



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

SESSION 2023/2024 SEMESTER 1

SECJ - DATA STRUCTURE AND ALGORITHMS

ASSIGNMENT 1

Group Name: Center Point

Topics: Inventory Management System

Lecturer: MDM LIZAWATI BINTI MI YUSUF

GROUP MEMBERS:

No.	Name	Matric No.
1	LIM SI NI	A22EC0070
2	ONG KAI XUEN	A22EC0100
3	SOH FEI ZHEN	A22EC0272

Table of Content

Table of Content	2
1. Objective	3
2. Synopsis	3
3. System Design	6
3.1. Pseudocode	6
3.1.1 Main function	6
3.1.2 Sort function	6
3.1.3 Search function	8
3.2. Flow Chart	10
3.3. Class Diagram	15
4. Data Structure Operation Description	16
4.1 Sorting	16
4.2 Searching	17
5. Conclusion	18

1. Objective

In our data structure and algorithm assignment 1, the main objectives of developing the Inventory management system are :

- To manage inventory in a warehouse
- To apply the sorting and searching technique in the system

2. Synopsis

The inventory management system is essential for one business or organization to track or manage its warehouse. Our inventory management system is designed to search or organize (sort) the inventory by its certain keys such as code, name, type, quantity, price in either ascending or descending order. These two methods are important because they not only save time but also offer convenience to users in managing the inventory effectively.

The menu is provided for the user. The user may select whether they want to sort the inventory list, search specific inventory, or exit the system.

```

~~~~~ WELCOME TO INVENTORY MANAGEMENT SYSTEM ~~~~~

:::Inventory List:::

-----
Inventory Code      Inventory Name      Inventory Type      Quantity      Price
-----
I001                Laptop              Computer            20            23.00
I002                Story Book          Book                10            100.00
I003                Novel              Book WE             20            120.30
I005                Mouse              Computer            30            19.80
I004                Key Pad            Computer            22            77.70

Do you want to
[1] Sorting
[2] Searching
[3] Exit
Option: |

```

If the user chooses the sorting option, they will be provided several criteria to sort the inventory list including **code**, **name**, **type**, **quantity** and **price**. Then the user is asked to choose whether the sorting should be sorted in ascending or descending order. The system will then automatically sort the inventory list based on the chosen criteria.

```
<<< Sorting Process >>>
[1] By Inventory Code
[2] By Inventory Name
[3] By Inventory Type
[4] By Quantity
[5] By Price
Option: |
```

Below is the example output of sorting by **Quantity** in **ascending order**:

```
::Sort By Quantity in Ascending Order

:::Inventory List:::
```

Inventory Code	Inventory Name	Inventory Type	Quantity	Price
I002	Story Book	Book	10	100.00
I003	Novel	Book WE	20	120.30
I001	Laptop	Computer	20	23.00
I004	Key Pad	Computer	22	77.70
I005	Mouse	Computer	30	19.80

Below is the example output of sorting by **inventory type** in **descending order**:

```
::Sort By Inventory Type in Descending Order

:::Inventory List:::
```

Inventory Code	Inventory Name	Inventory Type	Quantity	Price
I001	Laptop	Computer	20	23.00
I004	Key Pad	Computer	22	77.70
I005	Mouse	Computer	30	19.80
I003	Novel	Book WE	20	120.30
I002	Story Book	Book	10	100.00

Other than that, if the user selects the searching option, They will be presented with 2 choices, whether they want to search by **code** or **name**. Following this, the user then enter the desired code or the name they want to search for. The system will display the relevant information for the specific inventory item to the user.

```
<<< Searching Process >>>
[1] By Inventory Code
[2] By Inventory Name
Option: |
```

Below is the example output of searching by **code** “I003” :

```
Enter your search key: I003
::Search By Inventory Code

:::Inventory List:::
-----
Inventory Code   Inventory Name   Inventory Type   Quantity   Price
-----
I003             Novel           Book WE         20         120.30
```

Below is the example output of searching by **name** “Story Book” :

```
Enter your search key: Story Book
::Search By Inventory Name

:::Inventory List:::
-----
Inventory Code   Inventory Name   Inventory Type   Quantity   Price
-----
I002             Story Book      Book            10         100.00
```

* Note that the name entered is not case sensitive

If the user choose to exit the system, the system will display a goodbye message to user

```
Bye Bye!!!
```

3. System Design

4. Data Structure Operation Description

4.1 Sorting

In implementing our inventory management system, we use **improved bubble sort** technique to sort our inventory.

Improved bubble sort is an enhanced sorting technique from bubble sort (to minimize unnecessary iteration). The improved bubble sort is used to iteratively compare and swap the adjacent elements until the entire array is sorted. The sorting is based on user chosen criteria such as inventory code, name, type, quantity, or price. The sorting order can be ascending or descending. The function “**sort**” consists of 4 important parts (function, data, loops). I will briefly describe the data structure operation that happened in this function.

void sort(Inventory data[], int n)

The “sort” function receives an array of Inventory objects (data) and the number of elements in the array (n) as parameters.

int sortChoice = menu();

int orderChoice = sortMenu();

Inside the sort function, the sortChoice and orderChoice receive the value of the user chosen type of sorting (inventory code, name, type, quantity, or price) and the order (ascending or descending).

for (int p = 1; (p < n) && !sorted; ++p)

This is an external loop which to check whether the list is sorted in order to improve the efficiency of the bubble sort. The sorting process continues until the array is sorted or no swaps are made during the pass.

for (int x = 0; x < n - p; ++x)

This is the internal loop, which is used to control the swap if they are not in order. As it finished its execution, the largest/smallest in the array will be moved at the top (depending on the order chosen).

In addition, inside the internal loop, there are several switch case that refer to the sortChoice data. The specific section of the switch statement is executed depending on the sortChoice value (user's choice of sorting criteria).

```

switch (sortChoice)
{
case 1:
    sortType = "Inventory Code";
    if (orderChoice == 1)
    {
        if (data[x].getCode() > data[x + 1].getCode())
        {
            Inventory temp = data[x];
            data[x] = data[x + 1];
            data[x + 1] = temp;
            sorted = false;
        }
    }
}

```

As shown in figure above, the “if” statement in case 1 *if (data[x].getCode() > data[x + 1].getCode())* is used to compare the adjacent elements.

4.2 Searching

In implementing our inventory management system, we use **sequential search** technique to search the information of our inventory.

In sequential search, every element in the array will be checked until the search key is found or the process reaches the last element. In the inventory management system, the user is prompted to enter their desired searching criteria whether by inventory code or inventory name. This means every element in the selected list will be checked by the system using the user entered key (name or code). If the corresponding keyword is found, the system will display the information of the inventory item.

In the implementation of our inventory management system, **void seqSearch(Inventory data[], int n)** is used as a function to perform sequential sort. The function receives an array of Inventory objects (data) and the number of elements in the array (n) as parameters.

int searchChoice = menuSearch();

searchChoice data is used to acknowledge the number searching type entered by the user. The system then prompts the user to enter the searching key.

Initially the index is set to -1 , found is set to false.


```

switch (searchChoice)
{
case 1:
    searchType = "Inventory Code";
    for (int i = 0; i < n; i++)
    {
        if (data[i].getCode() == searchKey)
        {
            index = i;
            found = true;
        }
    }
    break;
}

```

if (data[i].getCode() == searchKey) is used to check the elements one by one inside the data array. If the key is matched, the sequential search is performed successfully since the found is now set to true.

```

if (found)
{
    data[index].display();
    cout << endl;
}
else
{
    cout << "Cannot Find!!!\n";
}
cout << endl;

```

Finally, the information of the array will be displayed based on the index found.

5. Conclusion

Sorting and searching techniques are both the techniques that are implemented in the inventory management system so that the information in the system is more organised and easy to find. Finding a suitable approach to implement in an inventory management system is important because it can improve the productivity of an organization.

By completing this assignment, our team has gained much knowledge and practical experience regarding how to implement sorting and searching functions in an inventory management system. Starting from design, implementation of codes, until we get the output of the system, we truly gained a deeper understanding on how algorithms work in our real life system.