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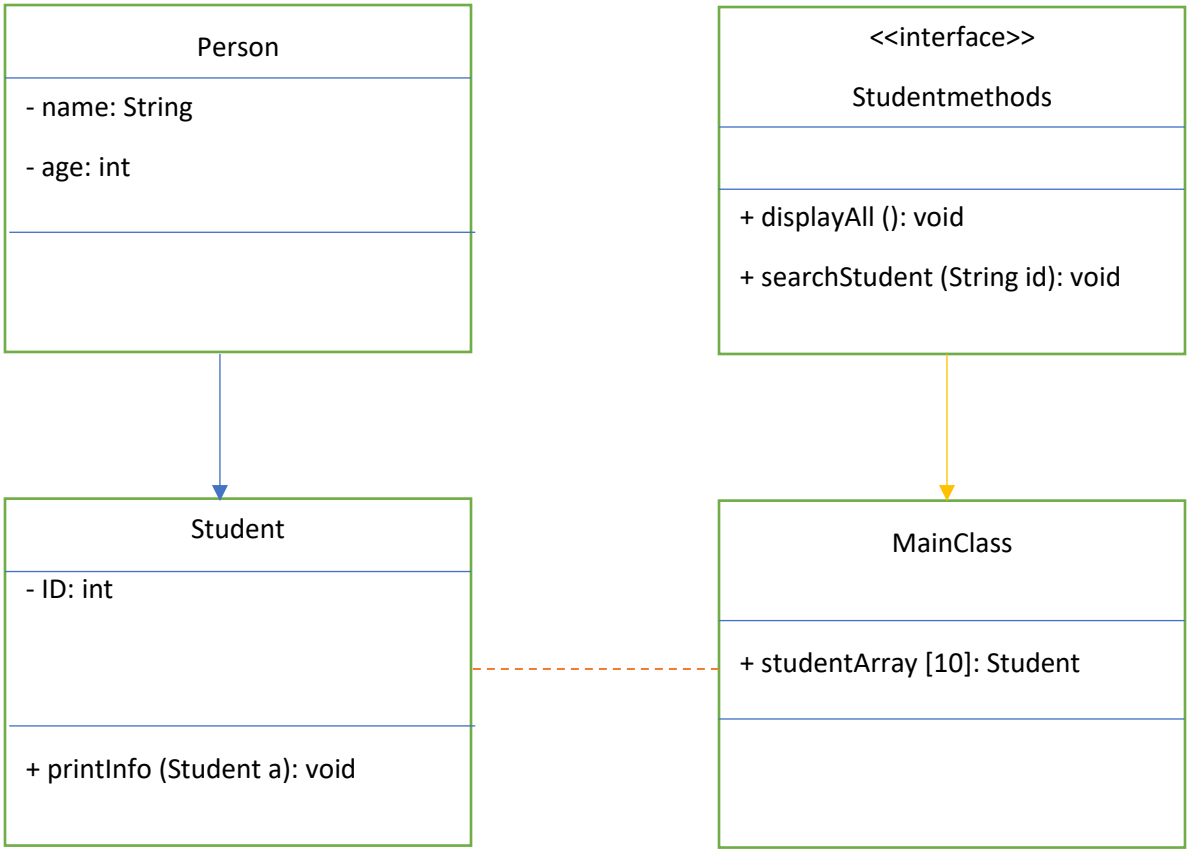
CS310 Data Structures Spring 2020

HomeWork 1

Author original Java code to do the following:

From the given code template establish the relationships from the following class diagram.



Inherits

Imported

Implements

Program Flow:

Main Class implements the Interface StudentMethods.

When MainClass is executed, the following happens:

1. A user menu is displayed for the following:
    a. Insert Student
    b. Delete Student using ID
    c. Search Student using ID
    d. Display All Students
    e. Exit
2. All students are inserted into an array of Student Objects.
3. A Maximum of 10 students may be entered.
4. All Information, Name, Age and ID must be user input (Hint: Use Scanner)
5. To delete a student, the user must input the ID of the student, search the array (excluding nulls) and display the object using Student->printInfo (Student a).
6. After displaying delete the student and replace the object in the array with Null
7. To Search for a Student, user must Input the ID of the student, search the array (excluding nulls) and display the object using Student->printInfo(Student a); This is the method searchStudent(String id) implemented from the Interface.
8. Search does not delete.
9. Display All students, executes the displayAll () method implemented from the Interface. All students in the studentArray must be displayed (excluding nulls).
10. Exit option closes the program.

Error Handling:

Handle the following errors:

1. If user enters an option from the menu that is not valid, display error to the User and repeat the menu.
2. No More than 10 students can be entered, if the array is full, display error message to the user and repeat the menu.
3. If ID already exists, display error message to User that the student cannot be created and repeat menu.
4. If Search or Delete cannot find the student ID to display and delete, print error message to the User and repeat menu.

Methods:

Student class – printInfo (Student a):

This method takes the input of the student object and prints the entire info of the student (Name, age and ID).

Constraints:

1. All variables must have public Getters and Setters
2. Use Scanner for user Input.
3. All Classes must contain Constructors.

Sample Output:

```
User Menu:

Input Choice:

   1. Insert Student
   2. Delete Student by ID
   3. Search Student by ID
   4. Display All Students
   5. Exit

1

Insert Student ID: 1234

Insert Student Name: Jane

Insert Student Age: 21

Student Inserted!

User Menu:

Input Choice:

   1. Insert Student
   2. Delete Student by ID
   3. Search Student by ID
   4. Display All Students
   5. Exit

2

Insert Student ID to Delete: 1236

Student Not Found!

User Menu:

Input Choice:

   1. Insert Student
   2. Delete Student by ID
   3. Search Student by ID
   4. Display All Students
   5. Exit

3

Input Student ID to Search: 1234

ID: 1234 Name: Jane Age: 21

User Menu:

Input Choice:

   1. Insert Student
   2. Delete Student by ID
   3. Search Student by ID
   4. Display All Students
   5. Exit

1

Insert Student ID: 1237

Insert Student Name: John

Insert Student Age: 21

Student Inserted!

User Menu:

Input Choice:

   1. Insert Student
   2. Delete Student by ID
   3. Search Student by ID
   4. Display All Students
   5. Exit

4

ID: 1234 Name: Jane Age: 21

ID: 1237 Name: John Age: 21

User Menu:

Input Choice:

   6. Insert Student
   7. Delete Student by ID
   8. Search Student by ID
   9. Display All Students
   10.      Exit

5 Good Bye!
```

Files to be submitted:

Submit a ZIP file (ZIP file must have your First and Last Name) containing the following:

1. ReadMe File - PDF:
    a. Analyze the Time complexity of the following methods:
        i. searchStudent (String id)
        ii. displayAll ()

        Derive the complete time function and mention the tightest bound Big O of both these methods.
    b. List and briefly explain all class used in your programming Assignment.
2. JAR file of the following classes:
    a. Person
    b. Student
    c. MainClass
    d. StudentMethods.java (Interface)
3. Run.bat – Executable batch file to run the program.