**Warehouse Management System**

**CSCI 5448 Project: Part 1**

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**Title:** Warehouse Management System

**Description:** A system that allows warehouse personnel to manage the inventory and operations of an automated warehouse. The warehouse includes the following features:

* 3 truck loading docks for receiving incoming pallets of products
* 1 shipping center for packaging and shipping outgoing products
* 16 storage shelves
* 6 autonomous forklifts for moving pallets from the loading docks to storage shelves
* 8 autonomous robots to move individual products from the shelves to the shipping center

**Actors:**

* Warehouse Operator – directs the movement of forklifts, robots, and products around the warehouse
* Inventory Manager – responsible for monitoring inventory levels and ordering products from warehouse suppliers
* Customer Service Representative – enters orders that are placed by phone (Stretch Functionality)
* Customer – places orders on the website (Stretch Functionality)

**Functionality:**

1. ***Warehouse Operations***

* The system shall depict the layout of the warehouse floor, including the locations of the storage shelves, shipping center, and loading docks.
* The system shall show the following information to the Warehouse Operator:
  + total capacity of each storage shelf
  + number of each product currently on each shelf
  + arrival of a truck at the loading dock
  + the next pallet to be offloaded from the truck
  + which product is on the pallet to be offloaded from the truck
  + quantity of the product on each pallet
* The system shall allow the Warehouse Operator to select the shelf on which to store incoming pallets.
* The system shall assign an appropriate autonomous forklift to move each pallet based on pallet specifications and robot capabilities.
* The system shall indicate to the Warehouse Operator the following conditions:
  + when an autonomous forklift is “busy”
  + when a forklift is carrying a pallet
  + when a pallet is placed on the storage shelf
* When a pallet is delivered to a shelf, the system shall update the total number of products on that shelf.
* After delivering a pallet to the shelf, the system will direct the forklift back to its assigned parking spot.

1. ***Order Fulfillment***

* Upon receipt of an order, the system shall automatically retrieve the product from the shelf and move it to the warehouse packing center.
* The system shall show the number of each product ordered.
* The system shall show the number of orders pending shipment.
* The system shall assign an appropriate autonomous robot to retrieve ordered products based on product weight/size and robot capabilities.
* The system shall indicate when an autonomous robot is "busy".
* The system shall indicate when the robot has picked up the product.
* When a product is delivered to the Shipping Center, the system shall update the total number of that product shipped.
* After delivering a product to the Shipping Center, the system shall direct the robot back to its assigned parking spot.

1. ***Inventory Management***

* The system shall show product information to the Inventory Manager. Product information to be displayed includes the following:
  + weight
  + supplier
  + supplier's price
  + customer's price
  + location in warehouse
  + quantity on hand
  + quantity on order
  + total number sold
* The system shall allow the Inventory Manager to place orders for new product shipments from the suppliers.
* The system shall allow the Inventory Manager to define the following order specifications:
  + product
  + options as appropriate for the product (e.g., size, color, and style)
  + quantity
  + delivery date

1. ***System Test/Demonstration Infrastructure***

The following requirements are not applicable to the deliverable Warehouse Management System; however, they are necessary for the test and demonstration of system functionality described above.

* The system shall simulate incoming customer orders.
* The system shall simulate arriving trucks with pallets of products.

**Stretch Functionality:**

* The system shall include a website for customers to place orders.
* The system shall provide an interface for customer service representatives to place orders received over the phone.
* The system shall animate the movement of autonomous forklifts/robots in order to show real-time location as they move around the warehouse.