OOP

Practical 4, Week 4

Submission

1. Your submission should contain two files. One of these files is **PDF** document with screenshots of the implementation (Java code) and testing only. Another file is **ZIP** file with the Java project.
2. You must save the files with name

   {YourStudentNumber}-Practical4.pdf;

   {YourStudentNumber}-Practical4.zip;

   For example: 202107081314-Practical4.pdf, 202107081314-Practical4.zip
3. You must upload from the student website: student.zy.cdut.edu.cn

Marking scheme

You will gain up to 5 marks for the completion of the exercise.

The markers will use the following marking scheme for each exercise.

Rubric	marks
No attempt has been made to answer the question. No implementation at all, or completely inappropriate considerations	0
Some attempt has been made to answer the question and some considerations shown. No effort to implement a working solution and test it.	1
Incomplete programming, but significant effort has gone into it. Some consideration and implementation of the result, but very limited, some of the rules have not been properly implemented, no testing.	2
Mostly complete programming but the implementation does not follow a correct standard. The program works but does not match the testing given properly.	3
Complete programming and good implementation, and some testing shown.	4
Excellent programming and implementation of the whole problem, including testing and implementation.	5

OOP

Week 4, Assessed exercises

(Details see the file "OOP Week 4 UML Exercises - Solution.docx")

Week 4 Exercise 5: World

Implement the class *World* using the UML diagram based on the class Entity from the file "OOP Week 4 UML Exercises - Solution.docx". You have to make sure that a World can contain up to 10 entities and that all the methods are implemented. You have to implement this association as **an array** and a counter as seen in the lecture. We will work with ArrayLists after the consolidation week.

When implementing the methods you should take into account the following assumptions for each one:

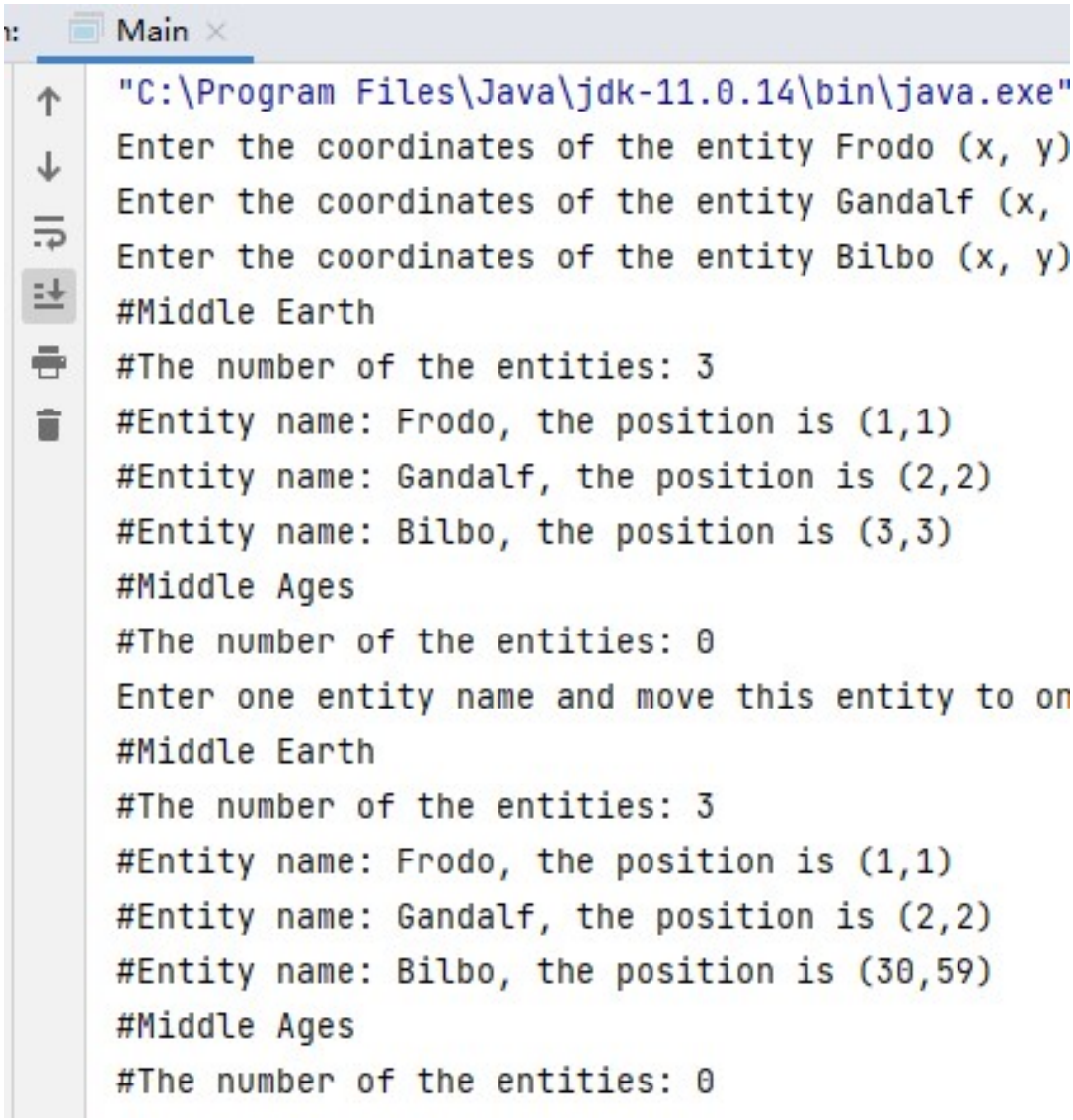
- addEntity: Add the entity if the world has not reached the maximum capacity, otherwise print "Middle Earth has reached the maximum capacity!" .
- deleteEntity: Delete the entity if there is an entity in that position.
- findEntity: If the entity with that name is found return the position, otherwise -1 is returned
- moveEntity: Move the entity if there is an entity with that name in the world, otherwise print "The entity is not exist".
  (**Details about those methods see the UML from file "OOP Week 4 UML Exercises - Solution.docx"**)

Week 4 Exercise 6: Main Class

- Implement a program that creates two worlds called "Middle Earth" and "Middle Ages".
- The program should add **three** entities to "Middle Earth" called "Frodo", "Gandalf" and "Bilbo" in different positions on the world (user should input the coordinates of each entity). **Display** all of the entities of the two worlds.
- Input one entity name, move this entity to one random position (range from 0 to 100) if found, **display** all of the entities of the two worlds, then add this entity to world "Middle Ages", then delete the entity from the world "Middle Earth", print "The entity was found, moved, added, and deleted." and **display** all of the entities of the two worlds again. If this entity name was not found, print "The entity is not exit!" and **display** all of the entities of the two worlds once again.

(Hint: Typically, Scanner class is used for input. Method nextInt(n) of Random class is used to get one random number of range from 0 to n-1)

Sample Testing Case and Result (Red rectangles are the inputs**)**



Complete the implementation and testing.

（1） Implementation

(Please show your design with some comments in your program and paste all of your source code here with screenshots)

```java
public class Entity {
    4 个用法
    private String name;
    4 个用法
    private int x;
    4 个用法
    private int y;

    3 个用法
    public Entity(String name) {
        this.name = name;
    }

    0 个用法
    public void display() { System.out.println(name + " position (" + x + " , " + y + ")"); }
    0 个用法
    public void move(int x,int y) {
        this.x = x;
        this.y = y;
    }
    3 个用法
    public String getName() { return this.name; }public void setName(String name) { this.name = name; }

    1 个用法
    public int getX() { return x; }public void setX(int x) { this.x = x; }

    1 个用法
    public int getY() { return y; }public void setY(int y) { this.y = y; }
}
```

```java
import java.util.Random;
import java.util.Scanner;
0 个用法
public class Main {
    0 个用法
    public static void main(String[] args) {
        World Middle_Earth = new World( name: "Middle Earth");//create world 1
        World Middle_Ages = new World( name: "Middle Ages");//create world 2
        Entity Frodo = new Entity( name: "Frodo");//create entity Frodo
        Entity Gandalf = new Entity( name: "Gandalf");//create entity Gandalf
        Entity Bilbo = new Entity( name: "Bilbo");//create entity Bilbo

        Middle_Earth.addEntity(Frodo);
        Middle_Earth.addEntity(Gandalf);
        Middle_Earth.addEntity(Bilbo);
        /*
        add three entities to “Middle Earth” called “Frodo”, “Gandalf” and “Bilbo”
         */

        Scanner input = new Scanner(System.in);

        System.out.print("Enter the coordinates of the entity Frodo (x, y):");
        Frodo.setX(input.nextInt());
        Frodo.setY(input.nextInt());

        System.out.print("Enter the coordinates of the entity Gandalf (x, y):");
        Gandalf.setX(input.nextInt());
        Gandalf.setY(input.nextInt());

        System.out.print("Enter the coordinates of the entity Bilbo (x, y):");
        Bilbo.setX(input.nextInt());
        Bilbo.setY(input.nextInt());

        Middle_Earth.display();
        Middle_Ages.display();
        /*
        Display all of the entities of the two worlds
         */

```

```
37
38          System.out.print("Enter one entity name and move this entity to one random position: ");
39          //Input one entity name
40          String name = input.next();
41          int position = Middle_Earth.findEntity(name);
42          if(position != -1) {
43              Middle_Earth.moveEntity(name, new Random().nextInt( bound: 101), new Random().nextInt( bound: 101) );
44              Middle_Earth.display();
45              Middle_Ages.display();
46
47              Middle_Ages.addEntity(Middle_Earth.getEntity(position));
48              Middle_Earth.deleteEntity(position);
49
50              System.out.println(name+" found, moved, added, and deleted.");//not exit
51          }else {
52              System.out.println("The entity is not exit!");
53          }
54          Middle_Earth.display();
55          Middle_Ages.display();
56
57          /*
58          move this entity to one random position (range from 0 to 100) if found, display all of the entities of the two
59          worlds, then add this entity to world “Middle Ages”, then delete the entity from the world “Middle Earth”, print
60           “The entity was found, moved, added, and deleted.”
61           */
62
63      }
64  }
```

```java
public class World {
    3 个用法
    private String name;
    12 个用法
    private Entity[] entities;
    11 个用法
    private int numEntities;

    2 个用法
    public World(String name) {
        this.name = name;
        entities = new Entity[10];
        numEntities = 0;
    }

    1 个用法
    public String
        return name;
    }public void setName(String name) {
        this.name = name;
    }

    6 个用法
    public void display() {
        System.out.println("#"+getName());
        System.out.println("#The number of the entities: "+numEntities);
        if(numEntities > 0) {
            for(int i = 0;i < numEntities;i++) {
                System.out.println("#Entity name: "+entities[i].getName()+", the position is ("+entities[i].getX()+","+entities[i].getY()+")");
            }
        }
    }

    1 个用法
    public Entity getEntity(int position) {
        return entities[position];
    }
```



```java
    public void addEntity(Entity entity) {
        if (numEntities <= 10) {
            entities[numEntities] = entity;//at end of array entities
            numEntities ++;//add an entity
        }else {
            System.out.print("Middle Earth has reached the maximum capacity!");
        }
    }

    1 个用法
    public void deleteEntity(int position) {
        if(position < numEntities) {
            entities[position] = entities[position + 1];//copy down
            position ++;//for all array
        }
        numEntities --;
    }

    1 个用法
    public int findEntity(String name) {
        int position = -1;
        for(int i = 0;i < numEntities;i++) {
            String nameEntity = entities[i].getName();
            if(nameEntity.equals(name)) {
                position = i;
            }
        }return position;
    }

    1 个用法
    public void moveEntity(String name, int x, int y) {
        int n = 0;//know if the name is all not same
        for(int i = 0;i < numEntities;i++) {
            String nameEntity = entities[i].getName();
            if (nameEntity.equals(name)) {
                entities[i].setX(x);
                entities[i].setY(y);
                n++;
            }
```

```
67          }if(n == 0) {
68              System.out.print("The entity is not exist");
69          }
70      }
71  }
72
```

（2） Testing

Testing 1 (Same sample test case)

```
D:\KaiFa\JAVA\bin\java.exe "-javaagent:D:\KaiFa\IntelliJ IDEA Community Ed
Enter the coordinates of the entity Frodo (x, y):1 1
Enter the coordinates of the entity Gandalf (x, y):2 2
Enter the coordinates of the entity Bilbo (x, y):3 3
#Middle Earth
#The number of the entities: 3
#Entity name: Frodo, the position is (1,1)
#Entity name: Gandalf, the position is (2,2)
#Entity name: Bilbo, the position is (3,3)
#Middle Ages
#The number of the entities: 0
Enter one entity name and move this entity to one random position: Bilbo
#Middle Earth
#The number of the entities: 3
#Entity name: Frodo, the position is (1,1)
#Entity name: Gandalf, the position is (2,2)
#Entity name: Bilbo, the position is (97,64)
#Middle Ages
#The number of the entities: 0
Bilbo found, moved, added, and deleted.
#Middle Earth
#The number of the entities: 2
#Entity name: Frodo, the position is (1,1)
#Entity name: Gandalf, the position is (2,2)
#Middle Ages
#The number of the entities: 1
#Entity name: Bilbo, the position is (97,64)

进程已结束,退出代码0
```

Testing 2 (Your own different test case)

```
D:\KaiFa\JAVA\bin\java.exe "-javaagent:D:\KaiFa\IntelliJ IDEA Community Edi
Enter the coordinates of the entity Frodo (x, y):2 2
Enter the coordinates of the entity Gandalf (x, y):3 3
Enter the coordinates of the entity Bilbo (x, y):4 4
#Middle Earth
#The number of the entities: 3
#Entity name: Frodo, the position is (2,2)
#Entity name: Gandalf, the position is (3,3)
#Entity name: Bilbo, the position is (4,4)
#Middle Ages
#The number of the entities: 0
Enter one entity name and move this entity to one random position: David
The entity is not exit!
#Middle Earth
#The number of the entities: 3
#Entity name: Frodo, the position is (2,2)
#Entity name: Gandalf, the position is (3,3)
#Entity name: Bilbo, the position is (4,4)
#Middle Ages
#The number of the entities: 0

进程已结束,退出代码0
```