StudentDatabase.java

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

class Student {
    int id;
    String name;
    int marks;

    public Student(int id, String name, int marks) {
        this.id = id;
        this.name = name;
        this.marks = marks;
    }

    public String toFileFormat() {
        return id + "," + name + "," + marks;
    }

    public static Student fromFileFormat(String line) {
        String[] parts = line.split(",");
        return new Student(Integer.parseInt(parts[0]), parts[1], Integer.parseInt(parts[2]));
    }

    public String toString() {
        return "ID: " + id + ", Name: " + name + ", Marks: " + marks;
    }
}

public class StudentDatabase {
    static ArrayList<Student> students = new ArrayList<>();
    static HashMap<Integer, Student> studentMap = new HashMap<>();
    static final String FILE_NAME = "students.txt";

    public static void main(String[] args) throws IOException {
        Scanner scanner = new Scanner(System.in);
        loadFromFile();

        while (true) {
            System.out.println("\n=== Student Database Menu ===");
            System.out.println("1. Add Student");
            System.out.println("2. View All Students");
            System.out.println("3. Search Student by ID");
            System.out.println("4. Save to File");
            System.out.println("5. Exit");
            System.out.print("Enter your choice: ");
            int choice = scanner.nextInt();

            switch (choice) {
                case 1:
                    addStudent(scanner);
                    break;
                case 2:
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                viewAllStudents();
                break;
            case 3:
                searchStudentById(scanner);
                break;
            case 4:
                saveToFile();
                break;
            case 5:
                System.out.println("Exiting...");
                saveToFile();
                return;
            default:
                System.out.println("Invalid choice.");
        }
    }
}

static void addStudent(Scanner scanner) {
    System.out.print("Enter ID: ");
    int id = scanner.nextInt();
    scanner.nextLine(); // consume newline

    if (studentMap.containsKey(id)) {
        System.out.println("Student with this ID already exists.");
        return;
    }

    System.out.print("Enter Name: ");
    String name = scanner.nextLine();

    System.out.print("Enter Marks: ");
    int marks = scanner.nextInt();

    Student s = new Student(id, name, marks);
    students.add(s);
    studentMap.put(id, s);
    System.out.println("Student added successfully.");
}

static void viewAllStudents() {
    if (students.isEmpty()) {
        System.out.println("No students found.");
    } else {
        for (Student s : students) {
            System.out.println(s);
        }
    }
}

static void searchStudentById(Scanner scanner) {
    System.out.print("Enter Student ID to search: ");
    int id = scanner.nextInt();
    if (studentMap.containsKey(id)) {
        System.out.println(studentMap.get(id));
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        } else {
            System.out.println("Student not found.");
        }
    }

    static void saveToFile() {
        try (FileWriter writer = new FileWriter(FILE_NAME)) {
            for (Student s : students) {
                writer.write(s.toFileFormat() + "\n");
            }
            System.out.println("Data saved to file.");
        } catch (IOException e) {
            System.out.println("Error saving to file.");
        }
    }

    static void loadFromFile() {
        File file = new File(FILE_NAME);
        if (!file.exists()) return;

        try (BufferedReader reader = new BufferedReader(new FileReader(FILE_NAME))) {
            String line;
            while ((line = reader.readLine()) != null) {
                Student s = Student.fromFileFormat(line);
                students.add(s);
                studentMap.put(s.id, s);
            }
            System.out.println("Data loaded from file.");
        } catch (IOException e) {
            System.out.println("Error loading file.");
        }
    }
}
```