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 beawarded for the assessed work. In addition, disciplinary actions may be taken.

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1. Introduction

The Camp Application and Management System (CAMS) application is designed to the needs of NTU by providing a centralised platform for camp management. Its primary goal is to streamline the processes of camp creation, registration, and user authentication for staff and students. This application enables staff members to efficiently handle camp-related tasks such as the creation of camps. Our development approach revolves around enhancing user experience and ensuring cohesion. Throughout the development of this project, we have considered various design principles to ensure seamlessness, user and programmer friendliness.

2. Application Overview

The core functionalities of CAMs encompass user authentication, camp creation, registration of camps, comprehensive reporting features as well as being able to suggest and enquire details of the camp. Our application's target audience are mainly the students and staff of NTU. We can further categorise students as either a participant or a Camp Committee Member.

- Students: Can easily view, register or enquiry camp details available to them
- Camp Committee Member: Possess student's functionalities with additional privileges to access all details of the camps they are in charge of
    - Ensures a tailored and accessible experience for students
- Staff: Have total control over camp-related tasks, which includes the creation, editing, deletion and management of suggestions and enquiries of camps. Staff can also toggle camps visibility, and manage attendee lists.

CAMs is committed to user-friendliness, allowing for intuitive navigation and straightforward interactions. Additionally, security of the app is of utmost importance. As such, we have implemented measures such as personalised user accounts and passwords.

3. Design Considerations

3.1 Approach Taken

Our group has decided to design CAMs which serves as a unified platform allowing both staff and students to manage, view, and register for camps, consolidating camp-related information and activities. Users are required to login using their NTU network user ID and a default

password 'password', which can be modified. Users are then prompted into different menus based on their user type and given different access to camps. Throughout our project, all information is stored in relevant camp Excel sheets which contain information related to camp committee members, enquiries, suggestions and participants.

3.2 Assumptions Made

- A single user will be using application at any point
- Participants have already been sorted by faculty
- All users can use filters to view the camp list (date, location etc.) Assume that default is by alphabetical order.
- Registration of camp and camp committee is automatic as long as there is vacancy.
- Number of camp committee is counted into total slots

3.3 Principles Used

Building a good program is about making it easy to understand, change and maintain while also keeping it user-friendly and reusable. Our main goal in designing CAMs was to ensure low coupling and high cohesion. To achieve this, we applied the various principles from the course to adhere to key principles during the designing phase, serving as a blueprint for the successful development of CAMs. Applying these concepts made the software easier to change whenever we needed to modify it.

3.3.1 Single Responsibility Principle (SRP)

The SRP plays a pivotal role in the design of CAMs as it ensures that each class within the system adheres to a singular responsibility. We utilised SRP by ensuring that each class does its one and only purpose well which allows us to make changes without having to update other classes.

- For example, in our *ManageCampStaff* class, we designed it such that it contains where the folder paths are located in order for the subclasses to locate them. The only responsibility it has is to list out a menu of the actions Staff can execute to manage camp.

3.3.2 Open-Closed Principle (OCP)

The OCP states that a module should be open for extension but closed for modification. In our project, the adherence to OCP has allowed us to easily introduce new user types and features without modifying existing code. This promotes code flexibility.

- OCP can be observed through inheritance from the various classes. For example, classes like 'User' and 'Student' can be extended to introduce new user types without modifying the existing ones.

3.3.3 Liskov Substitution Principle (LSP)

LSP states that a user of a base class should continue to function properly if a derivative of that base class is passed to it. In other words, subtypes must be substitutable for their base types without affecting CAMS's correctness.

- LSP can be observed through the AssignCSV and UpdateCSV classes where base methods for reading and writing Excel files are created and are then used in its subclasses to perform tasks that edit enquiries, suggestions and camp Excel files.

3.4 OODP Concepts used

3.4.1 Inheritance

Inheritance allows us to derive new classes from existing classes by absorbing their attributes and behaviours, and adding new capabilities in the new classes. This has allowed us to reuse code, and has greatly reduced the effort in implementing new classes.

- CAMs employ inheritance to establish a hierarchy among staff, students, and camp committee members. For example, 'Staff' and 'Student' is-a 'User'.

3.4.2 Encapsulation

Encapsulation involves bundling data and methods that operate on the data into a single class. Access to the data is restricted to methods within the class, enhancing data security.

- In CAMs, encapsulation is evident in the *'User'* class, where the private fields such as 'email' and 'passwords' are encapsulated within the class.

3.4.3 Abstraction

Abstraction is the process of simplifying complex systems by focusing on essential properties, while hiding the unnecessary details. Abstraction provides a blueprint for other classes to follow without specifying the implementation details.

- Abstraction is applied in the definition User, Staff and Student, where essential attributes are identified and abstracted. This provides a clear blueprint for implementation while hiding the unnecessary details when implementing these classes.

3.4.4 Polymorphism

Polymorphism is the ability of objects to take on multiple forms, allowing them to be treated as instances of their parent classes. This allows us to store a subclass object in a superclass variable and invoke a method through a superclass variable.
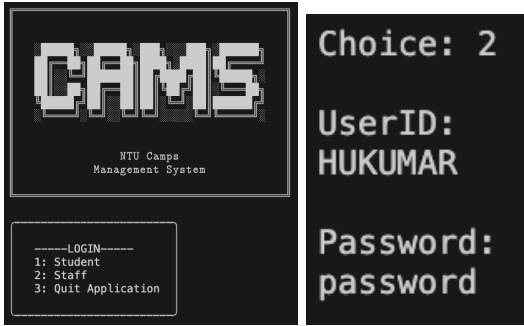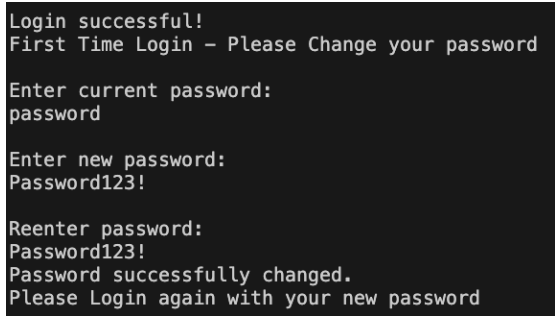
- In CAMs, polymorphism is implied in classes like AssignCSV and UpdateCSV where base methods of reading and writing an excel file are created and are extended to unique classes for the usage of Staff, Camp Committee Members and Participants.

4. UML Class Diagram

For the .drawio file, Click on "Open with diagrams.net" to view a clearer image:

https://drive.google.com/drive/folders/10r-OHYHccFaqTsGpiZ93m5bHrJ5eCCEc?usp=share_link

5. Testing

Login	Change password if first time login

Incorrect password	Successful Login
Login failed. Incorrect UserID or Password. Please try again. UserID:	------Student Profile------ Name: DENISE User ID: DL007 Email: DL007@e.ntu.edu.sg Faculty: SCSE Profile: Camp Committee Member =====Profile Options===== 1: Change Password 2. Camp Directory 3. Log Out ------Staff Profile------ Name: Madhukumar User ID: HUKUMAR Email: HUKUMAR@NTU.EDU.SG Faculty: SCSE Profile: Staff =====Profile Options===== 1: Change Password 2. Camp Directory 3: Log Out
Change password after login Error Checking: - Cannot be same as previous password - Must be 8 characters long - Must contain one upper character - Must contain one special character - New password must be entered twice and must match Re-login once password is changed ------LOGIN------ 1: Student 2: Staff 3: Quit Application Choice: Enter current password: Password123! Enter new password: Password123! Reenter password: Password123! Invalid Password — Same Password	Enter new password: pas Reenter password: pas Password too short. It must be at least 8 characters long Enter new password: Password! Reenter password: Password! Password successfully changed. Enter new password: password Reenter password: password New password must contain at least one uppercase letter. Enter new password: p Reenter password: pas Invalid Password — Passwords do not match. Enter new password: Password Reenter password: Password New password must contain at least one special character (!@#$%^&*).

STAFF

Create camp (Created in new folder, showcase with error for dates)	Change camp details (Change description, location and total_slots), show changes in csv
Manage enquiry (Reply to an enquiry and show change in CSV)	Manage suggestion (Reply to suggestion and show point increase in CM)
Generate camp report (1), show camps with students involved, choose chern and showcase report	Generate performance report

```
Select Report Type to Generate:
1. Camp Report
2. Performance Report
1

---Select Camps filter---
1. All created camps (No filter)
2. By Specified Camp Name
3. Camps with specified Location
4. By Specified faculty
5. Camps with x to y range of total slots
6. Camps with x to y range of occupied slots
7. Camps with x to y range of remaining slots
8. Camps with specified student involved (Either as Participant or Camp Committee Member)
9. Camps with duration within YYYY-MM-DD to YYYY-MM-DD
10. Camps BEFORE closing registration date
11. Camps AFTER closing registration date
1

----Select Student filters----
1. Participants and Camp Committee Members
2. Participants Only
3. Camp Committee Members Only
1

Camp Report #714c1a70-8513-451f-8fa1-89f52cbbdf0b has been created successfully!
```

```
≡ Camp Report #714c1a70-8513-451f-8fa1-89f52cbbdf0b.txt U

Camps > Camp Reports > ≡ Camp Report #714c1a70-8513-451
    1   Camp Name: SCSE TOP
    2   Start Date: 2024-08-15
    3   End Date: 2024-08-18
    4   Registration Closing Date: 2024-08-01
    5   Faculty: SCSE
    6   Location: AIA Canopy
    7   Total Slots: 700
    8   Remaining Slots: 683
```

```
Select Report Type to Generate:
1. Camp Report
2. Performance Report
2

----Select Sorting Type---
1. By Alphabetical Order
2. In Descending Order of Points
3. In Ascending Order of Points
1

Performance Report #ecc5ffb9-b120-45f6-ab6a-d47eea1f9f95 has been created successfully!
```

```
Performance Report #ecc5ffb9-b120-45f6-ab6a-d47eea1f
mps > Performance Reports > ≡ Performance Report #ec
    1   Camp Name: SCSE TOP
    2   Start Date: 2024-08-15
    3   End Date: 2024-08-18
    4   Registration Closing Date: 2024-08-01
    5   Faculty: SCSE
    6   Location: AIA Canopy
    7   Total Slots: 700
    8   Remaining Slots: 683
    9   Camp Committee Slots: 10
   0    Staff in Charge: HUKUMAR
   1    Description: scse orientation
   2
   3    Camp Committee Members | Points
   4    1. AARON | 10
   5    2. CHERN | 33
   6    3. CHLOE | 21
   7    4. ELIJAH | 40
   8    5. WEILIANG | 23
   9
```

Show all camps

```
----------All Camps----------
1. SCSE TOP
2. SCSE TOP 2
3. NBS TOP
4. ADM TOP
5. EEE TOP
6. WKW TOP
7. UOC
```

Delete Camp

```
Choose a camp:
-----Camps Created-----
1.SCSE TOP
2.SCSE TOP 2
3.SCSE TOP 3
3

Would you like to delete the following Camp: 'SCSE TOP 3'

Choice(Y/N): Y
Camp Deleted Successfully
```

Participant

Sign up for camp

```
======Profile Options=====
1: Change Password
2. Camp Directory
3. Log Out

2

------Camp Directory------
1.SCSE TOP
2.SCSE TOP 2
3.UOC

Choose a camp: 1

Participation Slots left:   684
Camp Committee Slots left:  5

What do you want to register as?
1. Camp Participant
2. Camp Committee Member
3. Return to Home Page
1

------Student Profile------
Name:    DENISE
User ID: DL007
Email:   DL007@e.ntu.edu.sg
Faculty: SCSE
Profile: Camp Committee Member

======Profile Options=====
1: Change Password
2. Camp Directory
3. Log Out
```

```
1     Camp Participants
2     CALVIN
3     ASHER
4     LIN
5     EMMA
6     RACHEL
7     BEN
8     KENDRICK
9     NOAH
10    MIA
11    LOGAN
12    AVERY
13    DENISE
```

Withdraw from camp

```
======Profile Options=====
1: Change Password
2. Camp Directory
3. Log Out

2

------Camp Directory------
1.SCSE TOP
2.SCSE TOP 2
3.UOC

Choose a camp: 1

====== SCSE TOP ======
1. Enquiry
2. View Camp Details
3. Withdraw From Camp
4. Return to Main Menu
3
Would you like to withdraw from the following Camp:
SCSE TOP
Choice(Y/N): y

------Student Profile------
Name:    DENISE
User ID: DL007
Email:   DL007@e.ntu.edu.sg
Faculty: SCSE
Profile: Camp Committee Member

======Profile Options=====
1: Change Password
2. Camp Directory
3. Log Out
```

```
1     Camp Participants
2     CALVIN
3     ASHER
4     LIN
5     EMMA
6     RACHEL
7     BEN
8     KENDRICK
9     NOAH
10    MIA
11    LOGAN
12    AVERY
13
```

Sending enquiry

```
====== SCSE TOP ======
1. Enquiry
2. View Camp Details
3. Withdraw From Camp
4. Return to Main Menu
1

What action would you like to perform?
1. Send an enquiry
2. Edit an existing enquiry
3. Delete an existing enquiry
4. Return to Main Menu
1
Enter Enquiry:
This is an enquiry
Enquiry Sent!
```

```
Camps > SCSE TOP > ▦ SCSE TOP_Enquiry.csv
    1    Enquiry,Sender,Respondent,Reply,Status
    2    This is an enquiry,DENISE, , ,Open
```

Editing enquiry

```
====== SCSE TOP ======
1. Enquiry
2. View Camp Details
3. Withdraw From Camp
4. Return to Main Menu
1

What action would you like to perform?
1. Send an enquiry
2. Edit an existing enquiry
3. Delete an existing enquiry
4. Return to Main Menu
2
Enquiry 1: This is an enquiry
Sent by: DENISE

Choose enquiry to edit
1
Enter edit
This is not an enquiry
Edit Sucessful
```

```
Enquiry,Sender,Respondent,Reply,Status
This is not an enquiry,DENISE, , ,open
```

Delete enquiry

```
Enquiry,Sender,Respondent,Reply,Status
```

```
====== SCSE TOP ======
1. Enquiry
2. View Camp Details
3. Withdraw From Camp
4. Return to Main Menu
1

What action would you like to perform?
1. Send an enquiry
2. Edit an existing enquiry
3. Delete an existing enquiry
4. Return to Main Menu
3
Delete enquiry
Enquiry 1: This is not an enquiry
Sent by: DENISE

Choose enquiry to Delete
1
Enquiry deleted
```

CCM

Sign up as camp committee member

```
Camps > SCSE TOP > ▦ SCSE TOP_CampCommitteeMember.csv
  1    Camp Committee Members,Points
  2    AARON,10
  3    WEILIANG,23
  4    CHLOE,21
  5    CHERN,32
  6    ELIJAH,40
  7 |  DENISE,0
```

```
======Profile Options=====
1: Change Password
2. Camp Directory
3. Log Out

2

------Camp Directory------
1.SCSE TOP
2.SCSE TOP 2
3.UOC

Choose a camp: 1

Participation Slots left:   682
Camp Committee Slots left:  5

What do you want to register as?
1. Camp Participant
2. Camp Committee Member
3. Return to Home Page
2

-------Student Profile-------
Name:    DENISE
User ID: DL007
Email:   DL007@e.ntu.edu.sg
Faculty: SCSE
Profile: Camp Committee Member
```

Send suggestion as camp committee member

```
Camps > SCSE TOP > ▦ SCSE TOP_Suggestion.csv
  1    Suggestion,CampComName,Approved
  2    (New Camp Name)SCSE TOP 2,DENISE,false
```

```
------Camp Directory------
1.SCSE TOP
2.SCSE TOP 2
3.UOC

Choose a camp: 1

====== SCSE TOP ======
1. Reply Enquiry
2. View Camp Details
3. Suggestion Management
4. Generate Camp Report
5. Return to Main Menu
3

-------- SCSE TOP Suggestion Actions--------
1.New Suggestions
2.Edit Suggestions
3.Delete Suggestions
4.Return
What do you wish to do?
1

-------- SCSE TOP Suggestions--------
1.Change Name
2.Change Location
3.Change Description
4.Change Camp Dates
5.Change Camp Registration End Date
6.Change Total Participation Slots
7.Quit
Enter Camp Details you wish to change:
1
Enter New Camp Name:
SCSE TOP 2
Suggestion Sent!
DENISE current points: 1
```

Generate camp report

```
Camps > Camp Reports > ≡ Camp Report #c3cff5d4-8f46-4200-922c-22d6b6c69265.txt
   1   Camp Name: SCSE TOP
   2   Start Date: 2024-08-15
   3   End Date: 2024-08-18
   4   Registration Closing Date: 2024-08-01
   5   Faculty: SCSE
   6   Location: AIA Canopy
   7   Total Slots: 700
   8   Remaining Slots: 681
   9   Camp Committee Slots: 10
  10   Staff in Charge: HUKUMAR
  11   Description: scse orientation
  12
  13   Camp Committee Members:
  14   1. AARON
  15   2. CHERN
  16   3. CHLOE
  17   4. DENISE
  18   5. ELIJAH
  19   6. WEILIANG
  20
  21   Participants:
  22   1. ASHER
  23   2. AVERY
  24   3. BEN
  25   4. CALVIN
  26   5. EMMA
  27   6. KENDRICK
  28   7. LIN
  29   8. LOGAN
  30   9. MIA
  31   10. NOAH
  32   11. RACHEL
  33
  34   ----------------------------------------
```

```
-------- SCSE TOP Suggestion Actions--------
1.New Suggestions
2.Edit Suggestions
3.Delete Suggestions
4.Return
What do you wish to do?
4
====== SCSE TOP ======
1. Reply Enquiry
2. View Camp Details
3. Suggestion Management
4. Generate Camp Report
5. Return to Main Menu
4

----Select Student filters---
1. Participants and Camp Committee Members
2. Participants Only
3. Camp Committee Members Only
1

Camp Report #c3cff5d4-8f46-4200-922c-22d6b6c69265 has been created successfully!
```

Reply to enquiry (show CSV of points updated and CSV updated)

```
Enquiry,Sender,Respondent,Reply,Status
This is an enquiry,CHERN,DENISE,This is an enquiry,closed
```

```
====== SCSE TOP ======
1. Reply Enquiry
2. View Camp Details
3. Suggestion Management
4. Generate Camp Report
5. Return to Main Menu
1
Enquiry 1: This is an enquiry
Sent by: CHERN

Select enquiry to reply:
1
Enter Reply:
This is a reply

Reply Sucessful!

Current points: 4
```

6. Reflection

This project has been challenging throughout the course of our project. Creating CAMS we aimed to implement a scalable yet easy to use system, to do so, implementing OOP concepts was crucial in achieving these objectives.

Abstraction and design pattern: At the start of our project, we struggled with understanding the concept of abstraction and effectively implementing design patterns. We placed priority in choosing an appropriate design pattern for each class which required a deep understanding of the problem given to us. However, by frequently revisiting concepts taught in the lecture notes, we were able to overcome this difficulty.

Inheritance VS Composition: Understanding the difference between inheritance and composition was another challenge. Overusing inheritance led to a rigid class hierarchy, while excessive composition could result in overly complex structures. Because of our lack of understanding, our team had to undergo numerous rounds of restructuring in order to attain our current structure. To tackle this, we should regularly engage in code reviews and facilitate the identification of design flaws.

Testing and Debugging: Writing unit tests for classes and ensuring the correct functioning of interactions between objects presented its own set of challenges. Identifying and resolving issues within an intricate web of interconnected objects required a systematic and thorough debugging approach. With experience, we believe that our team would naturally improve in this aspect.

In conclusion, this project has been a valuable learning experience, providing us insights into the intricacies of designing a system such as CAMS. The challenges we encountered allowed us to grow and gain valuable knowledge of OOP principles which has not only improved our project but has also enriched our understanding of software design and development.