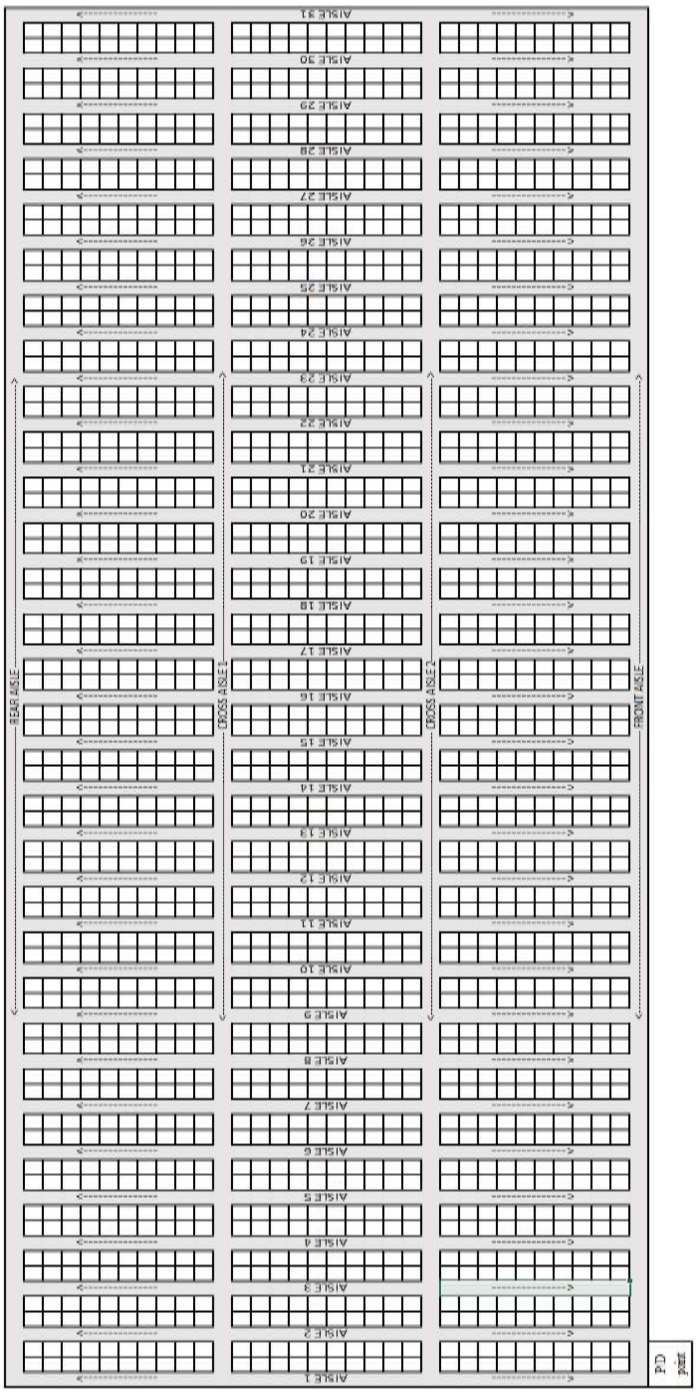
4.DESIGN

The main functionality of a warehouse is to receive and distribute products all along the supply chain process. So, it becomes important to take into consideration how the warehouse is designed. The requirements of the present as well as for the future should always be kept in mind. The goal of warehouse designing is to optimize the warehousing operations and achieve maximum efficiency. In short, the warehouse design element aims to maximize the utility of space, equipment, and efficiency of operations.

So in a warehouse we have different racks arranged in row and column wise and the items are arranged in particular order as per the usage and the space. The space in between the racks where we travel and can pick the items is called an aisle. So the space adjacent to the P/D point is called the front aisle and the back aisle is called as rear aisle. The aisle between the two column of racks will be called as cross aisle. The pick or drop point is the inlet or the exit from the warehouse. The P/D point is where we start to go near the racks of the items and pick the desired items. From here through the aisles we look for the desired items and fetch them.

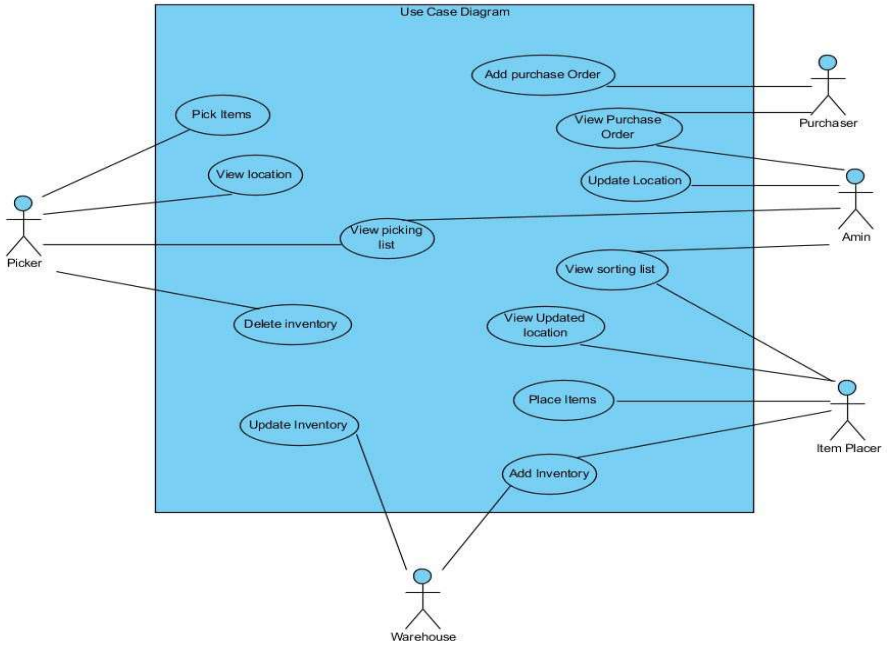


4.1 Warehouse Layout

Use case Diagram:

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. It represents different actors that take part in the system and their respective activities. The different actors in the order picking system are:

1. Purchaser 2. Admin 3. Picker 4. Item Placer
1. Warehouse

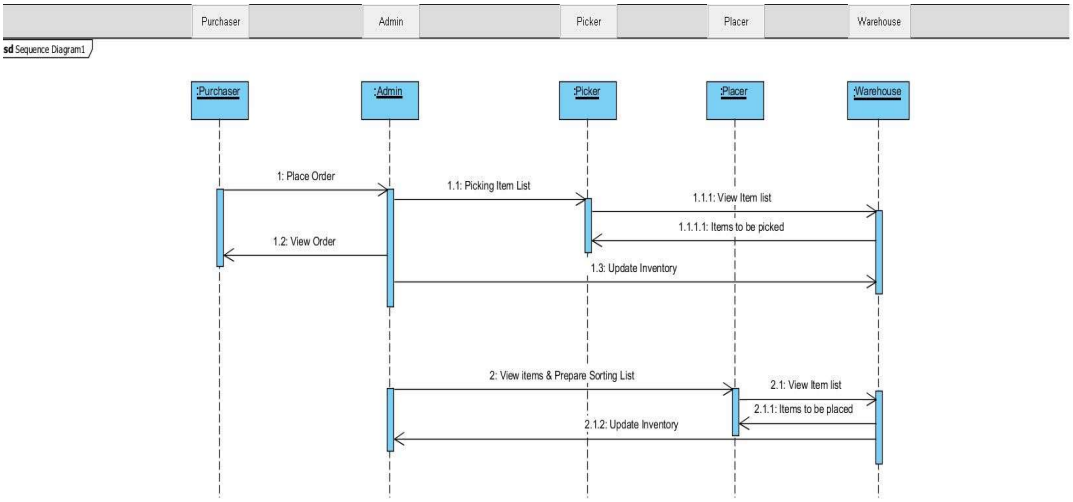


4.2 Use Case Diagram

1. **Purchaser:** Purchaser is the one who buys things from a buyer. He adds the purchase order based on his desire and this will be viewed by the admin. The purchaser can also view the order he placed.
2. **Admin:** Admin plays a key role in the warehouse picking and placing operations. He is the one who looks after the purchase orders and prepares respective picking or placing lists based on the orders. If there is a need for delivery then the admin looks after all the orders that have been placed and prepares the picking list and he even prepares a slotting list if new items enter the warehouse. He updates the places of the items after each delivery.
3. **Picker:** He is the one who is responsible for the picking activities in the warehouse. He receives a picking list from the admin based on the delivery and picks the required items mentioned items in the list. In this way he does the picking activity.
4. **Item Placer:** He is responsible for the placing of the items in the warehouse. After every picking or if new items enter into the warehouse the admin updates the locations of the items and based on the new item locations he places the items.
5. **Warehouse:** This forms the warehouse of the system. This involves use cases like AddInventory, DeleteInventory. Whenever there are any new items to be placed into the the warehouse then the AddInventory is used and whenever there is any delivery then items are removed, then DeleteInventory is used.

Sequence Diagram:

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. The actors from the use case diagram form the objects in the sequence diagram.



4.3 Sequence Diagram

The Sequence diagram for picking items in a warehouse involves:

- **Place Order**: Here the purchaser will place an order based on his desire and this what is called placing an order.

- **Picking Item list:** Based on the order the picking list is prepared and given to the picker.
- **View Item list:** The list will be viewed by the picker to know which items need to be picked.
- **Items to be picked:** Then based on the list required items will be picked by the picker.
- **Update Inventory:** After picking the items the inventory will be updated that is the items that are left and the new item locations will be updated.
- **Prepare sorting list:** If new items are to be placed the admin creates a placing list which will be used by the item placer.
- **View Item list:** The list will be viewed to know which items are to be placed in which area and the items are placed.

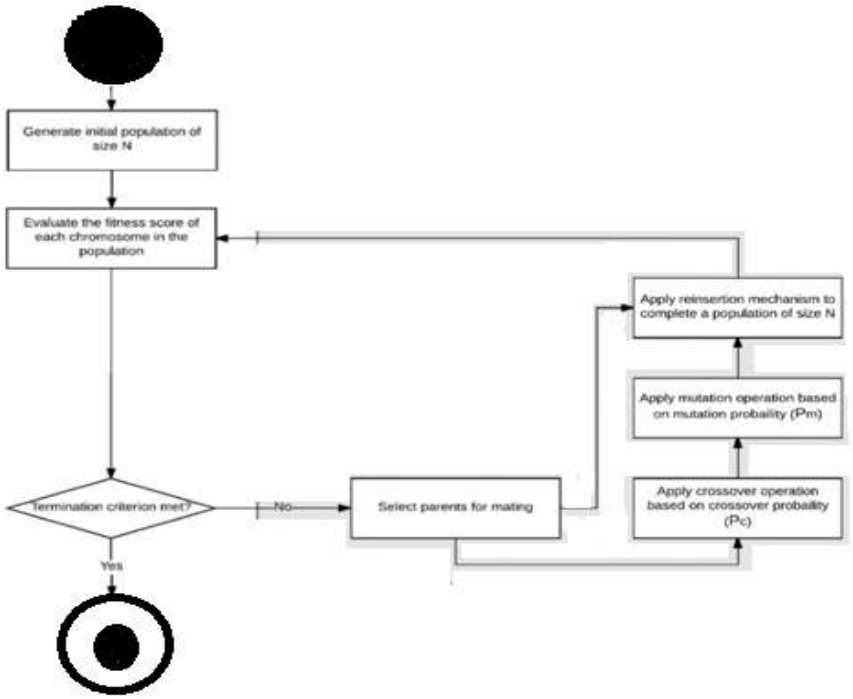
At last after all the operations of a particular delivery the inventory is again updated.

In this way in a sequence the operations in a warehouse are performed and the purchaser can view his order till he receives the items he ordered.

Activity Diagram:

This diagram explains the steps that are in the genetic algorithm. They are:

1. Selection
2. Crossover
3. Mutation
4. Reinsertion



4.4 Activity Diagram