CS162 – Programming Techniques

Lab 06
Stack & Queue

Cảm ơn thầy Trần Duy Quang đã cung cấp template cho môn học

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Notes

Create a single solution/folder to store your source code in a week.

Then, create a project/sub-folder to store your source code of each assignment.

The source code in an assignment should have at least 3 files:

- A header file (.h): struct definition, function prototypes/definition.
- A source file (.cpp): function implementation.
- Another source file (.cpp): named YourID_Ex01.cpp, main function. Replace 01 by id of an assignment.

Make sure your source code was built correctly. Use many test cases to check your code before submitting to Moodle.

2

Content

In this lab, we will review the following topics:

- Stack, queue and their applications.

3

Assignments

A: YY: 01

H: YY: 05 (choose 1 in [3.1, 3.2], choose 1 in [3.3, 3.4])

3.1 Stack as an Array

Implement a stack of integer with the following functions:

1. **init(s, capacity):** create an empty stack.
2. **push(s, x):** add an integer to stack.
3. **pop(s):** remove the top element from stack, return the value of the removed one.
4. i**sEmpty(s):** check whether a stack is empty or not.
5. **empty(s):** make a stack empty.
6. **size(s):** get the number of elements in the stack.

```
struct Stack{
    int *data; // dynamic array
    int top; // index of top element
    int capacity; // size of stack
};
```

3.2 Stack as a Linked List

Implement a stack of integer with the following functions:

1. **init(s, capacity):** create an empty stack.
2. **push(s, x):** add an integer to stack.
3. **pop(s):** remove the top element from stack, return the value of the removed one.
4. i**sEmpty(s):** check whether a stack is empty or not.
5. **empty(s):** make a stack empty.
6. **size(s):** get the number of elements in the stack.

```
struct Node{
    int data;
    Node *next;
};

struct Stack{
```

```
    Node *head;
    int capacity;
};
```

3.3 Queue in an Array

Implement a queue of integer with the following methods:

1. **init(s, capacity):** create an empty queue.
2. **enqueue(s, x):** add an integer to queue.
3. **dequeue(s):** remove the oldest element from queue, return the value of the removed one.
4. i**sEmpty(s):** check whether a queue is empty or not.
5. **empty(s):** make a queue empty.
6. **size(s):** get the number of elements in the queue.
7.

```
struct Queue
{
    int *data;
    int in;
    int out;
    int capacity;
};
```

3.4 Queue in a Linked List

Implement a queue of integer with the following methods:

1. **init(s, capacity):** create an empty queue.
2. **enqueue(s, x):** add an integer to queue.
3. **dequeue(s):** remove the oldest element from queue, return the value of the removed one.
4. i**sEmpty(s):** check whether a queue is empty or not.
5. **empty(s):** make a queue empty.
6. **size(s):** get the number of elements in the queue.

```
struct Queue{
    Node *head;
    Node *tail;
    int capacity;
};
```

3.5 Decimal base to binary, hex base

1. Convert an unsigned integer from decimal base to binary base, and vice versa
2. Convert an unsigned integer from decimal base to hex base, and vice versa

3.6 Stack in STL

Write a report to show how to use stack in C++ Standard Template Library

https://www.cplusplus.com/reference/stack/stack/

3.7 Individual Project Report

Write a short paragraph (at least 10 sentences) to describe 1 task you have completed in the project in this week (2021-04-06 – 2021-04-12). **A task must be done only by 1 member.**

Your report should answer the following questions:

What is the name of your task?

Write a short description about this task.

What is the start date that you began to work on this task and the end date that you finished this task?

What is the number of working hours you spent for this task?

Screenshot the commit in your Github/Bitbucket/GitLab project.