MASTERING EMBEDDED SYSTEM ONLINE DIPLOMA

First Term (Final Project 2)

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Problem Statement

Write a program for a student information management system that do as follows:

1. **Store Student First Name**

2. **Store Student Last Name**

3. **Store student Roll number (unique for each student)**

4. **Store GPA for each student**

5. **Store courses registered by each student**

Approach

Use queue to be the database of the system having the following functions:

1. **Add students from file**

2. **Add students Manually**

3. **Find students by roll number**

4. **Find students by first name**

5. **Find students in a specific course and their number**

6. **Total number of students in the system**

7. **Update Student**

8. **Delete Student**

Note

Max number of courses to be register for each student is 10 due to different levels and semesters so students can have different number of courses registered.

The Main make sure that I used correct queue type (linear or circular) but print error if you choose something else and exit program and prints a warning if choose linear.

Implementation

Main Code (interface with the user)

Student.h has functions prototypes for the student management system

Student.c has functions definitions

Myfunctions.h has prototype for helping functions in student.h

Myfunctions.c has definitions for helping functions in student.h

Simulation

Error when choosing wrong queue type:

```
 main.c ⊠   myFunctions.c   student_functions.c   student_functions.h
 18 /*This function just display options for the user to choose from*/
 19⊕void display_options()□
 37⊕int main(void)
 38 {
 39     FIFO_Status_t student_queue_status;/*that is a variable to store the queue status*/
 40     student_queue_status=FIFO_init(&student_queue,NUMBER_OF_STUDENTS,students,5);
 41     /*we initialize the queue to be circular giving number of element and place in memory to Be stored*/
 42     if(student_queue_status==FIFO_ALLOCATION_ERROR )
 43     { /*Make sure memory is accessible*/
 44         _PRINTF("[ERROR] Initializing the buffer\n");
 45         return 0;/*Exit if not*/
 46     }
 47     if(student_queue_status==FIFO_WRONG_TYPE)
 48     {/*Make sure queue is correct data type linear or circular*/
 49         _PRINTF("[ERROR] Wrong buffer type\n");
 50         return 0;/*Exit if not*/
 51     }
 52     if(student_queue.type==Linear)
 53     {/*WARN user that his fifo is linear*/
 54         _PRINTF("[WARNING] You chose fifo to be linear so you cannot exceed adding [number of students = %d]\n",NUMBER_OF_STU
 55     }
 56
 57     /*Welcome user*/
```

```
 Problems  Tasks  Console ⊠  Properties  Outline  Build Targets  Task List
<terminated> (exit value: 0) Student Management System.exe [C/C++ Application] C:\Users\abdel\workspace\Student Management System\Debug\Student Management System.exe (8/9/24, 7:53 P
[ERROR] Wrong buffer type
```

Warning when choose linear buffer:

```
 main.c ⊠   myFunctions.c   student_functions.c   student_functions.h
 18 /*This function just display options for the user to choose from*/
 19⊕void display_options()□
 37⊕int main(void)
 38 {
 39     FIFO_Status_t student_queue_status;/*that is a variable to store the queue status*/
 40     student_queue_status=FIFO_init(&student_queue,NUMBER_OF_STUDENTS,students,Linear);
 41     /*we initialize the queue to be circular giving number of element and place in memory to Be stored*/
 42     if(student_queue_status==FIFO_ALLOCATION_ERROR )
 43     { /*Make sure memory is accessible*/
 44         _PRINTF("[ERROR] Initializing the buffer\n");
 45         return 0;/*Exit if not*/
 46     }
 47     if(student_queue_status==FIFO_WRONG_TYPE)
 48     {/*Make sure queue is correct data type linear or circular*/
 49         _PRINTF("[ERROR] Wrong buffer type\n");
 50         return 0;/*Exit if not*/
 51     }
 52     if(student_queue.type==Linear)
 53     {/*WARN user that his fifo is linear*/
 54         _PRINTF("[WARNING] You chose fifo to be linear so you cannot exceed adding [number of students = %d]\n",NUMBER_OF_
 55     }
 56
 57     /*Welcome user*/
```

```
 Problems  Tasks  Console ⊠  Properties  Outline  Build Targets  Task List
Student Management System.exe [C/C++ Application] C:\Users\abdel\workspace\Student Management System\Debug\Student Management System.exe (8/9/24, 7:54 PM)
[WARNING] You chose fifo to be linear so you cannot exceed adding [number of students = 50]
Welcome to the Student Management System
Choose The Task to be be performed
-----------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
```

1] Displaying options:

```
Problems  Tasks  Console ×  Properties  Outline  Build Targets  Task List
Student Management System.exe [C/C++ Application] C:\Users\abdel\workspace\Student Management System\Deb
Welcome to the Student Management System
Choose The Task to be be performed
------------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice:
```

2]Add Student manually:

```
Student Management System.exe [C/C++ Application] C:\Users\abdel\workspace\Student Management System\Debug\Student Management System.exe (8/9/24
Choose The Task to be be performed
-----------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 1
Adding Student Data:-
------------------------------
Enter roll number: 6408
Enter Student First Name: Medhat
Enter Student Last Name: Saleh
Enter Student GPA: 2.1
Press -1 when finishing adding course
Enter course ID: 151
Press -1 when finishing adding course
Enter course ID: 200
Press -1 when finishing adding course
Enter course ID: 114
Press -1 when finishing adding course
Enter course ID: -1
Finished taking course
[INFO] Student added successfully
Print total number of students on the system:-
-------------------------------------------------------------
Number of students you have : 1
Total Available spaces : 49
MAX NUMBER OF STUDENTS TO ADD : 50
```

2] Add student Manually with already roll number taken:

```
Choose The Task to be be performed
------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 1
Adding Student Data:-
----------------------------
Enter roll number: 6408
[ERROR] Roll number entered twice
Print total number of students on the system:-
-------------------------------------------------------------
Number of students you have : 1
Total Available spaces : 49
MAX NUMBER OF STUDENTS TO ADD : 50
```

We only have one student from pervious adding so we can't add the second student

3] Adding students from text file and one of them has repeated roll number

```
1 9733 Abdelrahman Emam 1.97 151 211 114
2 7100 Abdelrahman Hassan 2.9 114
3 6751 Yassin Amin 2.7 114
4 5401 Ziad Walid 2.8 114 151
5 9733 Ahmed Ibrahim 2.1 114 151
6
```

Data in the text file

```
Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 2
Enter file to read from with its extension: data.txt
[INFO] Student added successfully
[INFO] Student added successfully
[INFO] Student added successfully
[INFO] Student added successfully
[ERROR] Roll number already exists
Print total number of students on the system:-
-------------------------------------------------------------
Number of students you have : 5
Total Available spaces : 45
MAX NUMBER OF STUDENTS TO ADD : 50
```

Last student was not added as he has same roll number of first one

so the first 4 students is added so total now is 5

4]Search for student using roll number (make sure only one is found)

```
Choose The Task to be be performed
---------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 3
Searching for student using Roll number:-
-------------------------------------------------------------
Enter student roll number: 9733
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Emam
[INFO]          GPA: 1.97
[INFO]          Roll Number: 9733
[INFO]          Courses enrolled: 151     211     114
```

5] search for roll number not in the database

```
Choose The Task to be be performed
---------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 3
Searching for student using Roll number:-
-------------------------------------------------------------
Enter student roll number: 1010
[ERROR] Student is not found make sure that student is in the system previously or check roll number is correct
 Roll number entered is : 1010
 _____
```

6] Find Students by first name:

```
Choose The Task to be be performed
------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 4
Searching for student using First Name:-
------------------------------------------------------------
Enter student First Name: Abdelrahman
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Emam
[INFO]          GPA: 1.97
[INFO]          Roll Number: 9733
[INFO]          Courses enrolled: 151     211     114
******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Hassan
[INFO]          GPA: 2.90
[INFO]          Roll Number: 7100
[INFO]          Courses enrolled: 114
******************************
```

7] Search for student not in the data base by first name:

```
Choose The Task to be be performed
------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 4
Searching for student using First Name:-
------------------------------------------------------------
Enter student First Name: Mariam
[ERROR] Student is not found make sure that student is in the system previously or check First Name is correct
 First Name entered is : Mariam
```

8]Search students in a course

```
Choose The Task to be be performed
-----------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 5
Searching for students using course ID:-
-----------------------------------------------------------
Enter course ID: 151
[INFO]          First Name: Medhat
[INFO]          Last Name: Saleh
[INFO]          GPA: 2.10
[INFO]          Roll Number: 6408
[INFO]          Courses enrolled: 151     200     114
******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Emam
[INFO]          GPA: 1.97
[INFO]          Roll Number: 9733
[INFO]          Courses enrolled: 151     211     114
******************************
[INFO]          First Name: Ziad
[INFO]          Last Name: Walid
[INFO]          GPA: 2.80
[INFO]          Roll Number: 5401
[INFO]          Courses enrolled: 114     151
******************************
```

```
******************************
[INFO]          First Name: Ziad
[INFO]          Last Name: Walid
[INFO]          GPA: 2.80
[INFO]          Roll Number: 5401
[INFO]          Courses enrolled: 114     151
******************************
[INFO] Number of students in the course is 3
```

(took same student twice to prove it is related to the same course and screenshot)

9]Search for a course is not in the database

```
Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 5
Searching for students using course ID:-
------------------------------------------------------
Enter course ID: 11111
[ERROR] Student is not found make sure that student is in the system previously or check course ID is correct
 Course ID entered is : 11111
```

10]Total Number of students

```
Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 6
Print total number of students on the system:-
-------------------------------------------------------------
Number of students you have : 5
Total Available spaces : 45
MAX NUMBER OF STUDENTS TO ADD : 50
```

11] Show all students:

```
Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 9
Printing students data:-
-----------------------------------
[INFO]          First Name: Medhat
[INFO]          Last Name: Saleh
[INFO]          GPA: 2.10
[INFO]          Roll Number: 6408
[INFO]          Courses enrolled: 151     200     114
*******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Emam
[INFO]          GPA: 1.97
[INFO]          Roll Number: 9733
[INFO]          Courses enrolled: 151     211     114
*******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Hassan
[INFO]          GPA: 2.90
[INFO]          Roll Number: 7100
[INFO]          Courses enrolled: 114
*******************************
```

```
*******************************
[INFO]          First Name: Yassin
[INFO]          Last Name: Amin
[INFO]          GPA: 2.70
[INFO]          Roll Number: 6751
[INFO]          Courses enrolled: 114
*******************************
[INFO]          First Name: Ziad
[INFO]          Last Name: Walid
[INFO]          GPA: 2.80
[INFO]          Roll Number: 5401
[INFO]          Courses enrolled: 114     151
*******************************
```

12]Delete Student

```
Choose The Task to be be performed
------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 7
Searching for student to delete using roll number:-
---------------------------------------------------------
Enter student roll number to delete: 5401
[INFO] Student deleted successfully
```

13]Try to delete student not in the database

```
Choose The Task to be be performed
------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 7
Searching for student to delete using roll number:-
---------------------------------------------------------
Enter student roll number to delete: 11111
[ERROR] Student is not found make sure that student is in the system previously or check roll number is correct
 Roll number entered is : 11111
```

14]Make sure student is deleted previously is not in the database

```
Choose The Task to be be performed
----------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 9
Printing students data:-
----------------------------------
[INFO]          First Name: Medhat
[INFO]          Last Name: Saleh
[INFO]          GPA: 2.10
[INFO]          Roll Number: 6408
[INFO]          Courses enrolled: 151     200     114
******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Emam
[INFO]          GPA: 1.97
[INFO]          Roll Number: 9733
[INFO]          Courses enrolled: 151     211     114
******************************
[INFO]          First Name: Abdelrahman
[INFO]          Last Name: Hassan
[INFO]          GPA: 2.90
[INFO]          Roll Number: 7100
[INFO]          Courses enrolled: 114
******************************
```

```
*******************************
[INFO]          First Name: Yassin
[INFO]          Last Name: Amin
[INFO]          GPA: 2.70
[INFO]          Roll Number: 6751
[INFO]          Courses enrolled: 114
*******************************


_____

Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 6
Print total number of students on the system:-
-----------------------------------------------------------
Number of students you have : 4
Total Available spaces : 46
MAX NUMBER OF STUDENTS TO ADD : 50
```

As we can see number of students decreased by 1 and the deleted student not in the database

15]Update student data (GPA)

```
Choose The Task to be be performed
----------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 8
Searching for student using Roll number to update:-
---------------------------------------------------------
Enter student roll number: 9733
Select field to be updated
1]First Name
2]Last Name
3]GPA
4]Courses ID
5]Roll Number
Enter your choice: 3
Enter student GPA: 2.4
[INFO]GPA changed to 2.40
Data updated successfully
Student now:
[INFO]        First Name: Abdelrahman
[INFO]        Last Name: Emam
[INFO]        GPA: 2.40
[INFO]        Roll Number: 9733
[INFO]        Courses enrolled: 151     211     114
```

16]Update student roll number to be like another roll number

```
------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 8
Searching for student using Roll number to update:-
-------------------------------------------------------
Enter student roll number: 7100
Select field to be updated
1]First Name
2]Last Name
3]GPA
4]Courses ID
5]Roll Number
Enter your choice: 5
Enter student Roll Number: 9733
[ERROR] Roll Number already assigned to another student
Roll Number entered 9733
Data updated successfully
Student now:
[INFO]        First Name: Abdelrahman
[INFO]        Last Name: Hassan
[INFO]        GPA: 2.90
[INFO]        Roll Number: 7100
[INFO]        Courses enrolled: 114
```

As we can see student data did not change

17]Updating student not in the database

```
Choose The Task to be be performed
---------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 8
Searching for student using Roll number to update:-
-------------------------------------------------------
Enter student roll number: 11111
[ERROR] Student is not found make sure the roll number is entered perviosuly or correct
Roll number entered 11111
```

18]If we want to delete, update, show students when the database is empty.

```
Welcome to the Student Management System
Choose The Task to be be performed
---------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 9
[ERROR] There is no students data
```

```
Choose The Task to be be performed
-----------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 8
[ERROR] There is no students data
```

```
Choose The Task to be be performed
-------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 7
[ERROR] There is no students data
```

19]Add students when queue is full

```
Welcome to the Student Management System
Choose The Task to be be performed
------------------------------------------
1] Add Students Details Manually
2] Add Students Details From Text File
3] Find Student Details by Roll Number
4] Find Student Details by First Name
5] Find Student Details by Course
6] Find Total Number of Students
7] Delete Students Details by Roll Number
8] Update Students Details by Roll Number
9] Show All Information
10] Exit
Enter your choice: 2
Enter file to read from with its extension: data.txt
[INFO] Student added successfully
[INFO] Student added successfully
[ERROR] There is no enough places to add students
```

Change queue size to 2 so data.txt file is more than the queue can handle.

Link for codes:

https://github.com/Abdelrahman-Ahmed-Emam/Embedded_System_Online_Diploma.git