Semester 2 - Programming in C#

Assignment 1 - Lifesports

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Requirements

Visual Studio 2010 or higher

Goal

In this assignment you'll build a C# application in which you'll apply all the concepts and constructs that you've learned in the past 5 weeks.

In your must demonstrate your learning of the following topics

1. Inheritance
2. Overriding methods
3. Lists
4. Interfaces
5. Multiple windows

Format

- This assignment is an individual assignment.
- Submission deadline: Tuesday of week 6, 10pm.
- Hand-in through Canvas.
- Upload a ZIP file of the project folder.
- Only hand in your diagrams and project code (don't send executables. So clean your project before submission)

Description

A sporting centre named Lifesports offers sporting facilities to anyone with a membership. They have the following facilities:

1. Swimming pool

2. Gym
3. Dance / Ballet floor
4. Billiards and pool table hall

People who would like to make use of the facilities have to buy a membership to one facilities.

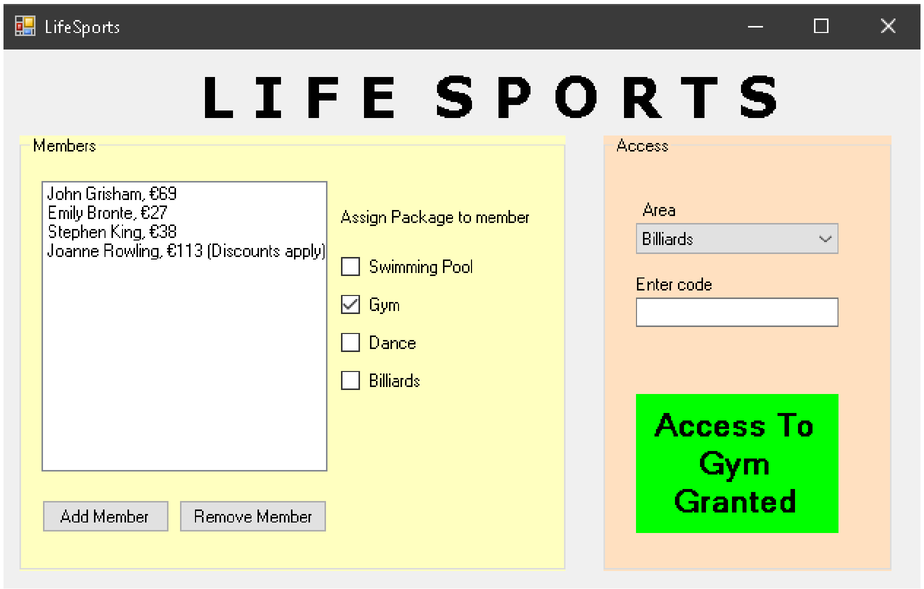
Currently their administration is done in Excel. Needless to say, this is cumbersome. Recently they've also had issues with people entering the facilities without paying.

To solve the above problems Lifesports has tasked you to do two things.

1. Write software to administrate memberships
2. Place gates with card readers at the different areas to prevent unauthorized people from entering the facilities.

Administration software

The application could like like this:



John Grisham, €69
Emily Bronte, €27
Stephen King, €38
Joanne Rowling, €113 (Discounts apply)

Assign Package to member

☐ Swimming Pool
☑ Gym
☐ Dance
☐ Billiards

Area: Billiards

Enter code

Access To Gym Granted

Figure 1: Main screen

Member section

- The listbox shows all the members in the system. Each line shows their name and the total fee they have to pay.

- When the user clicks the "Add Member" button they will see a new window which allows them to input the user details (see below)
- When the user clicks the "Remove Member" button, they will get a confirmation `Do you really want to remove this member? Yes|No` question. Upon confirmation, the member is removed.
- When a member is selected, the checkboxes on the right indicate which packages that member has. A user can changes the selection for that member by clicking the checkboxes. The listbox updates with the correct information. The HasPaid property will be set to `false`.
- When a member has multiple packages, the listbox line will show ("`Discounts Apply`"). Otherwise nothing will be shown. The price in the listbox is the total price for a package, or the discounted price in case of multiple packages.

Card Access

- Card input at the gates is simulated by entering the number into the textbox.
- The system will match each user for the card number or Mobilephone NFC number.
- When the card matches a member and the gate matches the membership, then the system will show:

1. in green: `Access to <member area> granted.` or
2. in red: `Access denied. Wrong area.` or
3. in red: `Access denied. Late payment.` or
4. in red: `Access denied. Unknown card.`

Members

The following details should be registered for a member.

- Given Name. The persons first name; a string. Must not be null or empty
- Family Name. The family name. Can be null or empty
- Membership Id. each sport centre member gets a unique id, auto generated
- Email. The contact email, can be null or empty
- Date of Birth(DOB). a valid date in the past
- HasPaid. Whether the person has paid their fees, defaults to `false`.

Don't forget to also let a user have a card ID or a NFC phone ID or both.

The minimum required data when creating a member is their given name, their DOB and the HasPaid property.

Note: to use the date of birth you can decide to use three integers. Alternatively, you can also use the `DateTime` class.

Membership packages

Choice of the following packages.

1. Swimming pool; €69
2. Gym; €55
3. Dance / ballet; €27
4. Billiards / snooker; €38
5. Multi package

Normaly people take single package memberships. Sometime people will take a multi package membership. In this case a person may buy a Dance and a Gym package together.

A multi package membership gets you discounts on the 2nd, 3rd and 4th package. The first package is 100% the price of a basic package. The second package is 70% of the original price, the third 50% and the fourth and subsequent packages are 35% of the package price.

Use the following structure for the package. You can fill in the missing fields and methods.

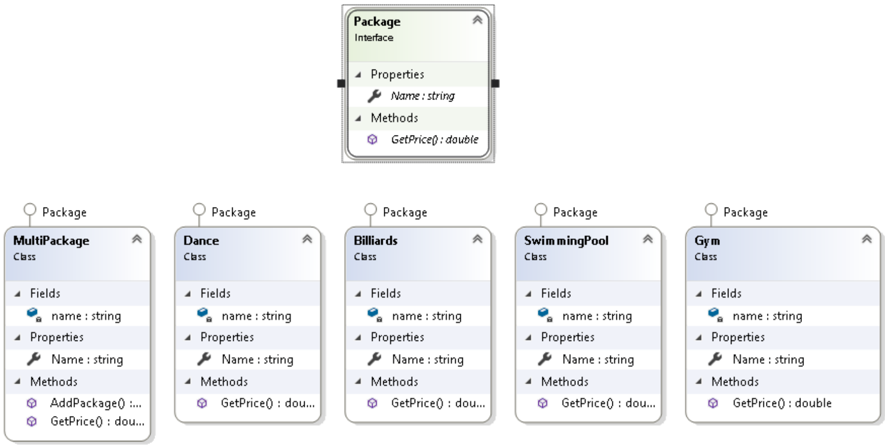


Figure 2: Class Diagram

Note: The software should allow people to sign up or change their packages at any time.

Area gates

To prevent people without memberships from entering the facilities, entrance gates are placed at the doors for each area. To enter an area, you have to present a membership card or mobile phone. Each card has a unique code that links you to your account. The code is then used to validate which packages you purchased. You can only enter the area for which you bought a package.

There are two types of card readers installed at each of the gates.

The first card reader reads a normal credit card sized membership card. A valid code for a card has the pattern: `"###AA###"`. Where `'#'` = a digit from `'0-9'` and `'A'` = any of `'A'`,`'B'`,`'C'`,`'R'`

The second reader scans a mobile phone with NFC capability. A valid code from a phone has the pattern: `'AA;##B###'`. Where `'A'` = any of `'A'`,`'B'`,`'C'`,`'R'`, the `';'` is fixed, `'#'` = a digit from `'0-9'` and the `'B'` is a `'T'` or a `'F'`

When a valid number is detected the program shows a green welcome message and depending on the type of card reader:

First reader: `"Welcome! Don't forget your chip card"`

Second reader: `"Welcome! Thank you for using your mobile phone!"`

When an invalid number is detected the program shows a red warning message: `"Wrong or broken card. Please contact the information desk."`

If a valid card has been detected but the fees have not been paid the system will show an orange warning message: `"Please pay membership fees at the information desk!"`

Assignment deliverables

A zip file with the following:

1. Class diagram of all classes you created (including the classed in the above diagram)
2. Sequence diagram of main events
3. C# project (source code only)

If you have questions regarding the requirements, please ask your teacher.

Extra functionality

Here are some suggested extra exercises that you can do. They are not required but could get improve your learning outcome evaluation.

1. Allow a user to sort the member list by first name or by last name.
2. Calculate the discounts of the family packages in such a way that the highest discounts apply to the cheapest packages.