



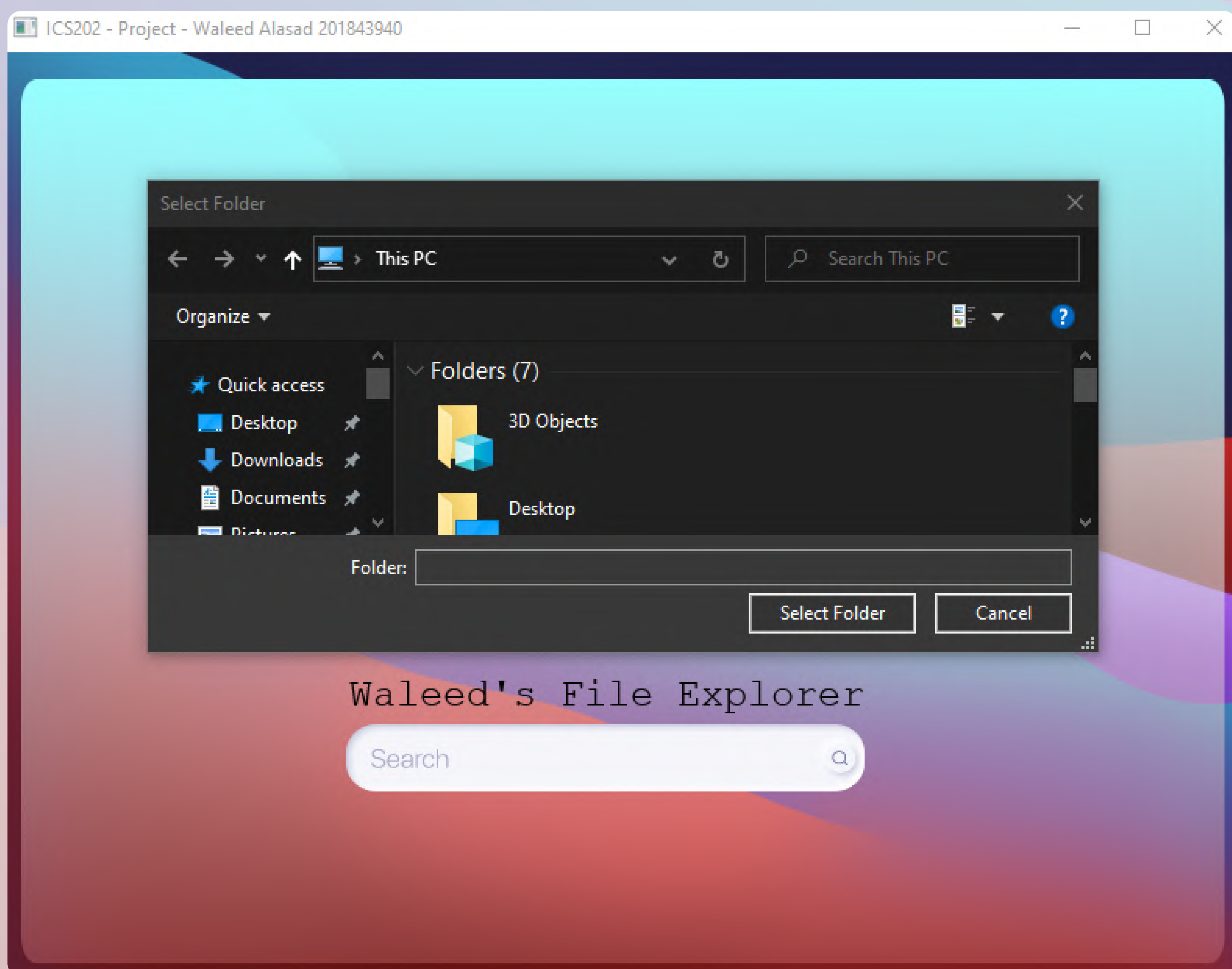
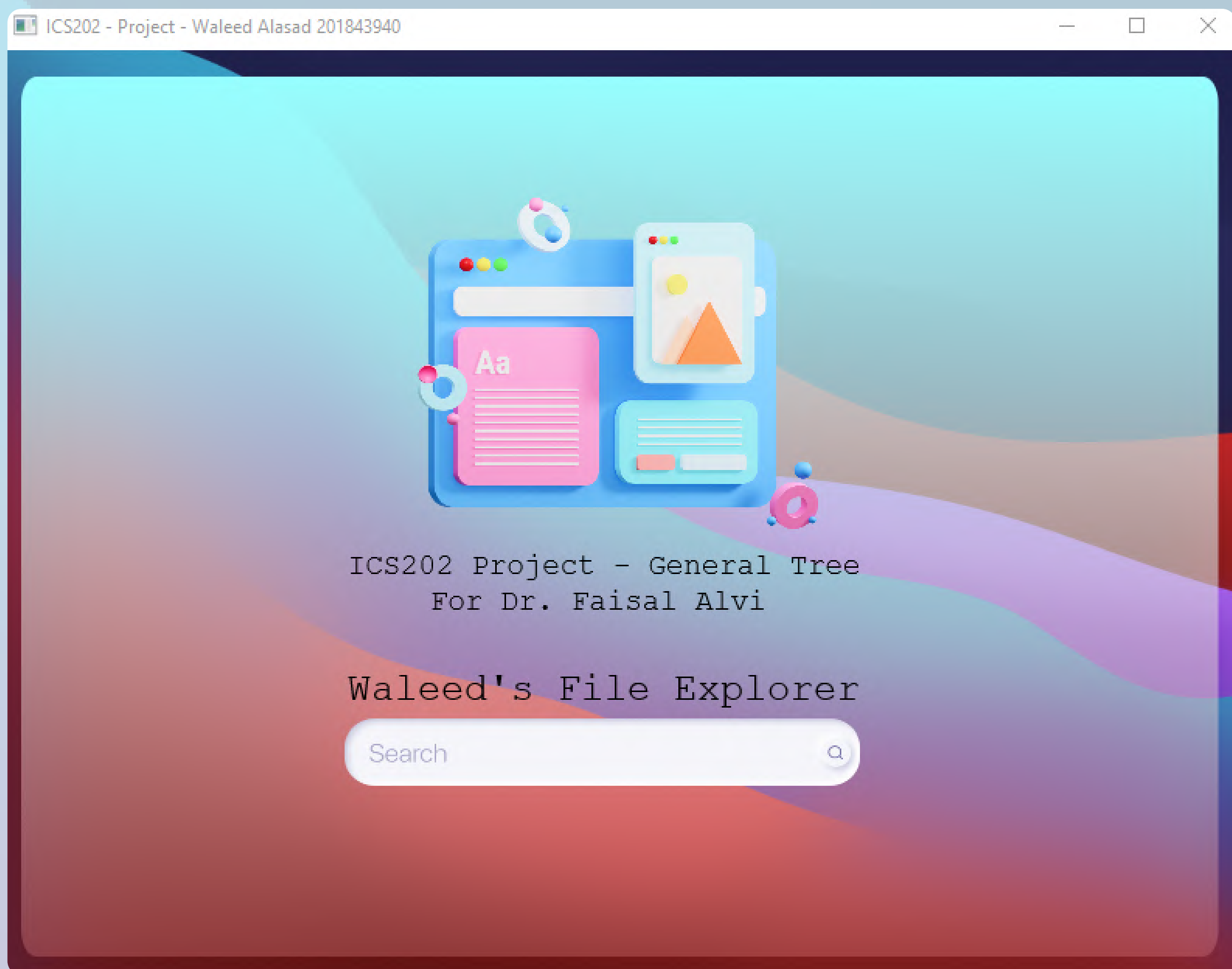
# ICS202 Project

General Tree

For Dr. Faisal Alvi

Waleed Alasad - 201843940

# Landing page





# Helping methods

**Enter():** Creates the system folder tree automatically as soon as a General Tree is object is created.

**Use:** Inserts all folders in the directory to the tree.

```
public void enter(File file, T parent) {
    for (File fileEntry : file.listFiles()) {
        if (fileEntry.isDirectory()) {
            insert(parent, (T) fileEntry.getName());
            enter(fileEntry, (T) fileEntry.getName());
        } else {
            insert(parent, (T) fileEntry.getName());
        }
    }
}
```

**Find():** Find the node that has the desired key, returns null if it is not found.

**Use:** Essential in insertion, deletion and path printing.

```
private GeneralTreeNode<T> find (GeneralTreeNode<T> rootNode,T key){
    if (rootNode.key.equals(key)) {
        return rootNode;
    }
    for (GeneralTreeNode<T> g : rootNode.children) {
        GeneralTreeNode<T> found = find(g,key);
        if (found != null) {
            return found;
        }
    }
    return null;
}
```

**NumberOfFiles():** Updates the number of files in a tree and returns it as a string.

**Use:** Used in printTree method to print the current number of nodes in the trees.

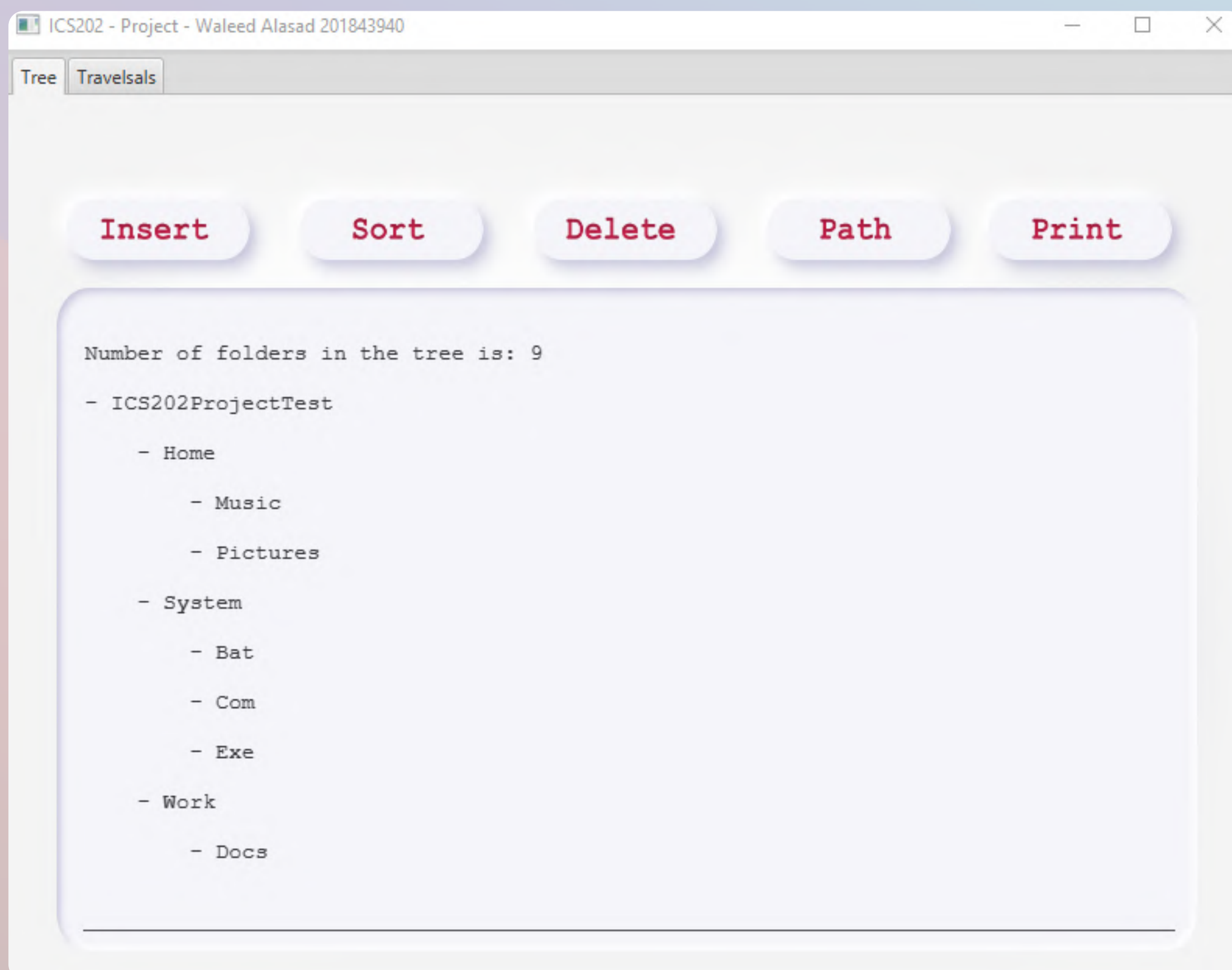
```
public String numberOfFiles() {
    folders=0;
    return numberOfFiles(rootNode);
}
public String numberOfFiles(GeneralTreeNode<T> node) {
    if (node.children.isEmpty())
        return "";
    else {
        for (GeneralTreeNode<T> g : node.children) {
            folders++;
            numberOfFiles(g);
        }
    }
    return String.valueOf(folders);
}
```



# Print tree

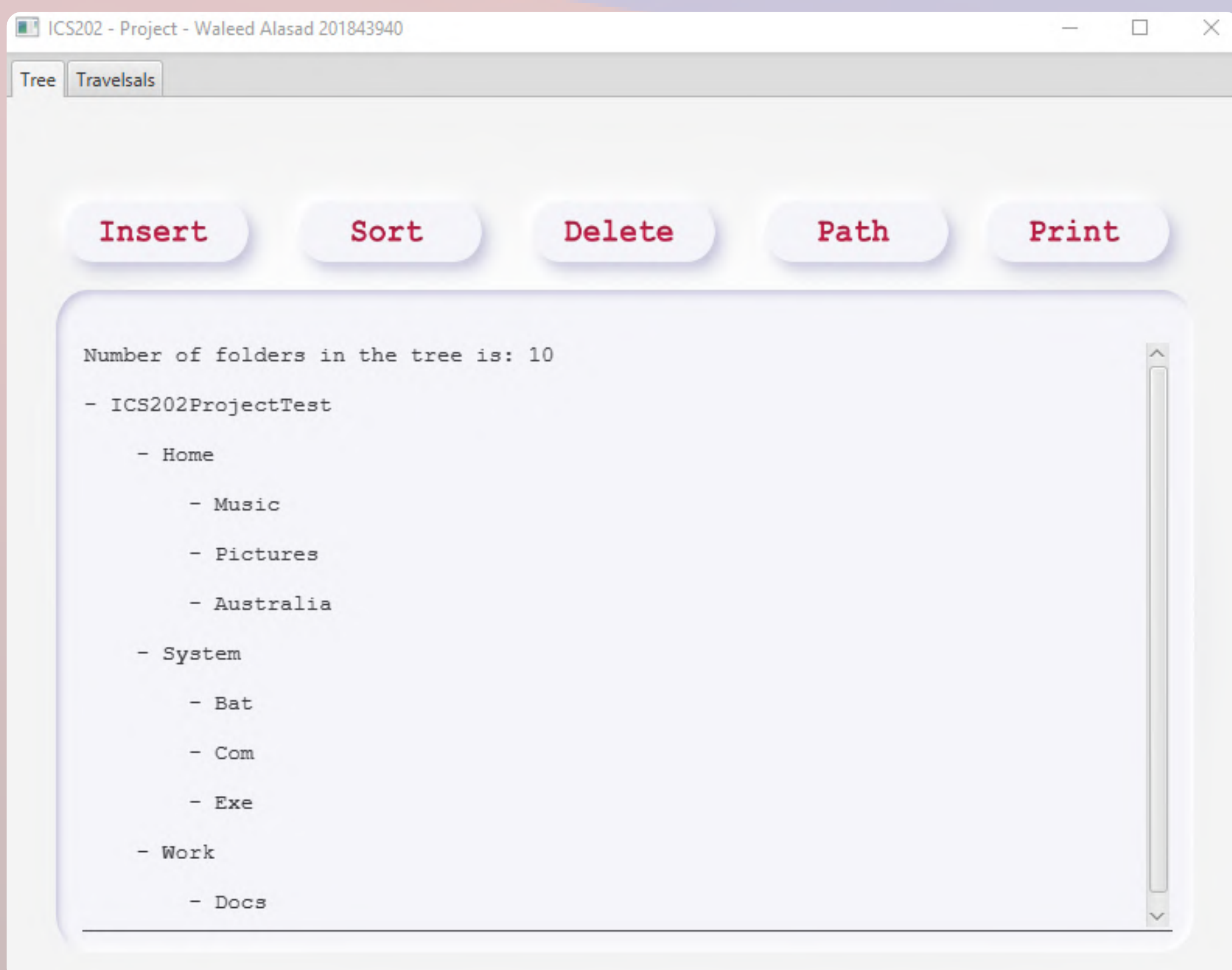
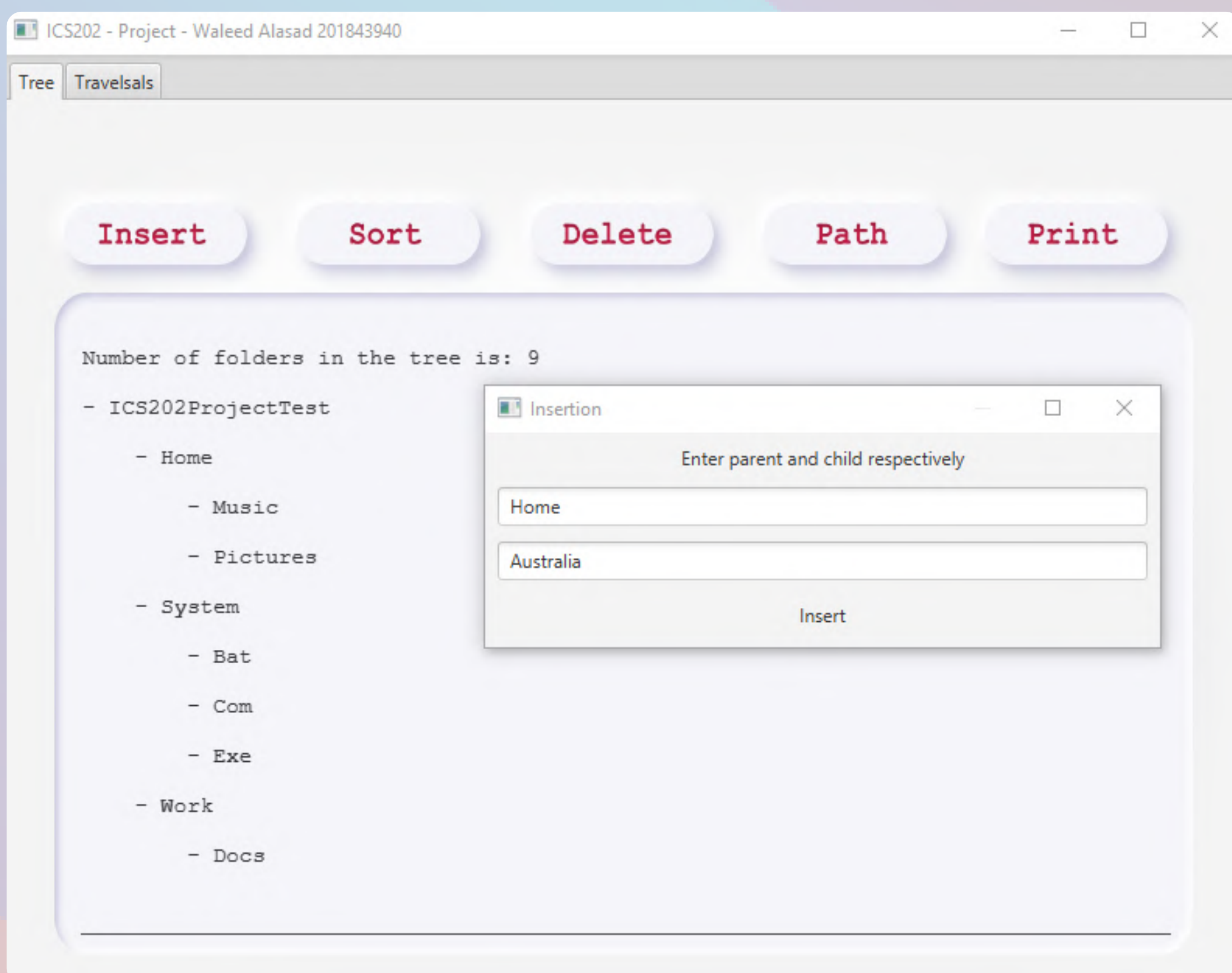
```
public String printTree() {
    return "Number of folders in the tree is: "+
        numberOfFiles()+"\n\n"+ printTreeAux(rootNode);
}

public String printTreeAux(GeneralTreeNode<T> node) {
    String x = "";
    for (int i = 0; i < node.level; i++) {
        x += "    ";
    }
    x += "- " + node + "\n";
    for (GeneralTreeNode<T> g : node.children) {
        x += "\n" + printTreeAux(g);
    }
    return x;
}
```



# Insert

```
public void insert (T father, T newNode) {
    GeneralTreeNode<T> parentT = find(rootNode,father);
    if (parentT != null) {
        if (parentT.children.size() != MAXIMUM) {
            GeneralTreeNode<T> t = new GeneralTreeNode<T>(newNode);
            t.setParent(parentT);
            parentT.children.add(t);
        } else {
            System.out.println("This node has the maximum allowed children,");
        }
    }
    else
        System.out.println("This directory does not exist");
}
```





# Sort by level

```
public void sortByLevel() {
    sortByLevelAux(rootNode);
}

public void sortByLevelAux(GeneralTreeNode<T> node) {
    if (node.children.isEmpty())
        return;
    else {
        node.children.sort(Comparator.comparing(o -> o.key));
        for (GeneralTreeNode<T> g : node.children) {
            sortByLevelAux(g);
        }
    }
}
```

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Tree Travelsals

Insert Sort Delete Path Print

Number of folders in the tree is: 10

- ICS202ProjectTest
  - Home
    - Music
    - Pictures
    - Australia
  - System
    - Bat
    - Com
    - Exe
  - Work
    - Docs

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# Traversals

## BreadthFirst:

```
public String BreadthFirst(){
    return BreadthFirst(rootNode);
}
private String BreadthFirst(GeneralTreeNode<T> root){
    String breadthFirst = "";
    if (root == null)
        return "";
    Queue<GeneralTreeNode<T>> q = new LinkedList<>();
    q.add(root);
    while (!q.isEmpty()) {
        while (q.size()>0) {
            GeneralTreeNode<T> p = q.remove();
            breadthFirst+=p.key + " -> ";
            for (GeneralTreeNode<T> g: p.children)
                q.add(g);
        }
    }
    return breadthFirst;
}
```

## Preorder:

```
public String Preorder() {
    return preorder(rootNode);
}

protected String preorder(GeneralTreeNode<T> p) {
    if (p != null) {
        String x = p.key + " -> ";
        for (GeneralTreeNode<T> g : p.children) {
            x += preorder(g);
        }
        return x;
    }
    return "";
}
```

## Postorder:

```
public String Postorder() {
    return postorder(rootNode);
}

protected String postorder(GeneralTreeNode<T> p) {
    if (p != null) {
        String x = "";
        for (GeneralTreeNode<T> g : p.children) {
            x += postorder(g);
        }
        return x + p.key + " -> ";
    }
    return "";
}
```

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Tree Traversals

Traversals

BFS

ICS202ProjectTest -> Home -> System -> Work -> Australia -> Music -> Pictures -> Bat -> Com -> Exe -> Docs ->

Postorder

Australia -> Music -> Pictures -> Home -> Bat -> Com -> Exe -> System -> Docs -> Work -> ICS202ProjectTest ->

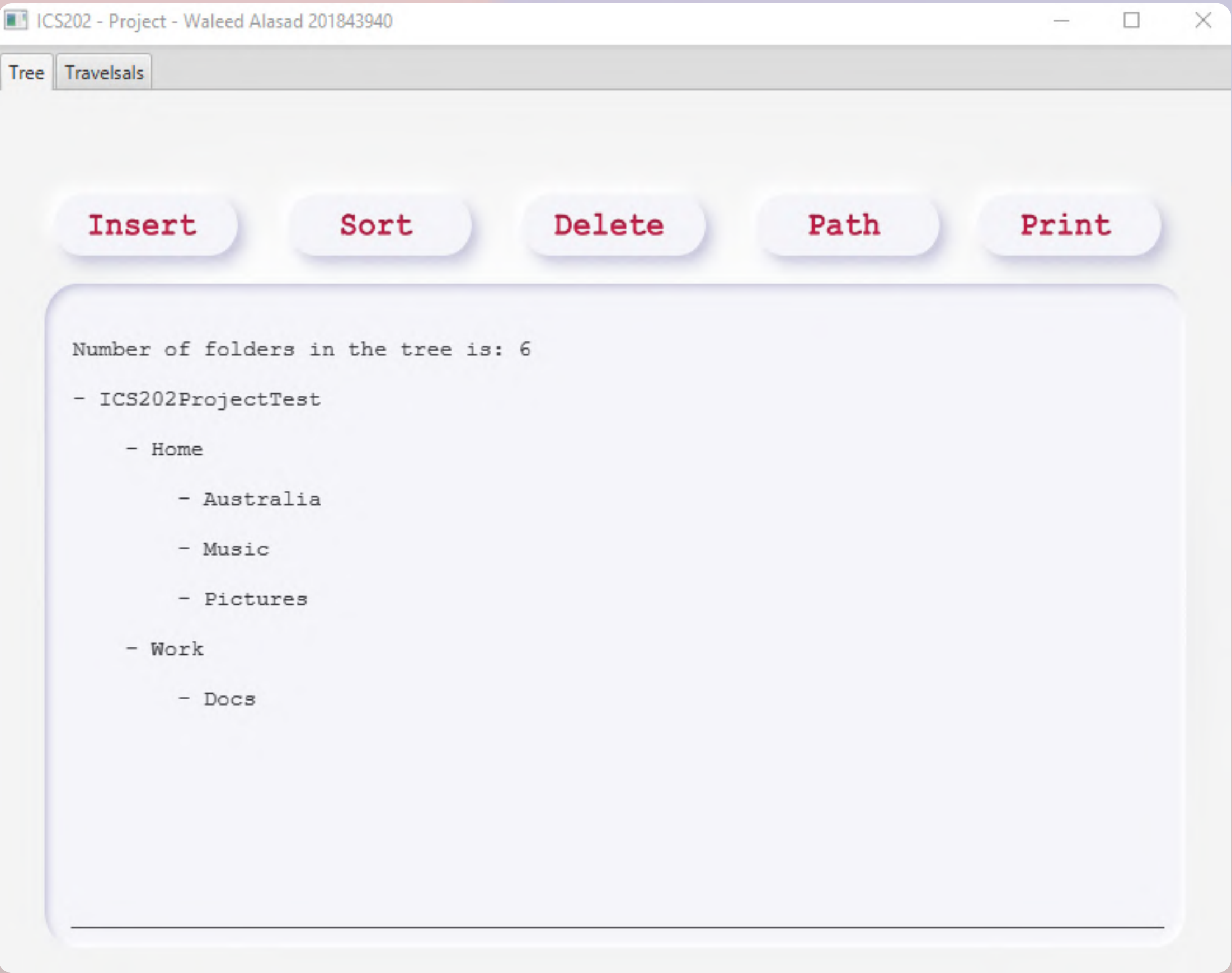
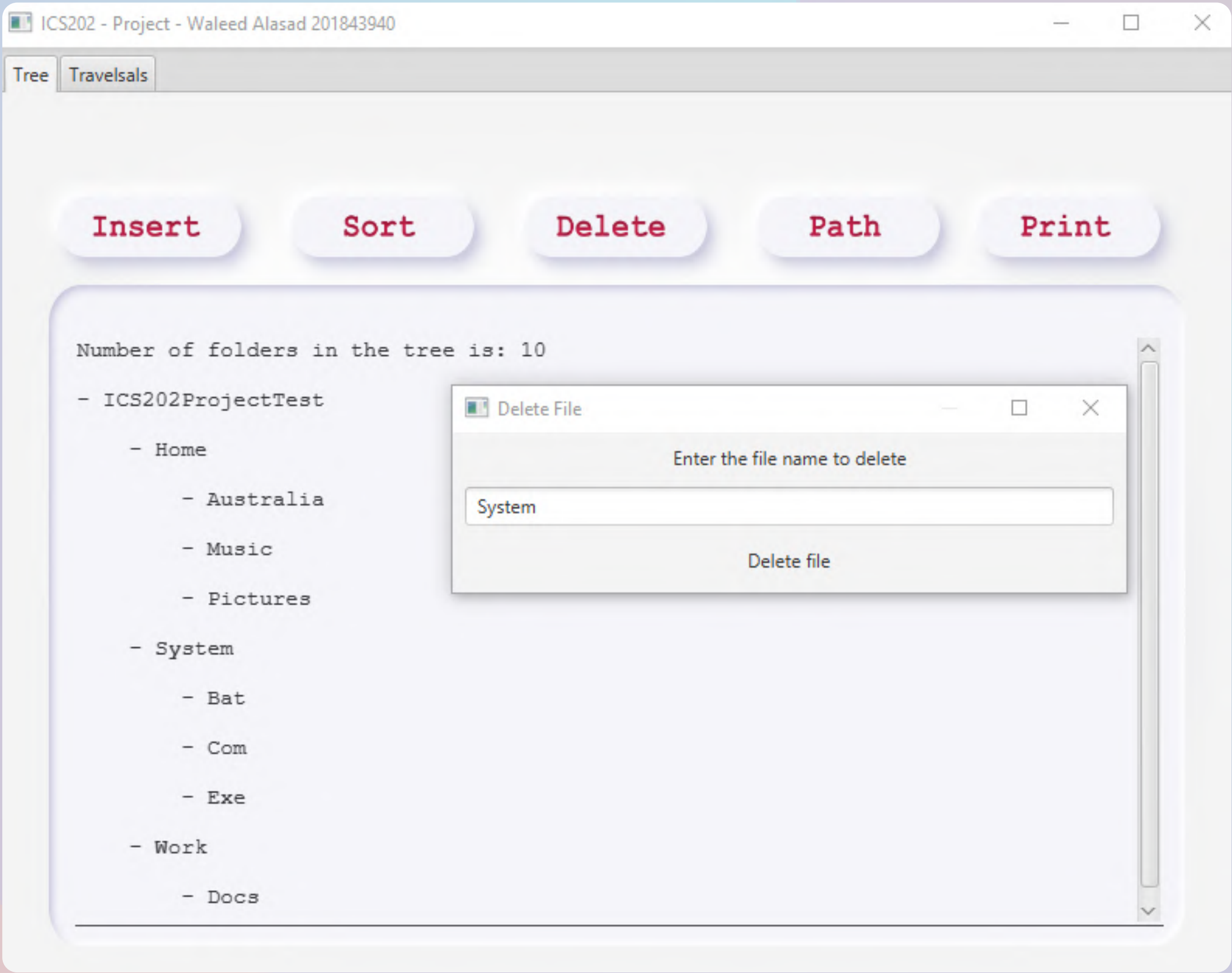
Preorder

ICS202ProjectTest -> Home -> Australia -> Music -> Pictures -> System -> Bat -> Com -> Exe -> Work -> Docs ->



# Delete

```
public void delete(T file){
    GeneralTreeNode<T> node = find(rootNode,file);
    if (node == null) {
        System.out.println("The file does not exist");
        return;
    }
    else{
        GeneralTreeNode<T> parent = node.parent;
        node.parent=null;
        parent.children.remove(node);
    }
}
```





# Search

```
public String search(T key) {
    GeneralTreeNode<T> node = find(rootNode, key);
    if (node == null)
        return "This file is not in tree";
    else {
        if (node.parent == null)
            return (String) node.key + " ";
        else
            return search(node.parent.key)+ " -> " + node.key;
    }
}
```

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Tree Travelsals

InsertSortDeletePathPrint

Number of folders in the tree is: 6

- ICS202ProjectTest

- Home

- Australia

- Music

- Pictures

- Work

- Docs

Path

Enter the file name to track path

Australia

Print path

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Tree Travelsals

InsertSortDeletePathPrint

ICS202ProjectTest -> Home -> Australia