Mock-up and test expected workflow to evaluate ergonomics and efficiency of potential design configurations.
- Design** - Finalize details, sizes, and heights of components and subassemblies to address all parts of the task and complete a finalized vision.



Key Features

- 1 Adjustable Floor:** Workers can quickly adjust their working height, making their work easier and more comfortable.
- 2 Counter:** Items can be moved from one side of the station to the other in seconds, providing exceptional order throughput.
- 3 Bag Drawers:** The station can convert from fulfilling orders to restocking in seconds, maximizing station flexibility.

Students

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