ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
ΤΜΗΜΑ ΠΛΗΡΟΦΟΡΙΚΗΣ & ΤΗΛΕΜΑΤΙΚΗΣ

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1η Εργασία στο μάθημα **«Ανάπτυξη Λογισμικού ΙΙ»**

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Περιεχόμενα

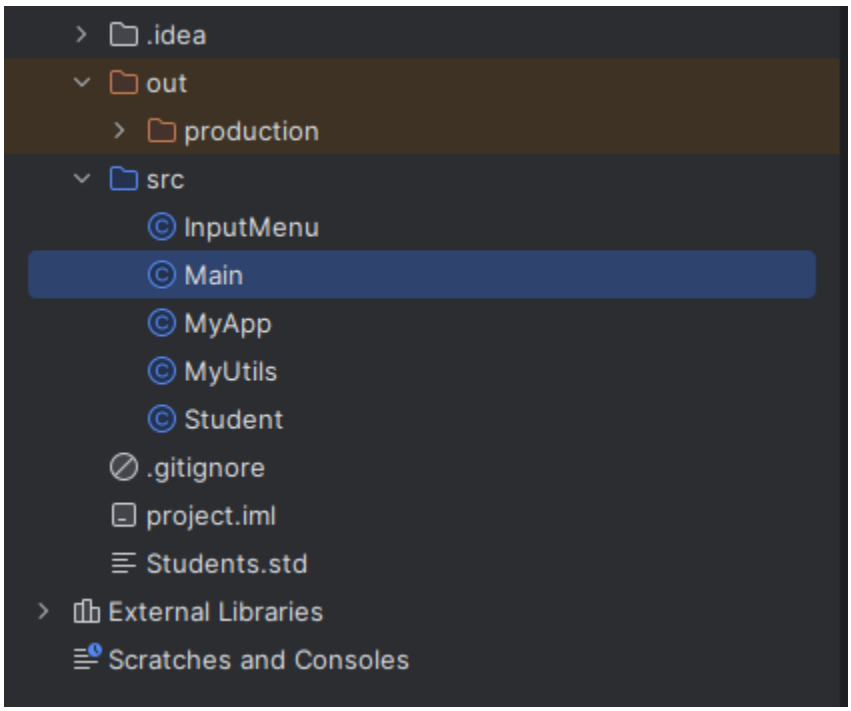
Περίληψη

Στόχος της εργασίας είναι να δημιουργηθεί μια εφαρμογή Java η οποία θα αποθηκεύει φοιτητές σε μια λίστα και θα επιτρέπει διάφορες λειτουργίες πάνω σε αυτήν τη λίστα. Συγκεκριμένα, όταν ξεκινάει θα εμφανίζει ένα μενού με τις εξής επιλογές:

- 1. View all students: Θα εκτυπώνει όλη τη λίστα με τους φοιτητές.
- 2. Add student: Θα προσθέτει έναν φοιτητή στη λίστα.
- 3. Delete a student: Θα διαγράφει έναν φοιτητή από τη λίστα με βάση το id του.
- 4. Modify a student: Θα επιτρέπει την αλλαγή μιας μεταβλητής του φοιτητή, πχ βαθμολογία, όνομα, τμήμα. ΟΧΙ το id.
- 5. Print a student: Θα αναζητεί και θα εκτυπώνει έναν φοιτητή με βάση το id του.
- 6. Sort list of students: Θα ταξινομεί τη λίστα με βάση τη βαθμολογία των φοιτητών (φθίνουσα σειρά).
- 7. Save list to a file: Θα αποθηκεύει τη λίστα των φοιτητών σε αρχείο.
- 8. Load list from a file: Θα φορτώνει τη λίστα φοιτητών από αρχείο.
- 9. Exit: Θα τερματίζει την εφαρμογή.

Δομή

Η δομή του προγράμματος φαίνεται παρακάτω.



- **Main**: Η κλάση αυτή είναι η κύρια κλάση που εκκινεί την εφαρμογή μας
- **Student**: Η κλάση αυτή δημιουργεί και περιγράφει την οντότητα του μαθητή όπως ζητείται στην εκφώνηση
- **InputMenu**: Η κλάση αυτή δημιουργεί το κύριο μενού επιλογών και διάδρασης
- **MyApp**: Η κλάση αυτή περιλαμβάνει την κύρια λογική της εφαρμογής μας
- **MyUtils**: Η κλάση αυτή δημιουργήθηκε επιβοηθητικά και περιλαμβάνει επαναχρησιμοποιήσιμες μεθόδους - εργαλεία για την εκτέλεση ελέγχων και διεργασιών.

Main.java

Ο κώδικας που δημιουργήθηκε μαζί με τα σχόλια είναι:

```
import java.util.ArrayList;
import java.util.Scanner;

public class Main {
   public static void main(String[] args) {
        ArrayList<Student> students= new ArrayList<>();
        Scanner scanner = new Scanner(System.in);
        new InputMenu(scanner, students);
        scanner.close();

   }
}
```

Student.java

Ο κώδικας που δημιουργήθηκε μαζί με τα σχόλια είναι:

```
public class Student implements java.io.Serializable {
   private int id;
   private String stName;
   private String stSurname;
   private String stDepartment;
   private double stGrade;
   public Student(int id, String name, String surname, String department,
double grade) {
        this.id = id;
        this.stName = name;
        this.stSurname = surname;
        this.stDepartment = department;
        this.stGrade = grade;
```

```
}

/**
 * GETTERS
 */
public int getId() {
    return id;
}
public String getName() {
    return stName;
}
public String getSurname() {
    return stSurname;
}
public String getDepartment() {
    return stDepartment;
}
public double getGrade() {
    return stGrade;
}

/**
 * SETTERS
 */
public void setId(int id) {
    this.id = id;
}
public void setName(String name) {
    this.stName = name;
}
public void setSurname(String surname) {
    this.stSurname = surname;
}
public void setDepartment(String department) {
    this.stDepartment = department;
}
public void setGrade(double grade) {
```

```
        this.stGrade = grade;
    }



    @Override
    public String toString() {
        return  "Student{ " +
                "id=" + id +
                ", Name='" + stName + '\'' +
                ", Surname='" + stSurname + '\'' +
                ", Department='" + stDepartment + '\'' +
                ", Grade=" + stGrade +
                " }";
    }
}
```

InputMenu.java

Ο κώδικας που δημιουργήθηκε μαζί με τα σχόλια είναι:

```
import java.util.ArrayList;
import java.util.Scanner;

public class InputMenu {
    /**
     * Display Menu
     */
    public void display_menu() {
        System.out.println(
                """
                        ######################
                        1) View all students
                        2) Add student
                        3) Delete a student
                        4) Modify a student
                        5) Print a student
                        6) Sort list of students
```

```
                    7) Save list to a file
                    8) Load list from a file
                    9) Exit
                    ######################
                    SELECTION:"""
    );
}

/**
 * Input selection
 */
public InputMenu(Scanner scanner, ArrayList<Student> students) {
    int selection; //option selection
    do {
        display_menu();
        selection = scanner.nextInt(); //get selection number
        switch (selection) {
            case 1:
                System.out.println("You selected 'View all students' ");
                MyApp.viewAllStudents(students);
                break;
            case 2:
                System.out.println("You selected 'Add student' ");
                MyApp.addStudent(students);
                break;
            case 3:
                System.out.println("You selected 'Delete a student' ");
                MyApp.deleteStudent(students);
                break;
            case 4:
                System.out.println("You selected 'Modify a student' ");
                MyApp.modifyStudent(students);
                break;
            case 5:
                System.out.println("You selected 'Print a student' ");
                MyApp.printStudent(students);
                break;
            case 6:
```

```
                    System.out.println("You selected 'Sort list of students'
");
                    MyApp.sortByGrade(students);
                    break;
                case 7:
                    System.out.println("You selected 'Save list to a file' ");
                    MyApp.saveToFile(students);
                    break;
                case 8:
                    System.out.println("You selected 'Load list from a file'
");
                    students = MyApp.loadFromFile(students);
                    // Check if loadedStudents is not null and contains data
                    if (students != null && !students.isEmpty()) {
                        for (Student student : students) {
                            System.out.println(student);
                        }
                    }
                    break;
                case 9:
                    System.out.println("You selected 'Exit' ");
                    //method();
                    break;
                default:
                    System.err.println("Unrecognized option");
                    break;
            }

        } while (selection != 9);
        scanner.close();
    }
}
```

MyApp.java

Ο κώδικας που δημιουργήθηκε μαζί με τα σχόλια είναι:

```
import java.io.*;
import java.util.*;
```

```
public class MyApp {
   /**
    * Selection 1.View all students
    * @param students arrayList
    */
   public static void viewAllStudents(ArrayList<Student> students) {
       if (students.isEmpty()) {
           System.out.println(MyUtils.getMessage("emptyList"));
       }else {
           System.out.println(students); //return all students
       }
   }
   /**
    * Selection 2.Add student
    * @param students arrayList
    */
   public static void addStudent(ArrayList<Student> students) {
       Scanner myEntry = new Scanner(System.in);
       System.out.println("Please add ID, Name, Surname, Department, Grade:
PRESS ENTER AFTER EACH ITEM INSERTION");
       while (true) {
           try {
               // ID
               MyUtils.printInfo("ID");
               String input = myEntry.nextLine();
               input = MyUtils.validateInputID("ID: ", input,
"invalidInput");
               int id = Integer.parseInt(input); //read input
               if (MyUtils.isIdExists(students, id)) {
                   continue;
               }

               // NAME
               MyUtils.printInfo("NAME");
               String name = myEntry.nextLine(); //read input
               name = MyUtils.validateInputChars("NAME: ", name,
"invalidCharacters");
```

```
                // SURNAME
                MyUtils.printInfo("SURNAME");
                String surname = myEntry.nextLine();
                surname = MyUtils.validateInputChars("SURNAME: ", surname,
"invalidCharacters");

                // DEPARTMENT
                MyUtils.printInfo("DEPARTMENT");
                String department = myEntry.nextLine();
                department = MyUtils.validateInputChars("DEPARTMENT: ",
department, "invalidCharacters");

                // GRADE
                double grade;
                while (true) {
                    try {
                        MyUtils.printInfo("GRADE");
                        grade = myEntry.nextDouble();
                        grade = MyUtils.validateInputGrade("GRADE: ", grade,
"invalidGrade");
                        break;
                    } catch (InputMismatchException e) {

System.out.println(MyUtils.getMessage("invalidInput"));
                        myEntry.nextLine();
                    }
                }
                Student myStudent = new Student(id, name, surname, department,
grade); //create new Student
                students.add(myStudent); //add new Student
                System.out.println("New Student added successfully");
            } catch (InputMismatchException e) {
                System.out.println(e.getMessage());
                myEntry.nextLine();
            }
            break;
        }
```

```
    }

    /**
     * Selection 3.Delete a student
     * @param students arrayList
     */
    public static void deleteStudent(ArrayList<Student> students) {
        Scanner myEntry = new Scanner(System.in);
        if (students.isEmpty()) {
            System.out.println(MyUtils.getMessage("emptyList"));
        } else {
            try {
                System.out.println("Select student's id to delete");
                // ID
                String input = myEntry.nextLine();
                input = MyUtils.validateInputID("ID: ", input,
"invalidInput");
                int selection = Integer.parseInt(input);

                //Find the student with the matching ID
                Student toDeleteStudent = null;
                for (Student student : students ) {
                    if (student.getId() == selection ) {
                        toDeleteStudent = student;
                        break;
                    }
                }
                if (toDeleteStudent != null) {
                    students.remove(toDeleteStudent);
                    System.out.println(toDeleteStudent + " removed.");
                } else {
                    System.out.println("Student not found");
                }


            } catch (IndexOutOfBoundsException e) {
                System.out.println("ID out of range, please try again.");
            } catch (InputMismatchException e) {
```

```
                System.out.println("Invalid input format. Please enter a valid
number next time.");
            }
        }
    }

    /**
     * Selection 4.Modify a student
     * @param students arrayList
     */
    public static void modifyStudent(ArrayList<Student> students) {
        Scanner myEntry = new Scanner(System.in);
        if (students.isEmpty()) {
            System.out.println(MyUtils.getMessage("emptyList"));
        } else {
            while (true) {
                try {
                    System.out.println("Select student's id to modify");
                    // ID
                    String input = myEntry.nextLine();
                    input = MyUtils.validateInputID("ID: ", input,
"invalidInput");
                    int selection = Integer.parseInt(input);

                    //Find the student with the matching ID
                    Student toModifyStudent = null;
                    for (Student student : students ) {
                        if (student.getId() == selection ) {
                            toModifyStudent = student;
                            break;
                        }
                    }
                    if (toModifyStudent != null) {
                        System.out.println("You selected: "+ toModifyStudent);
                        System.out.println("Please modify Name, Surname,
Department, Grade: PRESS ENTER AFTER EACH ITEM INSERTION");
                        // NAME
                        MyUtils.printInfo("NAME");
```

```
                        String name = myEntry.nextLine(); //read input
                        name = MyUtils.validateInputChars("NAME: ", name,
"invalidCharacters");



                        MyUtils.printInfo("SURNAME");
                        String surname = myEntry.nextLine();
                        surname = MyUtils.validateInputChars("SURNAME: ",
surname, "invalidCharacters");

                        MyUtils.printInfo("DEPARTMENT");
                        String department = myEntry.nextLine();
                        department = MyUtils.validateInputChars("DEPARTMENT:
", department, "invalidCharacters");

                        // GRADE
                        double grade;
                        while (true) {
                            try {
                                MyUtils.printInfo("GRADE");
                                grade = myEntry.nextDouble();
                                grade = MyUtils.validateInputGrade("GRADE: ",
grade, "invalidGrade");
                                break;
                            } catch (InputMismatchException e) {

System.out.println(MyUtils.getMessage("invalidInput"));
                                myEntry.nextLine();
                            }
                        }

                        toModifyStudent.setName(name);
                        toModifyStudent.setSurname(surname);
                        toModifyStudent.setDepartment(department);
                        toModifyStudent.setGrade(grade);
                        System.out.println("Student modified successfully");
                        break;
                    } else {
```

```
                        System.out.println("Student not found");
                        break;
                    }
                } catch (IndexOutOfBoundsException e) {
                    System.out.println("ID out of range");
                }
            }
        }

    }

    /**
     * Selection 5.Print student
     * @param students arrayList
     */
    public static void printStudent(ArrayList<Student> students) {
        Scanner myEntry = new Scanner(System.in);
        if (students.isEmpty()) {
            System.out.println(MyUtils.getMessage("emptyList"));
        } else {
            try {
                System.out.println("Select student's id to show");
                // ID
                String input = myEntry.nextLine();
                input = MyUtils.validateInputID("ID: ", input,
"invalidInput");
                int selection = Integer.parseInt(input);

                //Find the student with the matching ID
                Student toPrintStudent = null;
                for (Student student : students ) {
                    if (student.getId() == selection ) {
                        toPrintStudent = student;
                        break;
                    }
                }
                if (toPrintStudent != null) {
                    System.out.println(toPrintStudent);
```

```
                } else {
                    System.out.println("Student not found");
                }
            } catch (IndexOutOfBoundsException e) {
                System.out.println("ID out of range");
            }
        }

    }

    /**
     * Selection 6.Sort by grade
     * @param students arrayList
     */
    public static void sortByGrade(ArrayList<Student> students) {
        if (students.isEmpty()) {
            System.out.println(MyUtils.getMessage("emptyList"));
        } else {
            Comparator<Student> gradeComparator =
Comparator.comparingDouble(Student::getGrade);
            students.sort(gradeComparator.reversed());

            // Print each student's information separately
            for (Student student : students) {
                System.out.println(student);
            }
        }

    }

    /**
     * Selection 7.Save to file
     * @param students arrayList
     */
    public static void saveToFile(ArrayList<Student> students) {
        Scanner myEntry = new Scanner(System.in);
        System.out.print("Enter the file name to save (e.g. students): ");
        String fileName = myEntry.nextLine();
```

```
        try {
            FileOutputStream fileOut = new FileOutputStream(fileName);
            ObjectOutputStream out = new ObjectOutputStream(fileOut);
            out.writeObject(students);
            out.close();
            fileOut.close();
            System.out.printf("Serialized data is saved in " + fileName +
'\n');
        } catch (IOException e) {
            System.out.println("Error saving data to file: " + e.getMessage());
        }
    }

    /**
     * Selection 8.Load from file
     * @return arrayList of type Student
     */
    public static ArrayList<Student> loadFromFile(ArrayList<Student> students)
{
        Scanner myEntry = new Scanner(System.in);
        System.out.print("Enter the file name to load (e.g. students): ");
        String fileName = myEntry.nextLine();
        //myEntry.close();

        try {
            FileInputStream fileIn = new FileInputStream(fileName);
            ObjectInputStream in = new ObjectInputStream(fileIn);
            ArrayList<Student> loadedStudents = (ArrayList<Student>)
in.readObject();
            in.close();
            fileIn.close();
            students.addAll(loadedStudents);
            System.out.println("Load successfully. Here are the results:");
        } catch (IOException e) {
            System.out.println("Error reading from file: " + e.getMessage());
        } catch (ClassNotFoundException e) {
            System.out.println("Error loading data: " + e.getMessage());
        }
```

```
        return students;
    }
}
```

MyUtils.java

Ο κώδικας που δημιουργήθηκε μαζί με τα σχόλια είναι:

```
import java.util.ArrayList;
import java.util.Scanner;
import java.util.InputMismatchException;

/**
* MyUtils handles different input validations along with some messages
*/
public class MyUtils {
    // Method for input prompting ID, NAME etc.
    public static void printInfo(String message) {
        System.out.println(message+ ": ");
    }
    // method for checking unique id
    public static boolean isIdExists(ArrayList<Student> students, int id) {
        //iterate over the arrayList
        for (Student student : students) {
            if (student.getId() == id) {
                System.out.println("ID already exists. Please try a different
ID.");
                return true;
            }
        }
        return false;
    }

    /**
     *
     * @param messageType of type string
     * @return a String with the appropriate message
     */
```

```
    public static String getMessage(String messageType) {
        return switch (messageType) {
            case "emptyList" -> "List is empty - No students found"; // message
for empty list
            case "invalidInput" -> "Invalid input format. Please enter a valid
number."; // message for invalid number input
            case "invalidCharacters"-> "Invalid input format. Please enter only
alphabetic characters."; // message for invalid characters input
            case "invalidGrade" -> "Invalid grade. Grade must be between 0 and
10."; // message for grade value out of permitted range
            // Add more cases for other message types as needed
            default -> "Unknown message type";
        };
    }

    /**
     *
     * @param value of the input field ID
     * @param input the input we want to check
     * @param messageType the type of message we want to handle the error
     * @return the inserted id
     */
    public static String validateInputID(String value, String input, String
messageType) {
        Scanner scanner = new Scanner(System.in);
        while (!input.matches("\\d+")) { //prevent spaces insertion
            System.out.println(MyUtils.getMessage(messageType));
            System.out.print(value);
            input = scanner.nextLine();
        }
        return input;
    }

    /**
     *
     * @param value input field NAME, SURNAME, DEPARTMENT
     * @param chars the input we want to check
```

```
     * @param messageType the type of message we want to handle the error
     * @return the validated input
     */
    public static  String validateInputChars(String value,String chars, String
messageType) {
        Scanner scanner = new Scanner(System.in);
        String validatedChars = chars; // Variable to hold the validated input
        while (!validatedChars.matches("[a-zA-Z]+")) {
            System.out.println(MyUtils.getMessage(messageType));
            System.out.print(value);
            validatedChars = scanner.nextLine();
        }
        return validatedChars; // Return the validated input
    }

    /**
     *
     * @param value input grade
     * @param grade the value we want to check
     * @param messageType the type of message we want to handle the error
     * @return the validated value
     */
    public static double validateInputGrade(String value, double grade, String
messageType) {
        Scanner scanner = new Scanner(System.in);
        while (grade < 0 || grade > 10.0) {
            try {
                System.out.println(MyUtils.getMessage(messageType));
                System.out.print(value);
                grade = scanner.nextDouble();

                // Check if the entered grade is within the valid range
                if (grade >= 0 && grade <= 10.0) {
                    break; // Exit the loop if the grade is valid
                } else {
                    System.out.println("Invalid grade. Grade must be between 0
and 10.");
                }
```

```
            } catch (InputMismatchException e) {
                // Clear the invalid input from the scanner buffer
                scanner.next();
                System.out.println("Invalid input. Please enter a numeric
value.");
            }
        }
        return grade;
    }
}
```

Ενδεικτικές εκτελέσεις (screenshots):

Αρχικό μενού επιλογών

```
######################
1) View all students
2) Add student
3) Delete a student
4) Modify a student
5) Print a student
6) Sort list of students
7) Save list to a file
8) Load list from a file
9) Exit
######################
SELECTION:
```

Επιλογή 1

```
SELECTION:
1
You selected 'View all students'
List is empty - No students found
```

```
SELECTION:
1
You selected 'View all students'
[Student{ id=1, Name='Marinos', Surname='Kouvaras', Department='DIT', Grade=2.0 }]
```

Επιλογή 2

```
SELECTION:
2
You selected 'Add student'
Please add ID, Name, Surname, Department, Grade: PRESS ENTER AFTER EACH ITEM INSERTION
ID:
1
NAME:
Marinos
SURNAME:
Kouvaras
DEPARTMENT:
DIT
GRADE:
2
New Student added successfully
```

Επιλογή 3

```
SELECTION:
3
You selected 'Delete a student'
List is empty - No students found
```

```
SELECTION:
3
You selected 'Delete a student'
Select student's id to delete
1
Student{ id=1, Name='Marinos', Surname='Kouvaras', Department='DIT', Grade=2.0 } removed.
```

Επιλογή 4

```
SELECTION:
4
You selected 'Modify a student'
List is empty - No students found
```

```
SELECTION:
4
You selected 'Modify a student'
Select student's id to modify
1
You selected: Student{ id=1, Name='Marinos', Surname='Kouvaras', Department='DIT', Grade=2.0 }
Please modify Name, Surname, Department, Grade: PRESS ENTER AFTER EACH ITEM INSERTION
NAME:
Georgios
SURNAME:
Krasakis
DEPARTMENT:
DIT
GRADE:
2
Student modified successfully
```

Επιλογή 5

```
SELECTION:
5
You selected 'Print a student'
Select student's id to show
1
Student{ id=1, Name='Georgios', Surname='Krasakis', Department='DIT', Grade=2.0 }
```

Επιλογή 6

```
SELECTION:
6
You selected 'Sort list of students'
Student{ id=2, Name='Marinos', Surname='Kouvaras', Department='DIT', Grade=5.0 }
Student{ id=1, Name='Georgios', Surname='Krasakis', Department='DIT', Grade=2.0 }
```

Επιλογή 7

```
SELECTION:
7
You selected 'Save list to a file'
Enter the file name to save (e.g. students): test
Serialized data is saved in test
```

Επιλογή 8

```
SELECTION:
8
You selected 'Load list from a file'
Enter the file name to load (e.g. students): test
Load successfully. Here are the results:
Student{ id=2, Name='Marinos', Surname='Kouvaras', Department='DIT', Grade=5.0 }
Student{ id=1, Name='Georgios', Surname='Krasakis', Department='DIT', Grade=2.0 }
```

Επιλογή 9

```
SELECTION:
9
You selected 'Exit'

Process finished with exit code 0
```