

SC2002: OBJECT ORIENTED DESIGN & PROGRAMMING

AY23/24 SEMESTER 1 TUTORIAL GROUP SCS5 GROUP 5

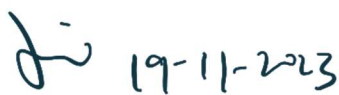
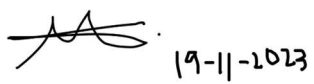
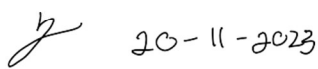
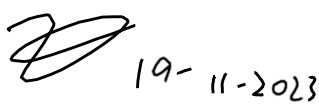
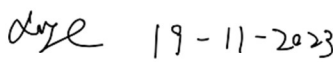
Camp Application and Management System (CAMs)

Declaration of Original Work for CE/CZ2002 Assignment

We hereby declare that the attached group assignment has been researched, undertaken, completed, and submitted as a collective effort by the group members listed below.

We have honored the principles of academic integrity and have upheld Student Code of Academic Conduct in the completion of this work.

We understand that if plagiarism is found in the assignment, then lower marks or no marks will be awarded for the assessed work. In addition, disciplinary actions may be taken.

Name	Course	Lab Group	Signature /Date
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1. Design Considerations

1.1 Approach

The Camp Application and Management System (CAMs) is designed to facilitate the interaction between two distinct user groups: the students and the staff members. Designing classes with the principles of high cohesion and loose coupling in consideration enables the creation of a project that exhibits reusability, extensibility, and maintainability. This, in turn, leads to the development of a system that effectively meets the specified requirements while facilitating readability, upgradability, and future additions.

1.2 Assumptions

The project aligns with the specifications provided in the assignment prompt, incorporating references from the Frequently Asked Questions (FAQ) document. We assume that in the creation of camps, all information is available, and the system does not accept null or blank inputs. We also assume that all inputs are deliberate, as users cannot quit upon starting a camp query or creation process. Another assumption made is that the end users possess the necessary knowledge to use the CAMs program. Hence, no tutorial or supplementary descriptions were provided. The programme's current state does not support concurrent operations, as it was designed with the premise that only one user would be utilising the programme at any given time.

1.3 Design Principles Applied

Design principles encompassed a range of concepts, beginning with the fundamental principles of Object-Oriented Programming and extending to more advanced ideas such as SOLID and design patterns like Model-View-Controller.

1.3.1 Single Responsibility Principle (SRP) from SOLID

SRP states that every program's class, module, or function should have one responsibility/purpose. In our program, we split the camp menu into individual classes, each allowing users to view, edit, create, and join camps. A similar principle is applied to the comment menu, which is a composite of classes to allow interaction with comments. By doing so, each class is dedicated to a specific set of responsibilities, promoting modularity,

maintainability, and a clear separation of concerns in our program. It enhances readability and facilitates future modifications or extensions.

1.3.2 Open Closed Principle (OCP) from SOLID

OCP states that software entities should be open for extension but closed for modification. This enables adding new functionality to a class without changing its existing code. The program adheres to OCP in the User abstract class, which contains all users' general attributes, and its subclasses, namely Student and Staff, extend this structure through specialisation. OCP is also applied in the Comment abstract class, which serves as a base structure extended by its subclasses, Enquiry and Suggestions. This implementation allows for extensibility. With possible additions including a feedback survey class, which can extend the Comment class. Additional features could be added to the program without modifying the base classes, highlighting the more flexible and scalable design.

1.3.3 Liskov Substitution Principle (LSP) from SOLID

The User class and its subclasses (AdminUser, Staff, Student) adhere to this notion in our assignment. When a User is anticipated, we can also use an AdminUser, Staff member, or Student. This principle is also applied to the Enquiry and Suggestion classes that extend the Comment class. Instances of their derived class can substitute the instances of base classes without affecting the correctness of the program. This promotes a high level of abstraction and facilitates polymorphic behaviour.

1.3.4 Interface Segregation Principle (ISP) from SOLID

ISP advocates that classes should only implement interfaces with methods they actually utilise. In our program, this is shown through the CommentHandler interfaces, where CommentHandler classes like StaffReplySuggestion will only realise IReplying interface. Similarly, StudentAddSuggestion only realises IAdding interface. This will avoid the case of classes having to implement a general class that contains methods it does not use, promoting a more focused and tailored implementation aligned with the specific needs of each class.

1.3.5 Dependency Inversion Principle (DIP) from SOLID

DIP requires that high-level modules should not depend on low-level modules. UserMenu class is an example of DIP in our program. UserMenu accepts a User object, which User is an

abstract class. The UserMenu does not need to know the specific type of user (whether it is an AdminUser, Student, or Staff). It only interacts with the User abstraction. This means we can pass any subclass of User to UserMenu, and it will work correctly. In the CommentMenu, it does not need to know what kind of comment (Enquiry or Suggestion), but still allows users to interact with the comments. In both cases, the detailed implementation depends on abstraction, while abstraction does not depend on the detailed implementation.

1.3.6 Singleton Pattern

This pattern restricts the instantiation of a class to a single instance. The utilisation of the Singleton design pattern in the implementation of AllUser and AllCamp guarantees the existence of a sole instance of each class across the entire application. This design choice facilitates a centralised access point for collecting all users and camps. This design pattern guarantees data consistency and integrity since it assures that all code components operate on a unified dataset.

1.3.7 Strategy Pattern

Strategy pattern is used in how classes like StudentEnquiryMenu and StaffSuggestionMenu delegates different behaviours (like adding, editing, deleting, replying, and viewing comments) to different strategies that implement specific interfaces (IAdding, IEditing, IDeleting, IReplying, IViewing). Each interface defines a method for a specific action, and concrete classes like StudentAddEnquiry implement these interfaces to provide the actual behaviour. This design allows for flexible and interchangeable behaviours at runtime. The specific implementation of these interfaces encapsulates the logic for adding a comment. The pattern supports the OCP by allowing new features to be added without modifying existing code.

1.3.8 Model-View-Controller (MVC)

MVC is commonly used for developing user interfaces that divide an application into three interconnected components, making the application more modular and easier to maintain, understand, and develop. We worked hard to follow this design pattern as closely as possible. MVC is evident in the way the packages are divided. The Camp package, Comment package, and User package are the model portion responsible for managing and manipulating the data and responding to requests for information about its state. The controller package comprises the classes that allow for reading of CSV files, filtering of camps and serialising of objects. The menu package is the view portion that displays options available to end users and allows

clients to interact with the program. By segmenting the responsibilities, it facilitates the organisation and development of the program, making it more structured and comprehensible.

2. Reflection

2.1 Difficulties Encountered

Developing a Java application of such a substantial scale from the ground up posed significant challenges. The primary challenge was designing the program to adhere to SOLID design principles. OCP and DIP were the most difficult to follow because both involve managing the dependencies of each class. For OCP, it was tedious in the planning stage to ensure that classes were closed for modification while open for extension. Occasionally, classes needed to be redesigned even after being coded because they were prone to modification. For DIP, deciding which interfaces would be most useful for our code was challenging because of the inevitable changes in the design as it is coded.

Additionally, the need to standardise and link various aspects of the code together posed another challenge. As each member wrote different parts of the code, standardisation of formatting and the use of methods across classes were occasionally problematic. It was critical to knit our individual parts together so that the program runs seamlessly.

Other trivial challenges include reading of the Excel file, as we need to identify the necessary external dependencies needed and, writing to an external file for report generation and ensuring that our program checks all the required functionalities of the CAMS application as stated in the group assignment.

2.2 Knowledge Learned

This task has shown us the importance of applying design principles when coding complex programs in contrast with our more simplistic lab programs, where design principles are not entirely applicable. We better understood how OOP is applied compared to other languages. The pros and cons of utilising an object-oriented programming language were encountered. Learning class separation allows looser coupling and high cohesion, making each class more focused and have a narrower scope. This is achieved by adherence to the design principles stated above. This allows us to have easily readable and modifiable code that is important in a

group setting. It enables each member to minimise the time spent on code reading and more time writing their part of the program. Other concepts learned also include packaging classes together and naming conventions. Using encapsulation allows for a clear separation of user data, teaching us to consider user data privacy. We learned to design a program that considers real-world users and real-world applications.

2.3 Further Improvements

A potential improvement might be achieved by a more precise separation of classes according to MVC, and we could also split up the classes even more for high cohesion. Other features we could have implemented include designing for concurrent users at once, adding users individually and the option to delete users.

3. UML Class Diagram

Visual Programming Standard (Shanghai Technology University)

Figure 1: UML of entity Student & Staff

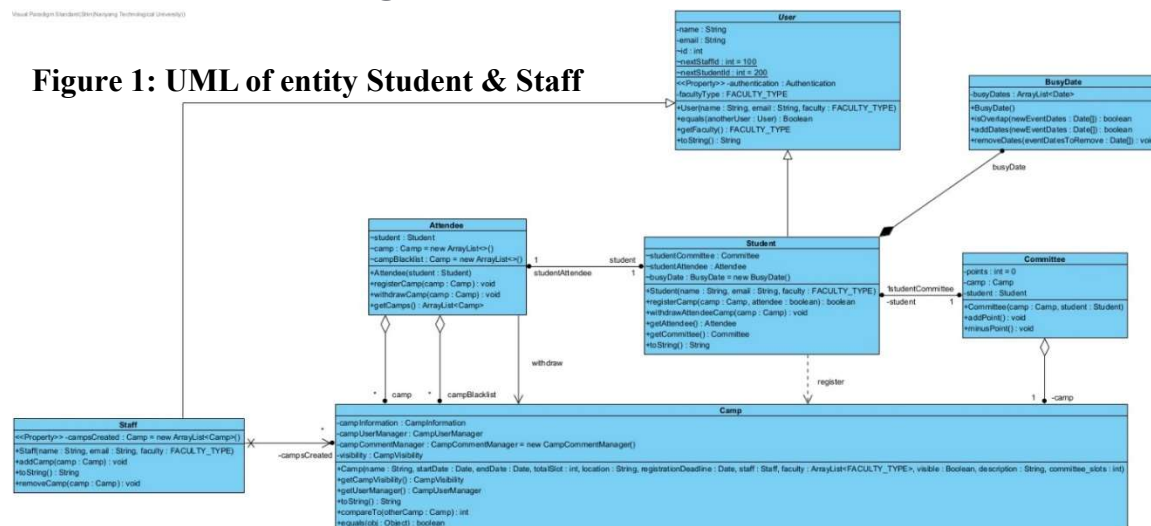


Figure 2: UML of controller Authentication

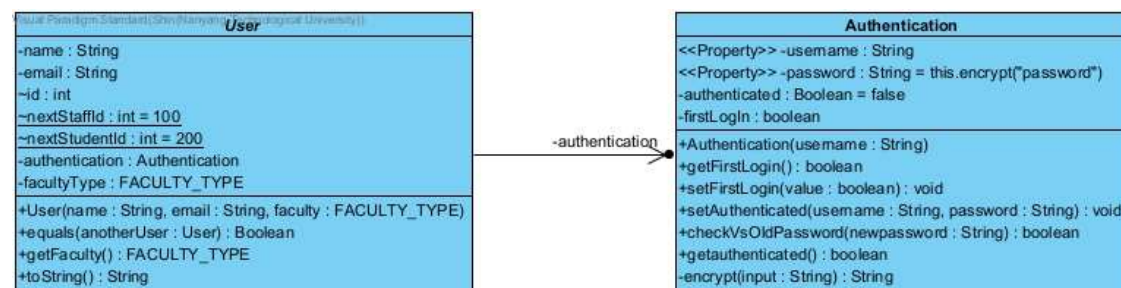


Figure 3: UML of entity Camp

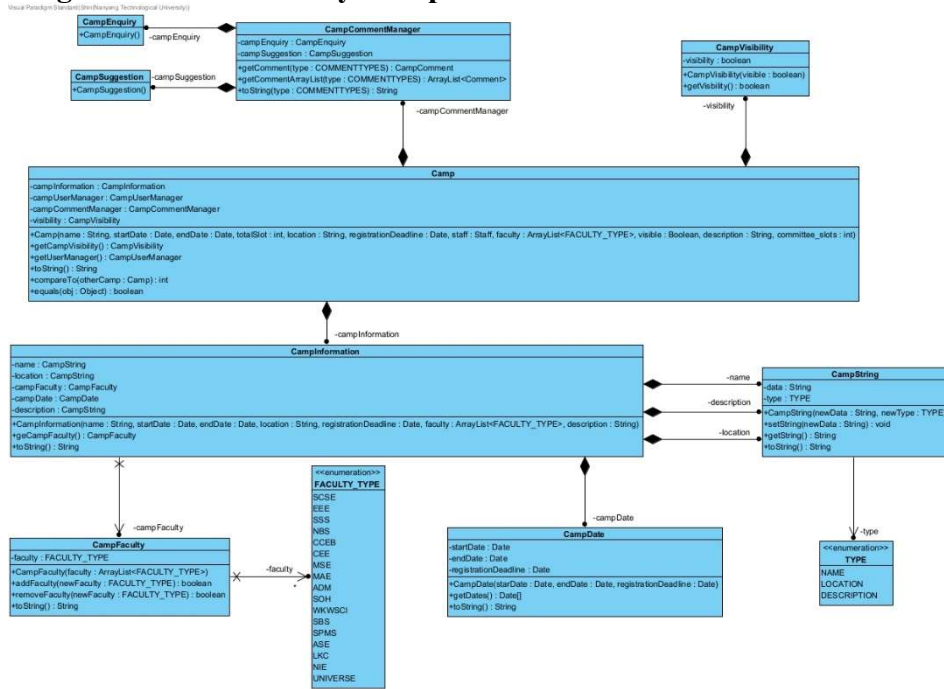


Figure 4: UML of controller AllCamp and AllUser

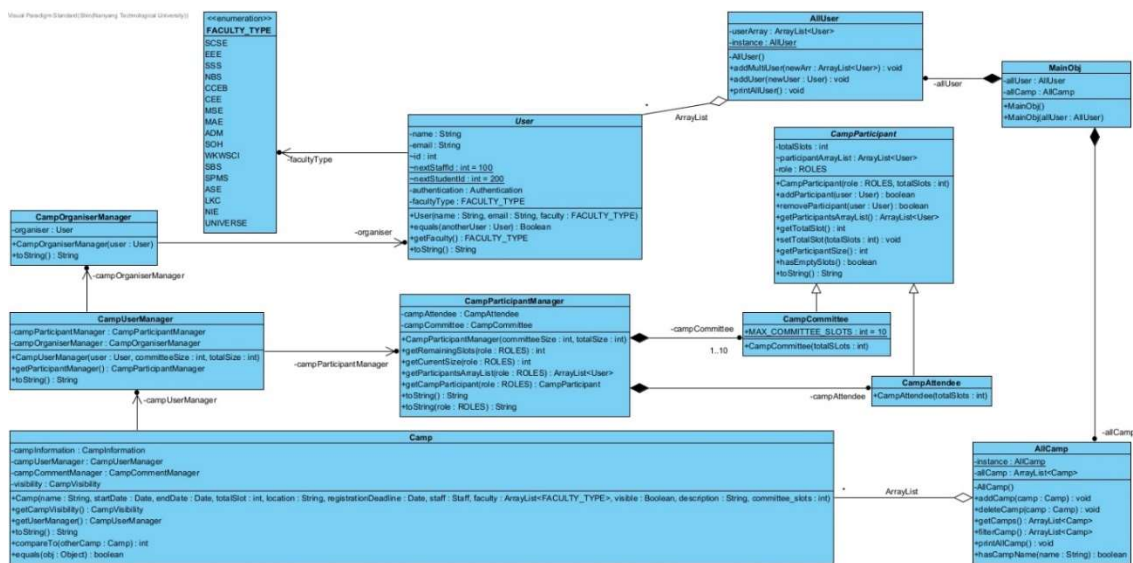


Figure 5: UML of boundary UserMenu

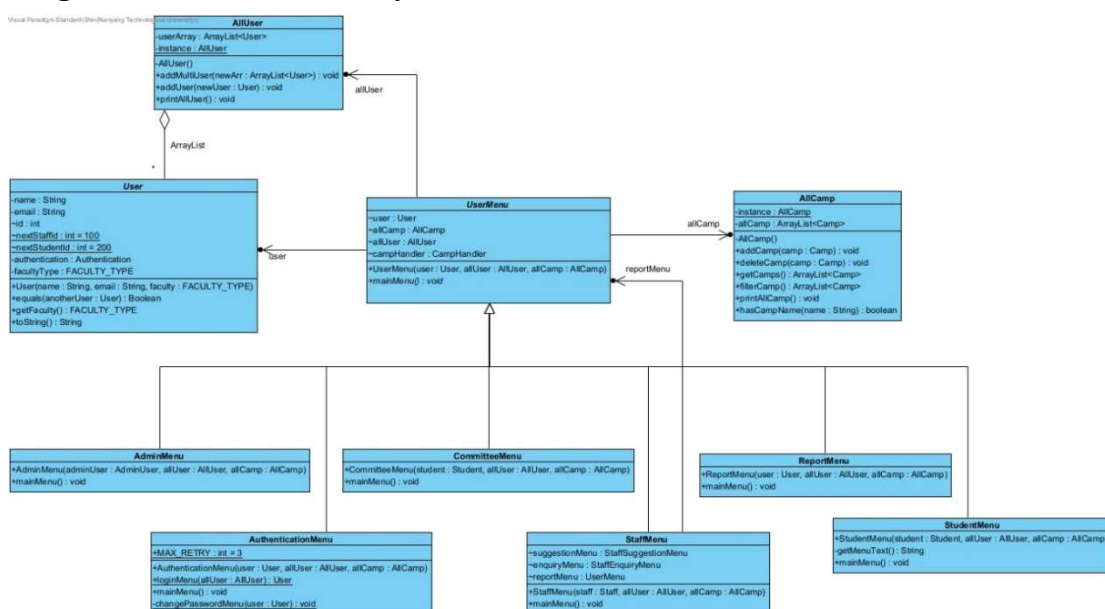


Figure 6: UML of boundary CampHandler

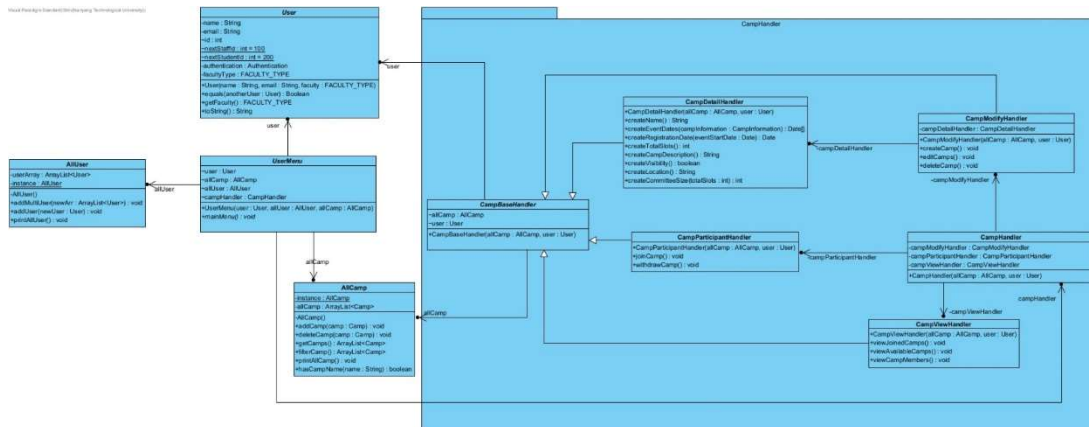
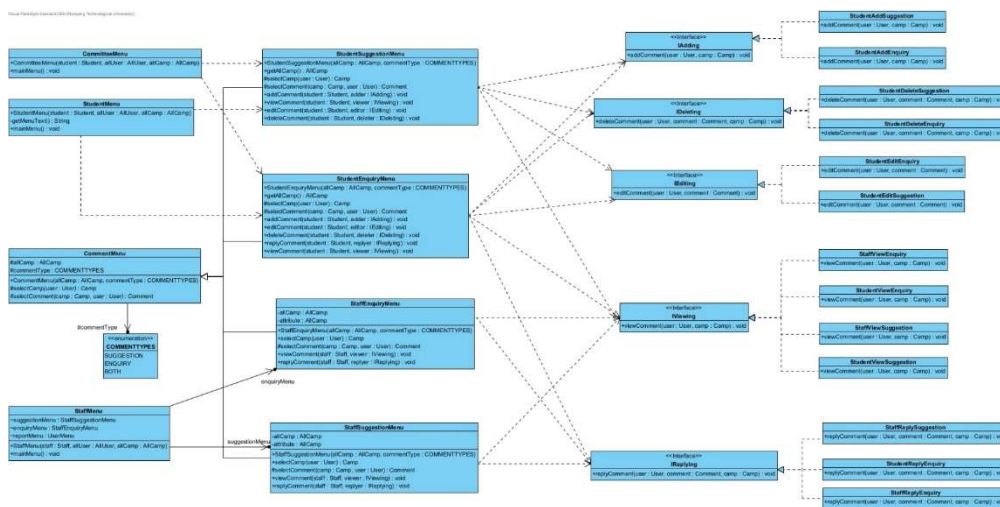


Figure 7: UML of boundary CommentMenu



4. Test Cases and Results

- Wrong input for numerical choice selection screens
- Results: error caught, prompted to re-enter selection

Main menu
 (1) Edit profile
 (2) Camp menu
 (3) Logout
 Choice: a
 Invalid input. Try again!
 Choice:

4.1 Login Page

- Input a name that does not exist
- Results: login page prompted again



Welcome to the Camp Application and Management System

(1) Login
 (2) Quit
 Choice: 1

Enter username and password to log in
 Username: randomname
 Username: admin
 Hello, admin! Key in your password to proceed
 Password:

- Inputting wrong passwords
- Results: Kick back to the main login page after 3 tries

```
Enter username and password to log in
Username: admin
Hello, admin! Key in your password to proceed
Password: pass
Password: passw
Password: passwo

Too many failed attempts!
```

- Inputting old password when prompted to change password or user-initiated change
- Results: Cannot set the old password as new password

```
Enter username and password to log in
Username: hukumar
Hello, MADHUKUMAR! Key in your password to proceed
Password: password

Please change your password on your first login!
Enter new password: password
New password cannot be same as old password! Please try again...
Enter new password: newpassword
Re-enter new password: newpassword
Password updated successfully!
```

- Inputting a wrong password when asked to input the new password twice when changing password
- Results: Cannot change password

```
Enter new password: newpassword
New password cannot be same as old password! Please try again...
Enter new password: newerpassword
Re-enter new password: different
Password does not match. Please try again...
Enter new password: newerpassword
Re-enter new password: newerpassword
Password updated successfully!
```

4.2 Staff Camp Menu

```
Let's create a camp!
Camp name: SCSE TOP
Camp description: oreintation for scse freshies
Total slots: 10
Location: arc
Choose the faculties that can participate:
1.SCSE, 2.EEF, 3.SSS, 4.NBS, 5.CCEB, 6.CEE, 7.MSE, 8.MAE, 9.ADM, 10.SOH, 11.WKWSI, 12.SBS, 13.SPMS, 14.ASE, 15.LKC, 16.NIE, 17.All Faculties, 18.Exit
Faculty 1: 0
Invalid faculty choice. Try again.
Faculty 1: 1
Faculty 2: 18
Visibility:
1. Visible to students 2. Not visible to students
Choice: 3
Invalid input. Please enter 1 for visible or 2 for not visible.
Visibility:
1. Visible to students 2. Not visible to students
Choice: 1
Camp commencement date in yyyy-MM-dd format: 2022-12-12
The date has already passed.
Camp commencement date in yyyy-MM-dd format: 2023-12-12
Camp end date in yyyy-MM-dd format: 2023-12-11
End date must be after the commencement date.
Camp end date in yyyy-MM-dd format: 2023-12-15
Camp registration deadline in yyyy-MM-dd format: 2023-12-13
Registration deadline must be before the commencement date.
Camp registration deadline in yyyy-MM-dd format: 2023-12-10
Committee slots: (Max 10): 11
Committee slots: (Max 10): 5
```

```
Choose what aspect you would like to edit:
(1) Camp Name
(2) Camp Dates
(3) Total Slots
(4) Location
(5) Registration Deadline
(6) Faculties
(7) Visibility
(8) Description
(9) Committee Slots
(10) Exit
Choice: 5
Camp registration date in yyyy-MM-dd format: 2024-01-12
Registration deadline must be before the commencement date.
Camp registration date in yyyy-MM-dd format: 2023-12-10
```

- Inputting various invalid inputs in different fields when creating and editing camp
- Results: Various error checking employed. User asked to re-input valid inputs for errors like numerical selection to invalid date format. Event dates are to follow sequentially

from the registration to the start and end dates. Dates need to be future dates in comparison to local device's date

- Inputting repeated camp name
- Results: Not allowed to repeat camp name as camp name is an ID for camps

```
Choose what aspect you would like to edit:
(1)  Camp Name
(2)  Camp Dates
(3)  Total Slots
(4)  Location
(5)  Registration Deadline
(6)  Faculties
(7)  Visibility
(8)  Description
(9)  Committee Slots
(10) Exit
Choice: 7
There are already students in the camp! Unable to change visibility
```

```
scse top selected
Camp Name: scse top
Camp Dates: Tue Dec 12 00:00:00 SGT 2023 - Tue Dec 12 00:00:00 SGT 2023
Total Slots: 100
Location: arc
Registration Deadline: Tue Dec 12 00:00:00 SGT 2023
Staff: MADHUKUMAR
Faculties: SCSE,
Description: oreintation
Committee Slots: 10
Remaining committee slots: 9
Remaining total slots: 99
There are already students in the camp! Unable to delete camp
```

- Trying to change visibility or delete camp, which has registrations.
- Results: Action not allowed

4.3 Student Camp Menu

- Trying to edit or delete an enquiry that is answered
- Results: Action not allowed

```
1 -> Enquiry 1:
Created by:CHERN | Camp: scse top | Comment: Can go late?

Replies (1):
MADHUKUMAR (2023-11-19 23:32:38) : Yes bro

2 -> Exit

Choice: 1
Enquiry has already been processed!
```

- Trying to join a camp when already registered for another on the same day
- Results: Overlap in schedule identified; action not allowed

```
Ntu camp selected
Camp Name: Ntu camp
Camp Dates: Tue Dec 12 00:00:00 SGT 2023 - Tue Dec 12 00:00:00 SGT 2023
Total Slots: 20
Location: hive
Registration Deadline: Tue Dec 12 00:00:00 SGT 2023
Staff: MADHUKUMAR
Faculties: UNIVERSE,
Description: For all ntu students
Committee Slots: 8
Remaining committee slots: 8
Remaining total slots: 20
Do you want to join as a committee member or attendee? C/A
Choice: A
There's an overlap in your schedule, registration failed!
Registration unsuccessful
```

- Trying to join back a camp that user previously quit
- Results: Action not allowed

```
scse top selected
Camp Name: scse top
Camp Dates: Tue Dec 12 00:00:00 SGT 2023 - Tue Dec 12 00:00:00 SGT 2023
Total Slots: 100
Location: arc
Registration Deadline: Sun Dec 10 00:00:00 SGT 2023
Staff: MADHUKUMAR
Faculties: SCSE,
Description: oreintation
Committee Slots: 10
Remaining committee slots: 9
Remaining total slots: 99
Do you want to join as a committee member or attendee? C/A
Choice: A
Unable to join camp you previously quit...
Registration unsuccessful
```

- Trying to join a camp, which registration deadline has passed
- Results: Action not allowed

```
Choice: 1

Ntu camp selected
Camp Name: Ntu camp
Camp Dates: Tue Dec 12 00:00:00 SGT 2023 - Tue Dec 12 00:00:00 SGT 2023
Total Slots: 20
Location: hive
Registration Deadline: Sun Nov 19 00:00:00 SGT 2023
Staff: MADHUKUMAR
Faculties: UNIVERSE,
Description: For all ntu students
Committee Slots: 8
Remaining committee slots: 8
Remaining total slots: 20
Sorry, the registration deadline for this camp has passed.
```

- Trying to join a filled camp
- Results: Filled camps do not show up on join camp page, however it shows up on all camp page. The camp's information can still be seen, and enquiries, like requesting a camp open more slots, can still be made to a filled camp

```
FULLCAMPTEST selected
Camp Name: FULLCAMPTEST
Camp Dates: Thu Dec 12 00:00:00 SGT 2024 - Thu Dec 12 00:00:00 SGT 2024
Total Slots: 1
Location: home
Registration Deadline: Thu Dec 12 00:00:00 SGT 2024
Staff: MADHUKUMAR
Faculties: SCSE,
Description: to test
Committee Slots: 0
Remaining committee slots: 0
Remaining total slots: 0
```

4.4 Camp Committee Menu

- Trying to enquire about a camp for which user is on the committee
- Results: Action not allowed

```
Choice: 3

scse top selected
Camp Name: scse top
Camp Dates: Tue Dec 12 00:00:00 SGT 2023 - Tue Dec 12 00:00:00 SGT 2023
Total Slots: 100
Location: arc
Registration Deadline: Sun Dec 10 00:00:00 SGT 2023
Staff: MADHUKUMAR
Faculties: SCSE,
Description: oreintation
Committee Slots: 10
Remaining committee slots: 9
Remaining total slots: 99
Committee member cannot raise enquiry for own camp
```

- Trying to edit or delete a suggestion that has been processed(rejected or accepted)
- Results: Action not allowed

```
Select Suggestion:

1 ->  Suggestion 1:
Created by:DENISE | Camp: scse top | Comment: Can we extend the camp dates?
Status: REJECTED

2 ->  Exit

Choice: 1
Suggestion has already been processed. It has been REJECTED
```

- Trying to withdraw from a camp that the user is a committee member of
- Results: Action not allowed; camp withdraw page will not show option for withdrawing from a camp that user is committee for

```
Committee member of: scse top

You haven't signed up for any camp as attendee...
What are we doing today?
(1)  Join camp
(2)  View available camps
(3)  View joined camps
(4)  Withdraw from registered camp
(5)  Enquire about one Camp
(6)  Edit your enquiry
(7)  Delete your enquiry
(8)  View enquiries
(9)  Committee Menu : scse top
(10) Exit
Choice: 4
Would you like to filter camps?
Choice(Y/N)
n
No camps to choose to! Returning to main menu...
```

5. Contributions

Dylan	<ul style="list-style-type: none"> Design and implementation of all entity classes, including camps users and comment as well as their individual subclasses. Development of methods in reading CSV file and serializing objects for data storage and retrieval. Construction of user menu base class and implementation of camp menu.
Xing Jie	<ul style="list-style-type: none"> Generating UML diagrams Development of student and enquiry related features Introducing camp filter for users to select camp by dates/locations Organising CommentMenu with strategy pattern
Jolene	<ul style="list-style-type: none"> Development of CommitteeMenu and suggestion related features Generated presentation flow and slide deck
Matthew	<ul style="list-style-type: none"> Development of Report and ReportMenu Creating story line and test case inputs
Isaac	<ul style="list-style-type: none"> Development of AdminUser and AdminMenu Singleton in AllUser & AllCamp Aesthetics and main program flow and writing report

6. Declaration of GAI assistance

Appendix I: Declaration on Use of GAI (Generative Artificial Intelligence) Assistance in relation to Assignment/Project (to be submitted individually even for group projects)

I, Tan Jin Hao Isaac (student name),
me20009 @e.ntu.edu.sg (NTU email) honestly and sincerely make the following declaration in relation to the following course submission:

- Name of course: Object oriented design & programming
- Course Code: SC2002
- Instructor: Dr Zhang Jie and Dr Li Fang
- Title of Assignment/Project Submission: Camp Application and Management System (CAMS)

In relation to the foregoing I hereby declare that, fully and properly in accordance with the Assignment/Project Instructions I have (checked where appropriate):

- Used GAI as permitted to assist in generating key ideas only. ☐
- Used GAI as permitted to assist in generating a first text only. ☐
- And/or
- Used GAI to refine syntax and grammar for correct language submission only. ☐

Or

- As it is not permitted: Not used GAI assistance in any way in the development or generation of this assignment or project. ☒

I also declare that I have:

- Fully and honestly submitted the digital paper trail required under the assignment/project instructions; and that
- Wherever GAI assistance has been employed in the submission in word or paraphrase or inclusion of a significant idea or fact suggested by the GAI assistant, I have acknowledged this by a footnote and that,
- Apart from the foregoing notices, the submission is wholly my own work.

Appendix I: Declaration on Use of GAI (Generative Artificial Intelligence) Assistance in relation to Assignment/Project (to be submitted individually even for group projects)

I, Matthew Hong Yu Jie (student name),
me20009 @e.ntu.edu.sg (NTU email) honestly and sincerely make the following declaration in relation to the following course submission:

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Appendix I: Declaration on Use of GAI (Generative Artificial Intelligence) Assistance in relation to Assignment/Project (to be submitted individually even for group projects)

I, Dylan Siow (student name),
me20009 @e.ntu.edu.sg (NTU email) honestly and sincerely make the following declaration in relation to the following course submission:

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Dylan Siow
Student Name & Signature

20/11/23
Date

Tan Jin Hao Isaac
Student Name & Signature

19-11-23
Date

I, Jolene Lim (student name),
me20009 @e.ntu.edu.sg (NTU email) honestly and sincerely make the following declaration in relation to the following course submission:

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Jolene Lim
Student Name & Signature

19/11/2023
Date

Matthew Hong Yu Jie
Student Name & Signature

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Or

- As it is not permitted: Not used GAI assistance in any way in the development or generation of this assignment or project. ☒

I also declare that I have:

- Fully and honestly submitted the digital paper trail required under the assignment/project instructions; and that
- Wherever GAI assistance has been employed in the submission in word or paraphrase or inclusion of a significant idea or fact suggested by the GAI assistant, I have acknowledged this by a footnote and that,
- Apart from the foregoing notices, the submission is wholly my own work.

Matthew Hong Yu Jie
Student Name & Signature

19-11-2023
Date