Programming Fundamentals - LAB
Project Report

Fast Hub

(student profile management system)

Section: BCY-1A

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Project Report

Introduction

The Student Management System (FastHub) is an application developed in C. It has been structured to strategically solve the critical problem by having very efficient and effective tools to manage academics in an institution of learning. The system thus has functions such as registering students, management of courses, determination of GPA or CGPA, and generation of transcripts dynamically. With file handling and logical structuring, it ensures persistence of data and reliability. This project combines some aspects of programming concepts about user-defined functions, arrays, and conditional statements to bring about a practical solution in streamlining academic processes and increasing productivity among both students and administrators.

Aim and Motivation

The main objectives of the project were to develop an efficient, easy-to-use Student Management System meant to manage important academic operations. The automation of the system reduces exhaustive manual inputs about grades, transcriptions, and courses.

The motivation behind the need for this project arises from the increased demand for digital solutions in education. This system takes inspiration from a need for reliability, accessibility, and streamlined tools that can ease one's administrative burdens while empowering students to manage their own academic data effectively and promptly.

Background

Research and Project Selection

The choice to develop **FastHub** stemmed from research on common challenges in academic institutions, such as:

- Difficulty in managing student grades across semesters.
- Limited accessibility to personalized transcripts and academic data.
- Lack of automated solutions for dropping courses and calculating GPA.

The project was selected as it offered a practical application of core programming concepts like file handling, arrays, and user-defined functions in C, enabling us to explore how such systems are built and utilized in the real world.

Project Specification

- **Programming Language:** C
- **Development Tools:** GCC Compiler, IDE: VS Code and Dev C++
- **Input:** Student details, course information, grades.
- **Output:** Transcripts, GPA/CGPA, dynamic course management.
- **Core Features:**
    - Student registration and login.
    - Admin functionalities for course addition and management.
    - Transcript generation.
    - GPA and CGPA calculation.
    - Secure file-based data storage and retrieval.

Problem Analysis

The primary challenges in developing this system were:

1. Efficiently managing student data across multiple semesters.
2. Ensuring accurate GPA and CGPA calculations.
3. Handling real-time updates to student records, such as course additions or drops.
4. Creating an error-proof and user-friendly interface.

Solution Design

Project Detail

The **Student Management System** was divided into the following modules:

1. **Admin Module**:
    - Handles course management.
    - Enables login using admin credentials.
2. **Student Module**:
    - Allows students to register, log in, and manage their academic records.
    - Includes functionalities like adding marks and generating transcripts.

Functionality and Features

The following functionalities define **FastHub's** operation:

- **Student Registration:** Collects and stores user information securely in files.
- **Login System:** Provides access based on user type (admin or student).
- **Course Management:** Students can register for courses and drop them if needed.
- **Transcript Generation:** Dynamically generates a file-based transcript with all academic details.
- **GPA and CGPA Calculation:** Calculates grades based on input marks.
- **Error Handling:** Detects and prevents invalid inputs or operations.

Project Breakdown Structure (Workload Distribution with Timeline)

The workload was divided among the team members as follows:

Member	Task	Timeline
Rayyan **(24K-2052)**	- Student login and registration functionality - Admin login - Validations for the entire system	7 days
Bashir **(24K-2012)**	- Student portal features and workflows - Project planning and report writing	6 days
Huzaifa **(24K-2044)**	- Complete admin panel implementation - Connecting admin panel with student panel - File handling for the entire system - UI designing for better CLI experience	10 days

This distribution ensured smooth collaboration and timely completion of the project.

Implementation and Testing

Implementation

The system was developed in three main parts:

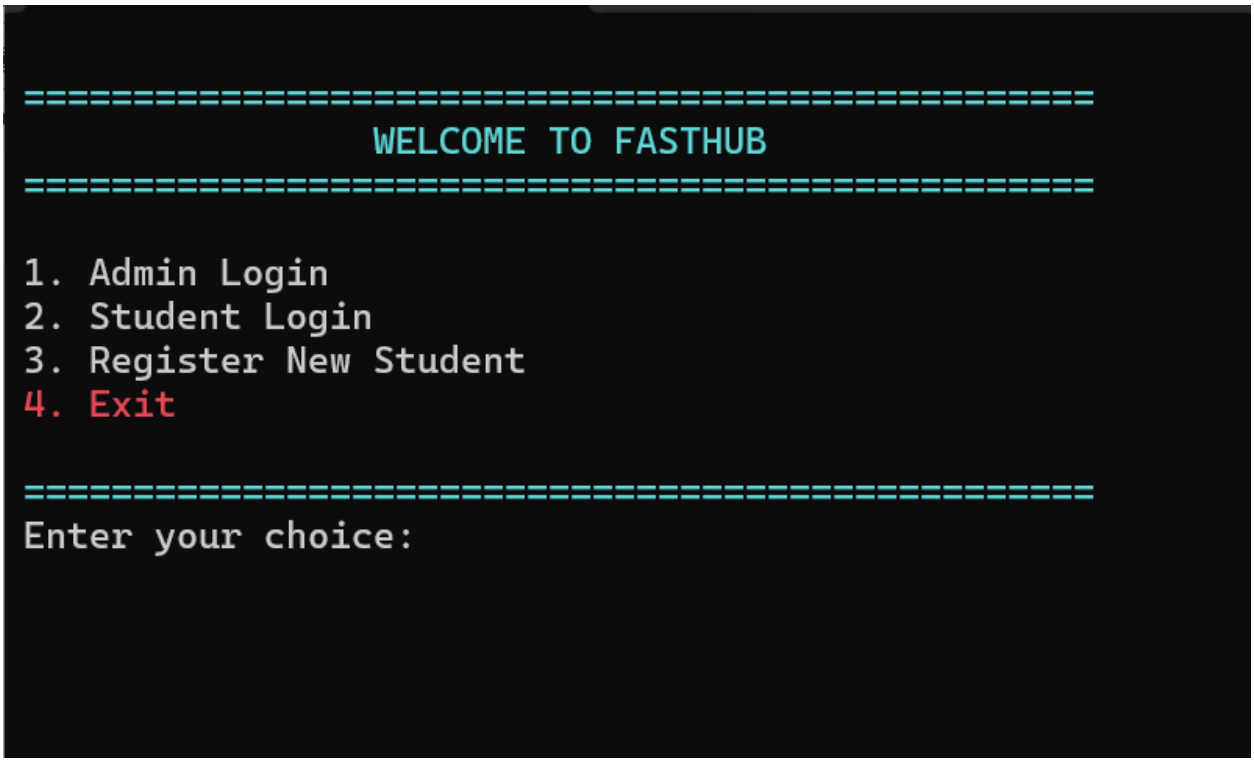
1. **Admin Functionalities**: Includes login and course management.
2. **Student Functionalities**: Covers registration, login, and academic record management.
3. **Data Management**: Uses file handling to store and retrieve information, ensuring persistence across sessions.

Testing

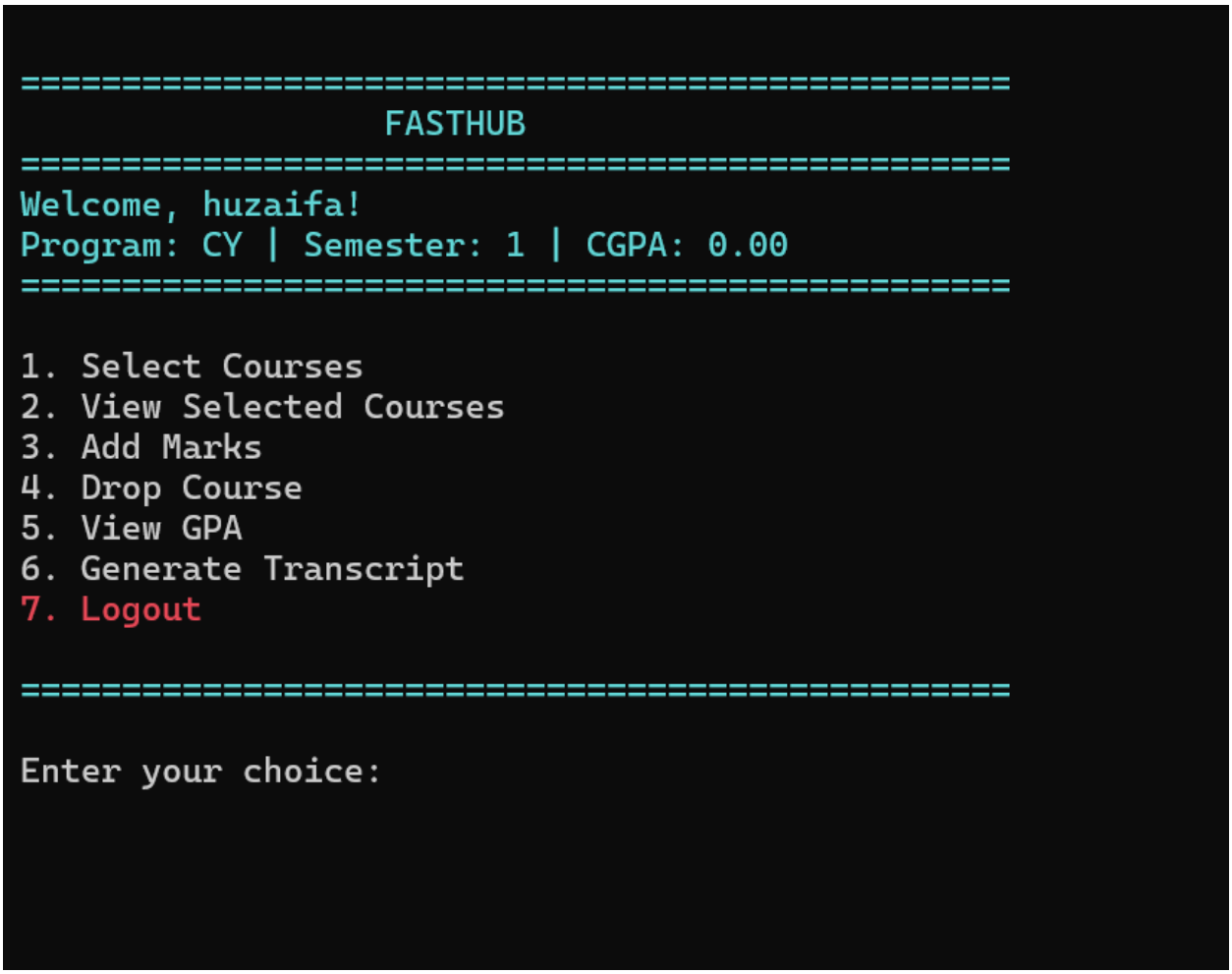
The project was rigorously tested to ensure:

1. Accurate GPA/CGPA calculations.
2. Proper transcript generation with all necessary details.
3. Error-free user input handling.

Screen Shots (Output):

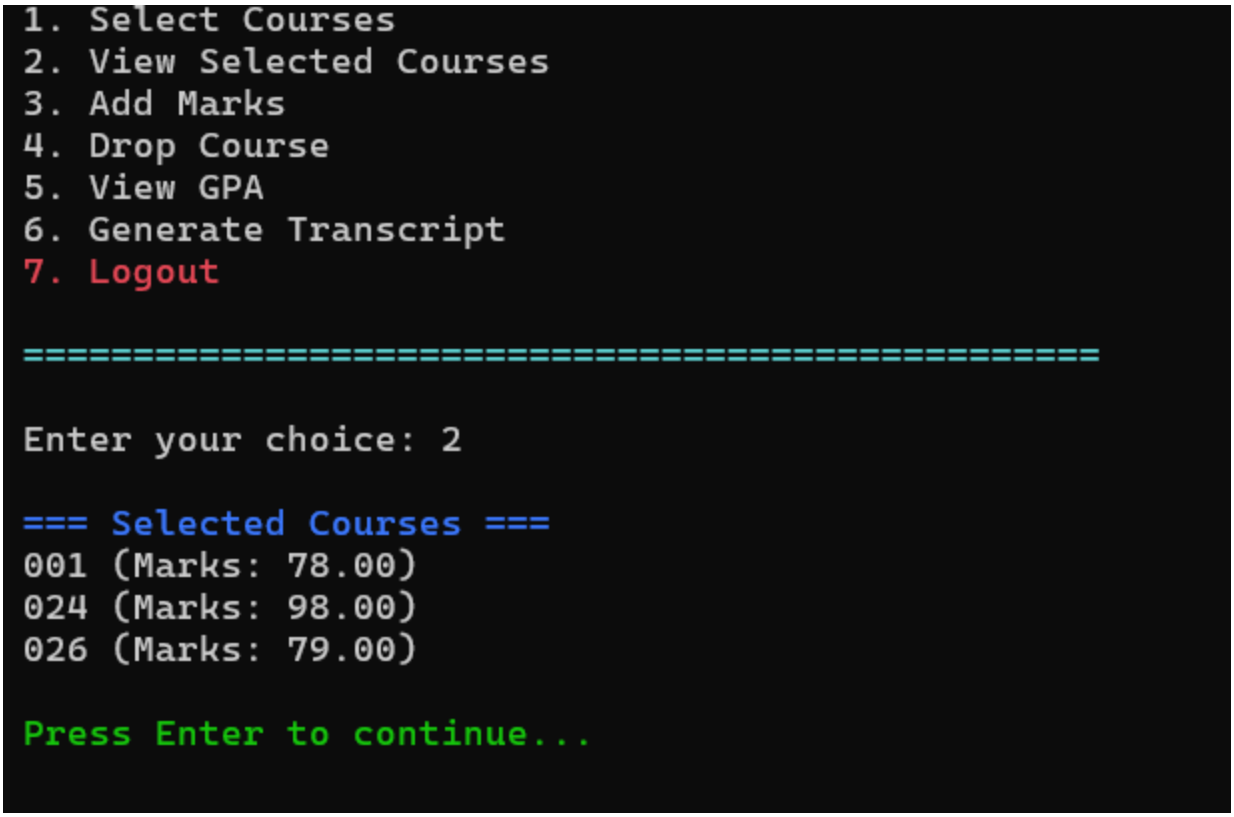


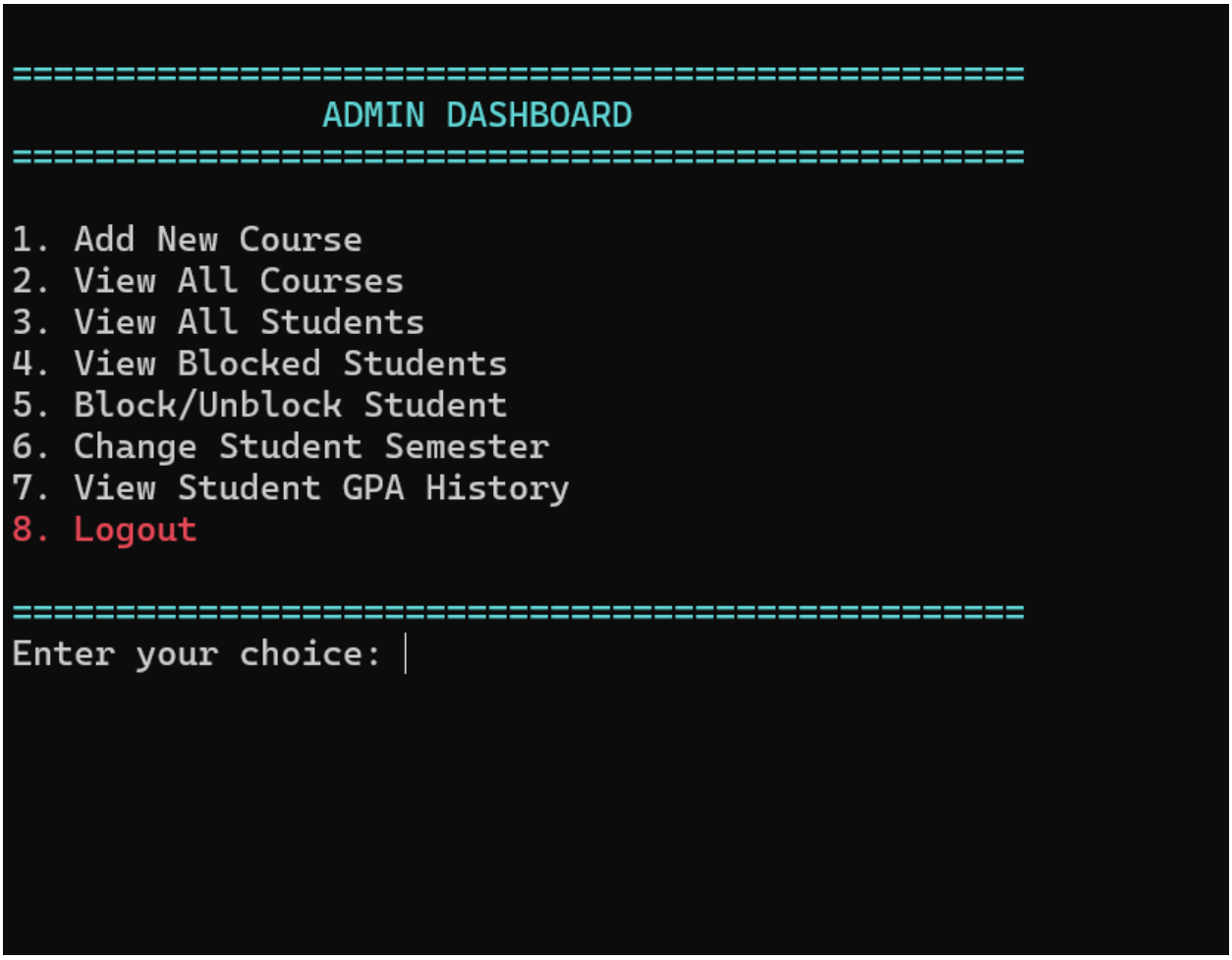
```
================================================
                WELCOME TO FASTHUB
================================================

1. Admin Login
2. Student Login
3. Register New Student
4. Exit

================================================
Enter your choice: 3

=== Student Registration ===
Name: huzaifa
Email: huzaifa
Invalid email format. Please enter a valid email.
Email: huzaifa@gmail
Invalid email format. Please enter a valid email.
Email: huzaifa@gmail.com
Roll Number: 24K-2044
Program (CS/SE/AI/CY/DS/CE): cs
Invalid program! Please choose from CS, SE, AI, CY, DS, or CE.
Program (CS/SE/AI/CY/DS/CE): CS
Password: huzaifa

Student registered successfully!

Press Enter to continue...
```


==========
FASTHUB
==========
Welcome, huzaifa!
Program: CY | Semester: 1 | CGPA: 0.00
==========
1. Select Courses
2. View Selected Courses
3. Add Marks
4. Drop Course
5. View GPA
6. Generate Transcript
7. Logout
==========
Enter your choice:

```
================================================
                   FASTHUB
================================================
Welcome, huzaifa!
Program: CY | Semester: 1 | CGPA: 0.00
================================================

1. Select Courses
2. View Selected Courses
3. Add Marks
4. Drop Course
5. View GPA
6. Generate Transcript
7. Logout

================================================

Enter your choice: 1

=== Available Courses for CY Program, Semester 1 ===
Code | Name | Credit Hours
------------------------
1. 001 | PF | 3
2. 023 | Introduction to Cybersecurity | 3
3. 024 | Networking Basics | 2
4. 025 | Computer Organization | 2
5. 026 | Internet Protocols Lab | 1

Select courses (enter course numbers, 0 to finish (e.g: 1 2 3 0)):
1 3 5 0
Course 001 added successfully!
Course 024 added successfully!
Course 026 added successfully!

Courses saved successfully!

Press Enter to continue...
```

```
1. Select Courses
2. View Selected Courses
3. Add Marks
4. Drop Course
5. View GPA
6. Generate Transcript
7. Logout

==================================================

Enter your choice: 3

=== Add Marks for Selected Courses ===
Enter marks for 001 (0-100): 78
Enter marks for 024 (0-100): 98
Enter marks for 026 (0-100): 79

Marks added successfully!

Press Enter to continue...
```


1. Select Courses
2. View Selected Courses
3. Add Marks
4. Drop Course
5. View GPA
6. Generate Transcript
7. Logout
==========
Enter your choice: 2
=== Selected Courses ===
001 (Marks: 78.00)
024 (Marks: 98.00)
026 (Marks: 79.00)
Press Enter to continue...


ADMIN DASHBOARD
1. Add New Course
2. View All Courses
3. View All Students
4. View Blocked Students
5. Block/Unblock Student
6. Change Student Semester
7. View Student GPA History
8. Logout
Enter your choice:

```
==============================================
                ADMIN DASHBOARD
==============================================

1. Add New Course
2. View All Courses
3. View All Students
4. View Blocked Students
5. Block/Unblock Student
6. Change Student Semester
7. View Student GPA History
8. Logout

==============================================
Enter your choice: 7
Enter student roll number: 24K-2043

=== GPA History for 24K-2043 ===
Semester 1: 3.23
Semester 2: 0.00
Semester 3: 0.00
Semester 4: 0.00
Semester 5: 0.00
Semester 6: 0.00
Semester 7: 0.00
Semester 8: 0.00
CGPA: 3.23

Press Enter to continue...
```

Conclusion

Summary

FastHub is a compact yet comprehensive CLI-based student profile management system. It simplifies academic management tasks like course enrollment, GPA calculations, and tracking academic progress, making it ideal for small-scale institutions and personal projects.

Discussion

FastHub highlights the efficiency of CLI-based systems for academic management. With its robust functionality and simple design, it addresses the shortcomings of traditional LMS platforms. For students, it serves as a learning milestone in structured programming and practical problem-solving.

Future improvements include:

1. Implementing a database for persistent data storage.
2. Introducing graphical elements for better user experience.
3. Enhancing security protocols for sensitive data