The Student Management System (SMS) is a Java-based application designed to manage student information and calculate Grade Point Averages (GPA) based on grades for various courses. The system is developed using Object-Oriented Programming (OOP) principles, encapsulating relevant data and functionalities within classes.

2. Objectives

The primary objectives of the SMS are as follows:

Maintain a list of students and courses within a university.

Allow the addition of students and courses dynamically.

Enable students to have grades for multiple courses.

Calculate and display the GPA for each student.

3. System Components

3.1 Student Class

Attributes:

studentId (int): Unique identifier for each student.

grades (ArrayList<Double>): List to store grades for each course.

Methods:

calculateGPA(): Calculates the GPA based on the grades.

3.2 Course Class

Attributes:

courseId (int): Unique identifier for each course.

courseName (String): Name of the course.

Methods:

getCourseName(): Returns the name of the course.

3.3 University Class

Attributes:

students (ArrayList<Student>): List to store instances of Student class.

courses (ArrayList<Course>): List to store instances of Course class.

Methods:

addStudent(Student student): Adds a student to the university.

addCourse(Course course): Adds a course to the university.

3.4 Main Class

Functionality:

Contains the main method to demonstrate the system by creating instances of students, courses, and the university. It also performs operations such as adding students, courses, grades, and calculating GPA.

4. Use Cases

4.1 Add Student

Actor: University Administrator

Description: The administrator can add a new student to the university by providing a unique student ID.

4.2 Add Course

Actor: University Administrator

Description: The administrator can add a new course to the university by providing a unique course ID and the name of the course.

4.3 Add Grade

Actor: University Administrator

Description: The administrator can add grades for a student in a specific course, updating the student's record.

4.4 Calculate GPA

Actor: University Administrator

Description: The administrator can calculate and view the GPA of a student based on the grades assigned for different courses.

5. Constraints

Student IDs and Course IDs must be unique.

GPA calculation is based on a simple average of grades.

6. User Interface

The system does not include a graphical user interface. Interaction with the system is primarily through the Main class, where administrators can demonstrate and test the system functionalities.

7. Dependencies

The system is developed in Java and relies on the ArrayList class from the Java Collections Framework for managing lists of students, courses, and grades.

8. Future Enhancements

Implementing file I/O to read and write student and course data from/to external files.

Extending the system to handle more complex GPA calculation algorithms.

Incorporating error handling mechanisms for better user experience.