GeeksQuiz

Computer science mock tests for geeks

Search

- Home
- Latest Questions
- Articles
- C/C++ Programs
- Contribute
- Books

Subscribe

How to create mergable stack?

September 26, 2014

Design a stack with following operations.

a) push(Stack s, x): Adds an item x to stack s
b) pop(Stack s): Removes the top item from stack s
c) merge(Stack s1, Stack s2): Merge contents of s2 into s1.

Time Complexity of all above operations should be O(1).

If we **use array** implementation of stack, then merge is not possible to do in O(1) time as we have to do following steps.
a) Delete old arrays
b) Create a new array for s1 with size equal to size of old array for s1 plus size of s2.
c) Copy old contents of s1 and s2 to new array for s1
The above operations take O(n) time.

We can **use a linked list** with two pointers, one pointer to first node (also used as top when elements are added and removed from beginning). The other pointer is needed for last node so that we can quickly link the linked list of s2 at the end of s1. Following are all operations.
a) push(): Adds the new item at the beginning of linked list using first pointer.
b) pop(): Removes an item from beginning using first pointer.
c) merge(): Links the first pointer second stack as next of last pointer of first list.

Can we do it if we are not allowed to use extra pointer?
We can do it with **circular linked list**. The idea is to keep track of last node in linked list. The next of last node indicates top of stack.
a) push(): Adds the new item as next of last node.
b) pop(): Removes next of last node.

c) merge(): Links the top (next of last) of second list to the top (next of last) of first list. And makes last of second list as last of whole list.

This article is contributed by **Rahul Gupta**. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above

Tags: Stack

Related Questions:

- Binary Heap
- Delete all occurrences of a given key in a linked list
- Deque | Set 1 (Introduction and Applications)
- A data structure for n elements and O(1) operations
- Convert left-right representation of a bianry tree to down-right
- Print level order traversal line by line
- C Program for Red Black Tree Insertion
- Can we reverse a linked list in less than O(n)?

Like 3 Tweet 0 +1 1

3 Comments GeeksQuiz Login

Recommend Share Sort by Best

Join the discussion…

StrictMath • 2 months ago

Its just like expanding Gray codes.
Each stack will be represented as individual circular linked list.

```
S14 <-- S15 <-- S16 <-- S17................S25 --> S24 --> S23
...|....................................A....................A.........................|
..V....................................|......................|.........................V
S13 --> S12 --> S11 --> S10(L)........(L)S20 <-- S21 <-- S22
```

We maintain just the "last" pointers:
last (S1) = S10, last (S2) = S20
The top of the stack is the next of last, ie top(S1) = last(S1)->next

1) Push(S1, x):
- Create S18
- S18->next = last(S1)->next

- last(S1) ->next = S18

2) Pop(S1):
- temp = last(S1)->next;
- last(S1)->next = temp->next;
- free(temp)

3) Merge S2 to S1:
- Connect S20 --> S17
- Connect S10 --> S25
- new_last (S) = S20

^ | v • Reply • Share ›

Ashish Jaiswal • 2 months ago

Can any one suggest the code here???

^ | v • Reply • Share ›

irjax • 4 months ago

Hi,
Could you please elaborate a bit more about this-

c) merge(): Links the top (next of last) of second list to the top (next of last) of first list. And makes last of second list as last of whole list.

How are you linking the 2 lasts?
If i understand it correct The 2 lists are in the opposite directions, so am not understanding the relation here.

^ | v • Reply • Share ›

Subscribe Add Disqus to your site Privacy

Categories

- Articles (124)
    - Algorithms (24)
    - C (16)
    - C++ (17)
    - Data Structures (29)
    - DBMS (1)
    - Interview Experiences (6)
    - Java (2)
    - Operating Systems (1)
    - Puzzle (12)
    - Searching and Sorting (10)
- Programs (35)
- Quizzes (2,106)
    - Aptitude (2)
    - Computer Science Quizzes (2,103)
        - Algorithms (147)
        - C (207)
        - C++ (129)
        - Computer Organization and Architecture (1)
        - Data Structures (132)
        - DBMS (2)
        - GATE (1,406)
        - Java (51)
        - Operating Systems (28)
    - Web technologies (1)

Recent Discussions

- Vidhi

  Process P2 will start it's last I/O operation...

  Operating Systems | Process Synchronization | Question 4 · 1 day ago

- xerosanyam

  This article is slightly less clear in one...

  A Programmer’s approach of looking at Array vs. Linked List · 1 day ago

- Aditya Goel

  Please include Heap overflow condition as well....

  Queue | Set 2 (Linked List Implementation) · 1 day ago

- Aditya Goel

We can initialize rear as -1 with no change in...

Queue | Set 1(Introduction and Array Implementation) · 1 day ago

- Sg

  Implementing this question leaves an extra...

  GATE | GATE-CS-2015 (Set 3) | Question 22 · 2 days ago

- jyuan92

  What if I want to handle the situation that,...

  Remove comments from a given C/C++ program · 2 days ago

-