2-10 Elementary Data Structures

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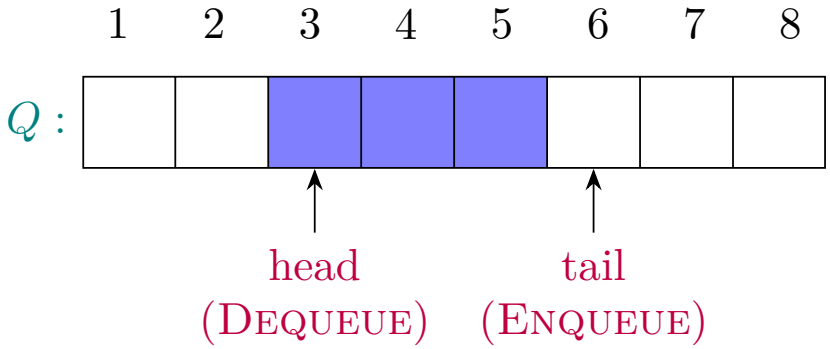
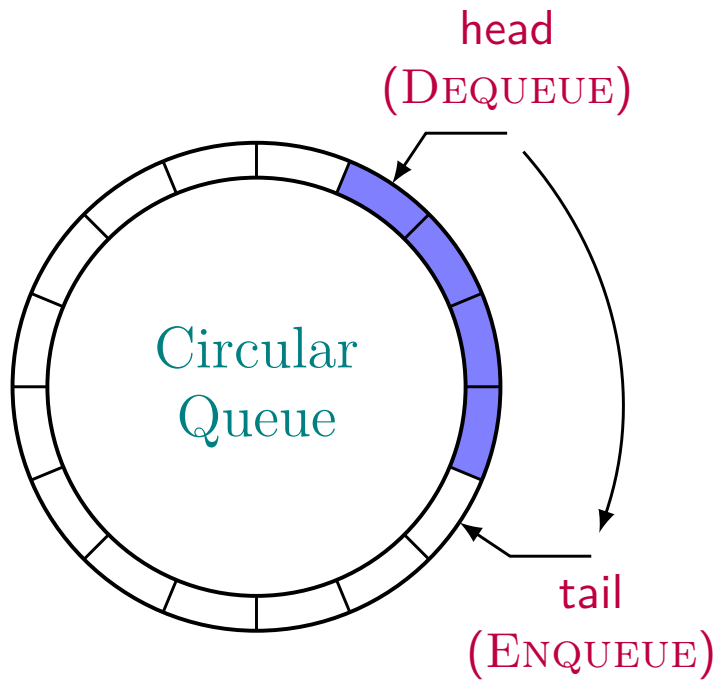
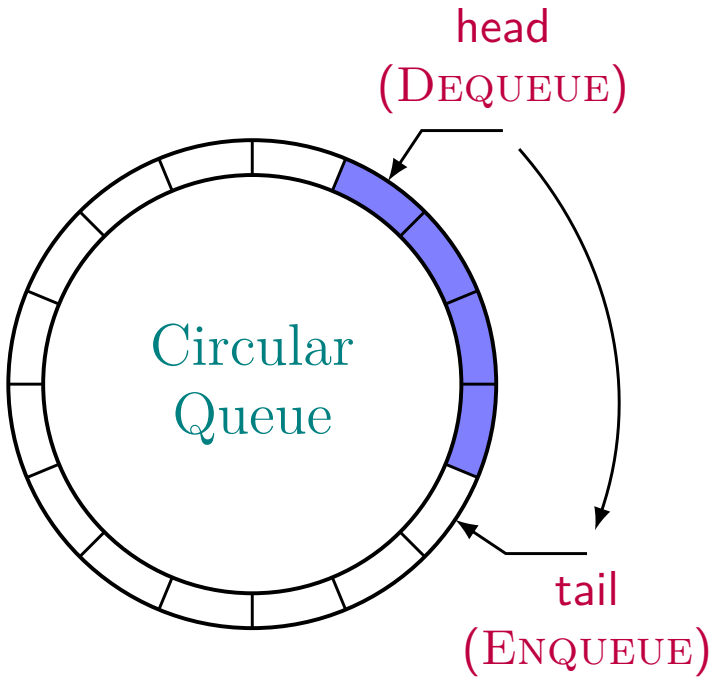
SO
EASY





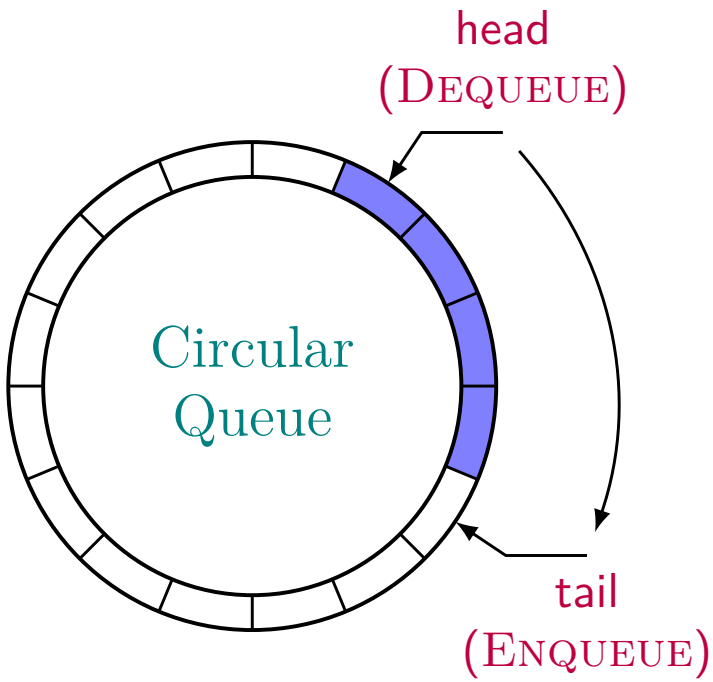
head & teal: following the same direction

Underflow and Overflow of a Circular Queue (Problem 10.1-4)



procedure DEQUEUE(Q)
  if $Q.head = Q.tail$ **then**
    return "UNDERFLOW"
  ...

procedure ENQUEUE(Q, x)
  if $Q.head = Q.tail + 1$ **then**
    return "OVERFLOW"
  ...



反馈: tail 为什么指向最后一个元素的后面? 这个太难受了。

Queue-Empty

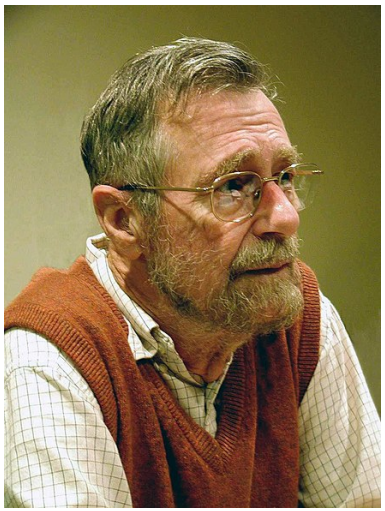
$[l, r)$ $(l, r]$ $[l, r]$ (l, r)

EWD831-0

Why numbering should start at zero EWD831.html

To denote the subsequence of natural numbers 2, 3, ..., 12 without the pernicious three dots, four conventions are open to us:

a) $2 \leqslant i < 13$
b) $1 < i \leqslant 12$
c) $2 \leqslant i \leqslant 12$
d) $1 < i < 13$



Why Numbering Should Start at Zero

A Queue, Two Stacks (Problem 10.1-6)

Show how to implement a queue using two stacks.
Analyze the running time of the queue operations.

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procedure ENQUEUE(x)
    Push(S_1, x)

procedure DEQUEUE()
    if $S_2 = \emptyset$ **then**
        while $S_1 \neq \emptyset$ **do**
            Push$\Big(S_2,$ *Pop*$(S_1)\Big)$
    Pop(S_2)

Correctness?

$$\textsc{Enq}(x, t_1), \textsc{Enq}(y, t_2) \wedge t_1 < t_2$$
$$\Longrightarrow$$
$$\textsc{Deq}(x, t_3), \textsc{Deq}(y, t_4) \wedge t_3 < t_4$$

item	Push into S_1	Pop from S_1	Push into S_2	Pop from S_2
x	1	1	1	1

$$\hat{c}_{\text{ENQ}} = 4$$
$$\hat{c}_{\text{DEQ}} = 0$$

$$\hat{c}_{\text{ENQ}} = 3$$
$$\hat{c}_{\text{DEQ}} = 1$$

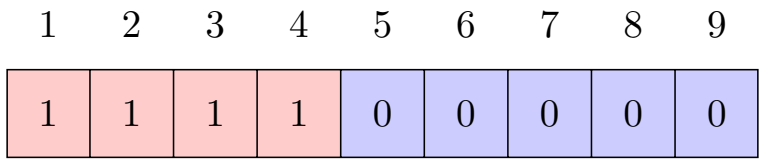
Compactify-List (Problem 10.3 – 5)

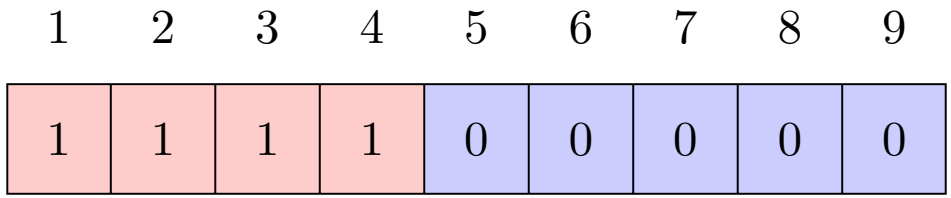
Compactify-List(L, F)

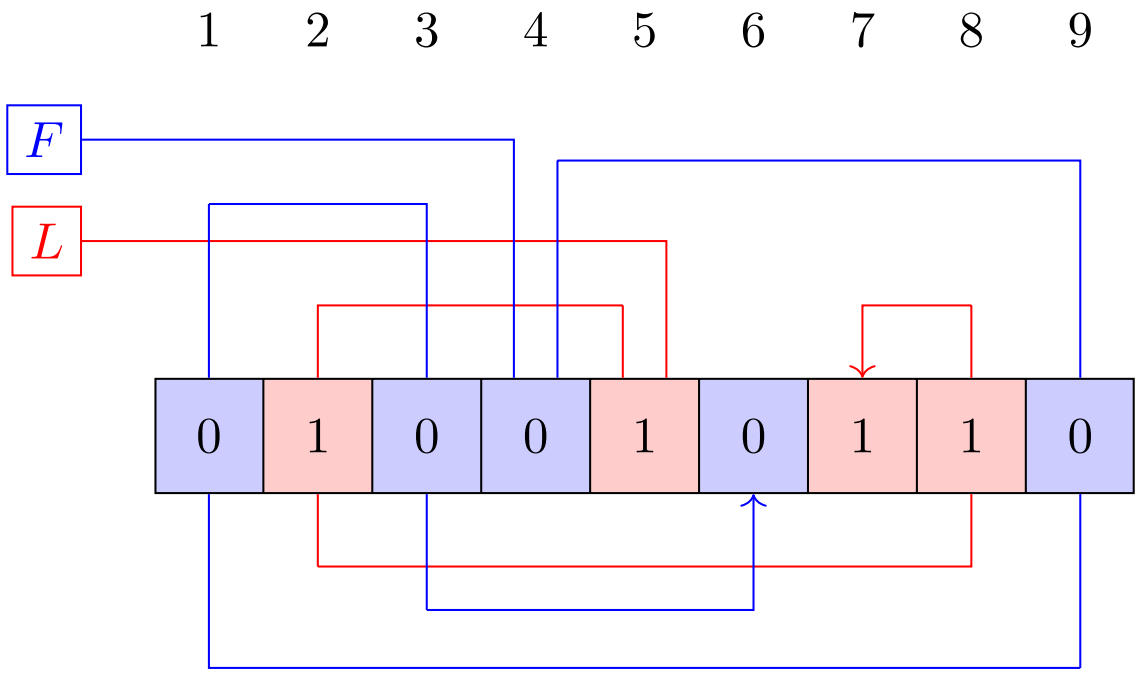
L : doubly linked list, $|L| = n$

F : doubly linked free list, $|F| = m - n$

$\Theta(n)$



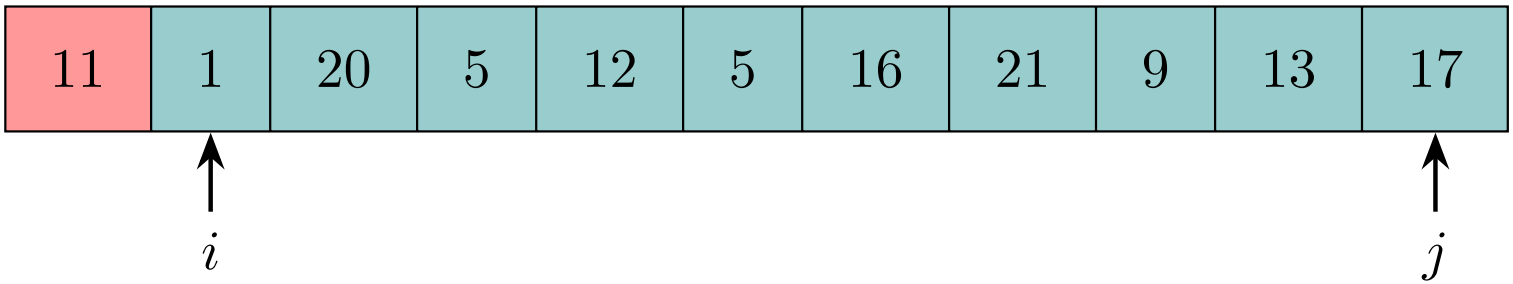




Swap $(0, 1)$ pairs

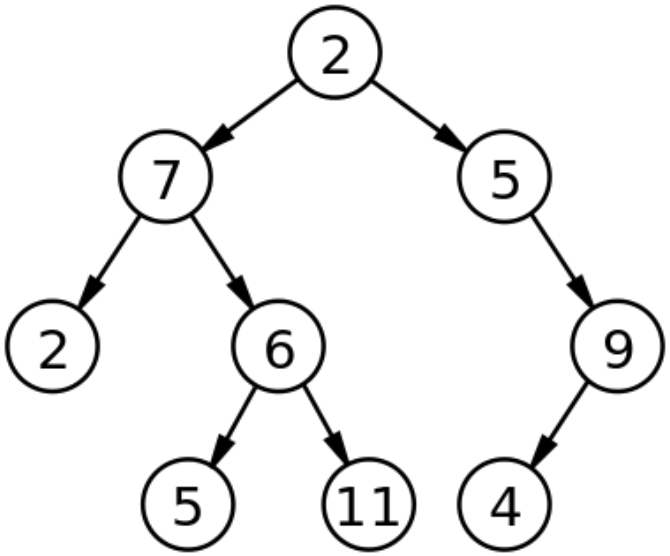
$\Theta(n)$

Hoare-Partition



Recursive Binary Tree Traversal (Problem $10.4 - 2$)

$O(n)$



procedure RECURSIVE-DFS(t)

print $t.key$

if $t.left \neq$ NIL **then**

RECURSIVE-DFS($t.left$)

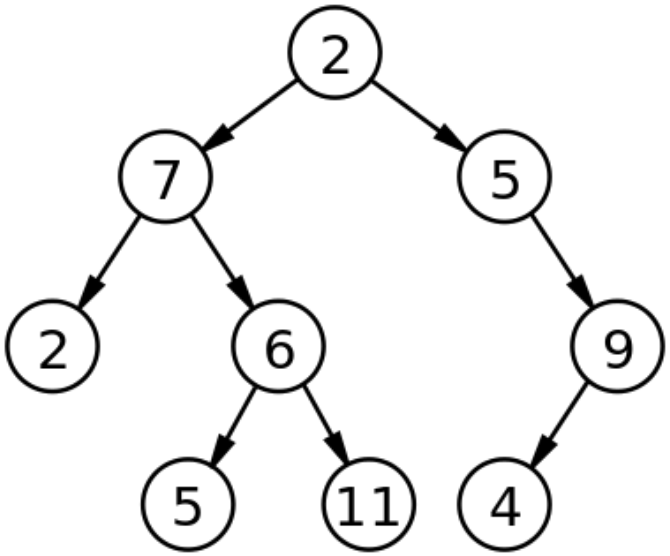
if $t.right \neq$ NIL **then**

RECURSIVE-DFS($t.right$)

RECURSIVE-DFS($T.root$)

Non-recursive Binary Tree Traversal (Problem $10.4 - 2$)

$O(n)$



procedure ITERATIVE-DFS(t)
  S.PUSH(t) ▷ S : stack

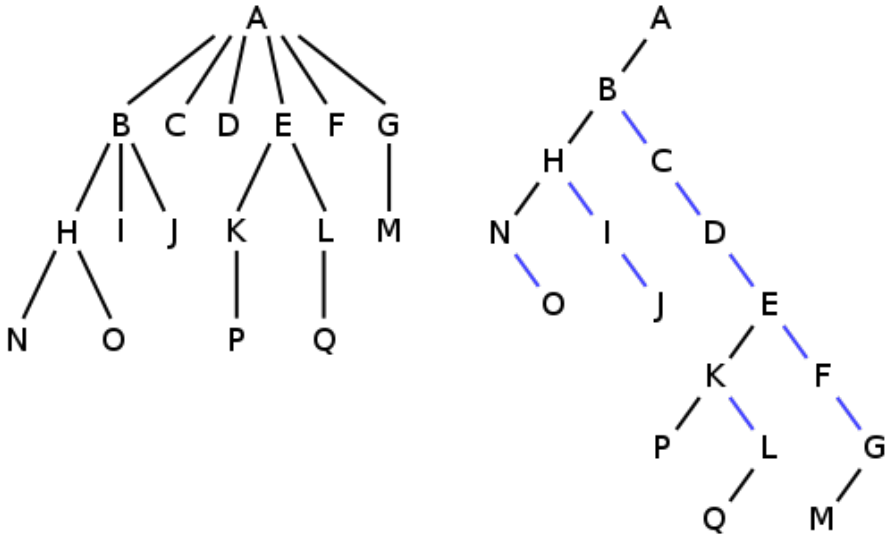
  while $S \neq \emptyset$ **do**
    $v \leftarrow S$.POP()
    print $v.key$

    if $v.right \neq$ NIL **then**
      S.PUSH($v.right$)
    if $v.left \neq$ NIL **then**
      S.PUSH($v.left$)

ITERATIVE-DFS($T.root$)

"LCRS" Tree Traversal (Problem $10.4 - 2$)

$O(n)$

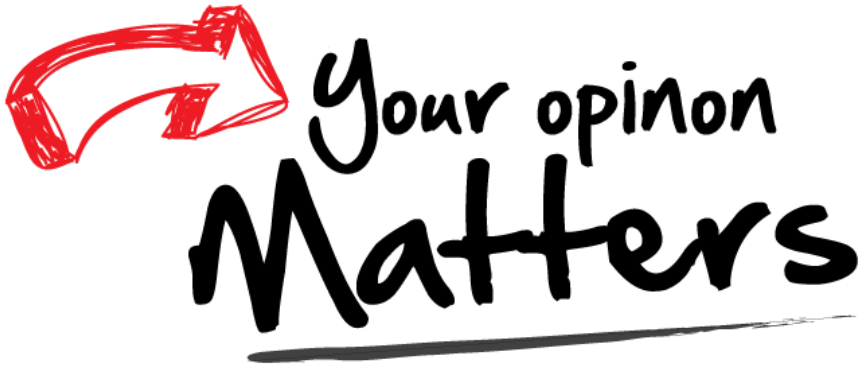


procedure RECURSIVE-DFS(t)
  print $t.key$

  if $t.lc \neq$ NIL **then**
    RECURSIVE-DFS($t.lc$)
  if $t.rs \neq$ NIL **then**
    RECURSIVE-DFS($t.rs$)

RECURSIVE-DFS($T.root$)


Thank
You!



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