Program Design (II)

Final Project
Submission Deadline: 2022/6/12
Presentation & Demo Period: 2022/6/14, 2022/6/16
Please use C language to complete the project.

Introduction

After learning all the things about C that we've introduced so far, have you ever wondered why we need to learn these topics and how can we apply them to the real world? This is an important question that we need to constantly ask ourselves as programmers. One of the major differences between excellent and poor programmers is the ability to select and design the most appropriate data type, structure, and algorithms to solve real-world problems.

Therefore, **this final project aims to let you practice this ability by designing and implementing a database system.** You need to decide the usage of this database system. For example, we have introduced a database system of information about parts stored in a warehouse with different operations (Ch 16.3, page 389; Ch 17.5, page 433). Likewise, you can design a database system to help students to plan the courses they need to take to meet the graduation requirements. If you still have a hard time figuring out what kind of database system you want to implement, you can always ask Google for bits of help (e.g., Examples of Data Structures in real life - Stack Overflow).

Although you can choose the database system you like to implement freely, the **purposes** and the operations that this system can do need to be **reasonable** and **useful**. After you decided what database system you want to implement, your system needs to meet the requirements described in the **Basic Part** to obtain basic points for the final project. We also describe some advanced items you can do to get more points in the **Advance Part**. Lastly, it is always important for a programmer to be able to clearly describe the program he/she designed and explain how to use it to colleagues, employers, or clients. Hence, **you will need to submit a paper report by 2022/6/12 and orally present your final project in the class (2022/6/14 or 2022/6/16)**. To check whether you are on the right track, we will **check your progress from 2022/5/10 to 2022/5/19**. Please read the following sections for more important information about the final project.

Team

This is a team project that requires **four to five members**. Please find your teammates and register your team at this link: https://forms.gle/wdaGSv3BgQFSX3hj8

Please finish the registration before 2022/4/29. Otherwise, you will not be able to obtain the score of the final project. In general, all team members will receive a similar score for the final project. However, we understand that collaboration is not always an easy task. Therefore, we encourage each team to use version control systems like Github to record the contributions of each team member. If there is any disagreement in a team, we will give different grades to each team member according to the records on the version control system as requested.

Basic Part

Data Type and Data Structure

- Your database system needs to have **at least three** basic data types (e.g., `int, float, char`)
- There should be at least one data with the **string** type in the system.
- There should be at least one kind of data created using structure, union, or enumerations.
- You need to use at least a **linked list** to store some data in your database system.

Operations

Your database system needs to have the following basic operations:

- Add: Add a new item to the database system. The program must print an error message if the item is already in the database.
- Delete: Delete a given item from the database. The program must print an error message if there is no matching item to be deleted in the database.
- Traverse: Print all items in the database in a specific format.
- Search: Given certain information about the item, the program needs to find and print the specific item.
- Sort: Sort all the items in ascending or descending order according to the given data. For example, you can sort products by their prices or expired dates.
- File I/O: Users can import items to the database system from external files and they can also export files of outputs or selected items into files. You can design the special file format for the database system.

Advance Part

- Use advanced data structures that did not cover in this course (e.g., queue or graph).

- Implement the searching or sorting algorithms based on the advanced data structures.
- Nicely designed user interface by using other C libraries.
- Other useful operations to make the database system more useful.

Paper Report

- Each team member's name and student ID number should be at the top of the paper report.
- The report could be written in Chinese or English. However, if you write the report in English, you will get a higher score.
- Here are five sections that you have to include in the report:
    - In the **Introduction** section, you should describe the usage of the database system and briefly explain how to use it. You can check the application descriptions in the App Store or Google Play to see how to properly introduce an application/software/program.
    - In the **Program Design** section, you should describe the structure of the database system by showing the relationship between different source files or functions. You can also check this tutorial on how to create structure charts for a program: https://www.geeksforgeeks.org/software-engineering-structure-charts/
    - In the **Basic Part** section, the report needs to clearly describe what basic parts you have done and explain how you achieve them. You are encouraged to show the corresponding snippet of codes with each basic part to aid your explanation by using Markdown.
    - In the **Advance Part** section, You also need to describe and explain the advanced parts you implemented and why you think they can be viewed as advanced parts.
    - Lastly, in the **Demonstration** section, you need to provide the link to the **Github repository** of your database system so that TAs can clone and execute your database system. You also need to include a README file on GitHub to explain how to execute your program in the Github repository
- **The submission deadline for the paper report in pdf format is 2022/6/12**. We will announce the submission link on eCourse2.

In-class Oral Presentation

- **The date of presentation will be 2022/6/14 or 2022/6/16**. We will run a lottery to determine the order of the presentation one week before the presentation week.
- **The presentation will be oral and in English.**

- The length of the presentation will be 6 to 8 mins depending on the number of teams.
- You need to prepare **slides in English** to
    - In the first slide, please introduce your group member with their name and student ID numbers.
    - For the rest slides, please briefly introduce your database system.
- Lastly, you will need to do a **live demonstration** by executing your database system and performing the most significant and interesting operations on the spot.

Grading

Basic Part (40%)

- (15%) Data Type and Data Structure
- (25%) Operations

Advance Part (20%)

Paper Report (20%)

- (5%) Clarity and Readability of the content and organization
- (5%) Written in English
- (10%) Describe all the requirements of the basic and advanced parts.

In-class Presentation (15%)

- (5%) Clearly introduce the purpose and operations of the database system in English
- (10%) Live Demonstration

Others (5%)

- Design of the database system
- Program structure (e.g., whether divide the program into different source files properly)
- Detailed comments

The Policy of Late Submission

If you failed to submit the paper report in time, you can still submit it by emailing the report to the instructor and TAs **before the presentation**. However, you can only get **half score** of the final project. If you fail to do the presentation, you will get a zero score for the final project.