Computer Programming 143 – Lecture 29
Dynamic Data Structures II

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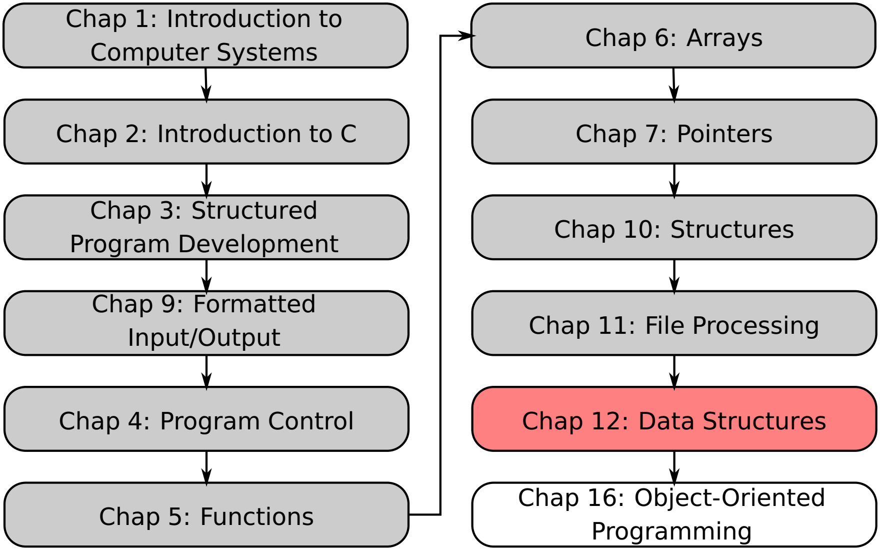
Module Overview


Chap 1: Introduction to Computer Systems
Chap 2: Introduction to C
Chap 3: Structured Program Development
Chap 9: Formatted Input/Output
Chap 4: Program Control
Chap 5: Functions
Chap 6: Arrays
Chap 7: Pointers
Chap 10: Structures
Chap 11: File Processing
Chap 12: Data Structures
Chap 16: Object-Oriented Programming

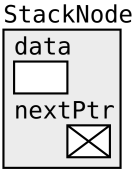
Lecture Overview

12.5 Stacks

Stacks

- Constrained version of a linked list
  - Is a row/line of self-referential structures
- Elements may only be inserted or deleted from the top (front) of a stack
  - A stack is therefore a last-in-first-out structure (LIFO)

```
struct stackNode {
    int data;
    struct stackNode *nextPtr;
};
typedef struct stackNode StackNode;
```

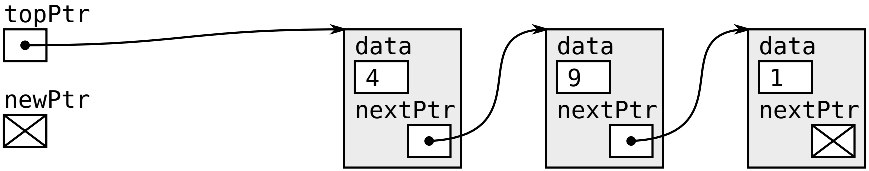


Use of stacks

- Function calls – store of return address and automatic local variables
- Used by compilers when evaluating expressions

12.5 Insertion in Stacks (“Push”)

```
newPtr = malloc( sizeof( StackNode ) );
newPtr->data = value;
newPtr->nextPtr = topPtr;
topPtr = newPtr;
```



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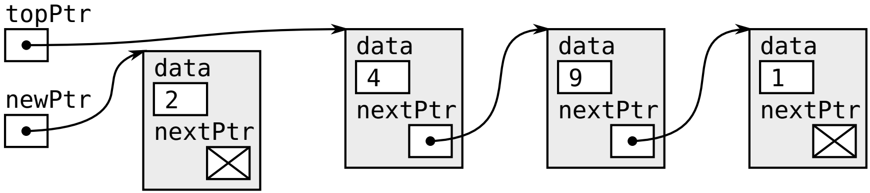

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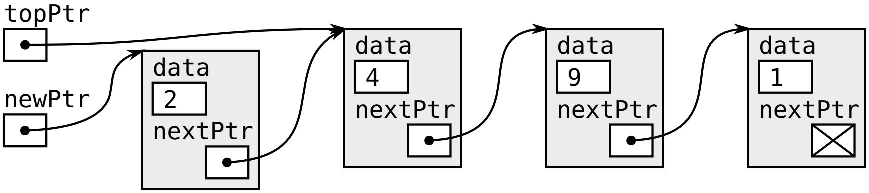

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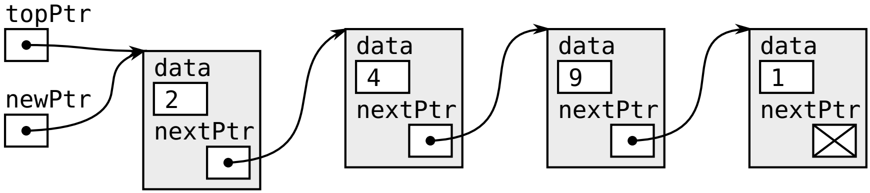


12.5 Deletion in Stacks (“Pop”)

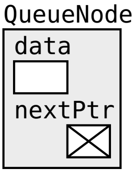
```
\\ Class exercise / Klasoefening















\\
```

12.6 Queues

Queues

- Constrained version of a linked list
  - Is a row/line of self-referential structures
- Elements may only be deleted from the front (head) of a stack and inserted at the back (tail)
  - A queue is therefore a first-in-first-out structure (FIFO)

```
struct queueNode {
    int data;
    struct queueNode *nextPtr;
};
typedef struct queueNode QueueNode;
```



Use of Queues

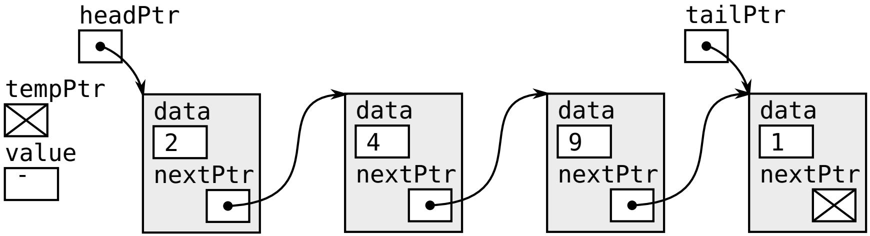
- Supporting print spooling
- Routing of data packets in computer systems
- Buffers

12.6 Insertion in Queues (“Enqueue”)

```
\\ Class exercise / Klasoefening











\\
```

12.6 Deletion in Queues (“Dequeue”)

```
value = headPtr->data;
tempPtr = headPtr;
headPtr = headPtr->nextPtr;
free( tempPtr );
```



12.6 Deletion in Queues ("Dequeue")

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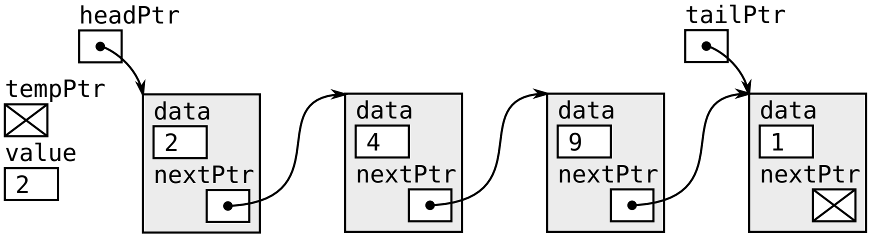

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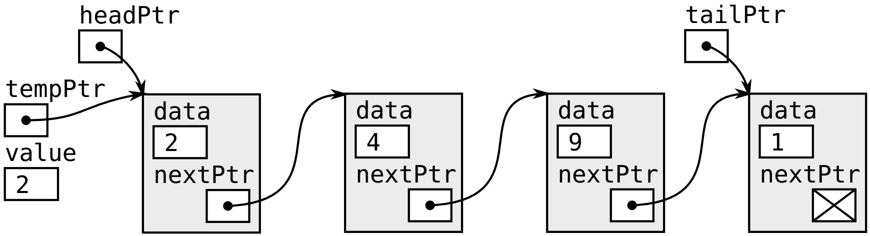

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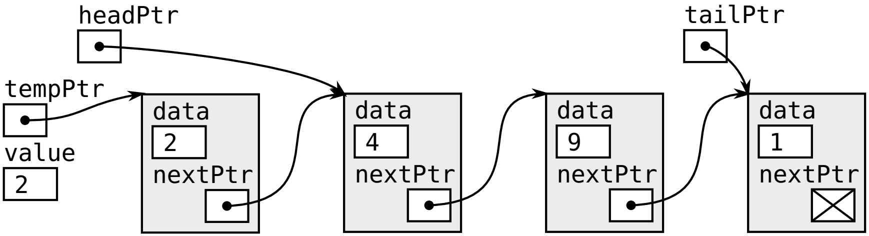

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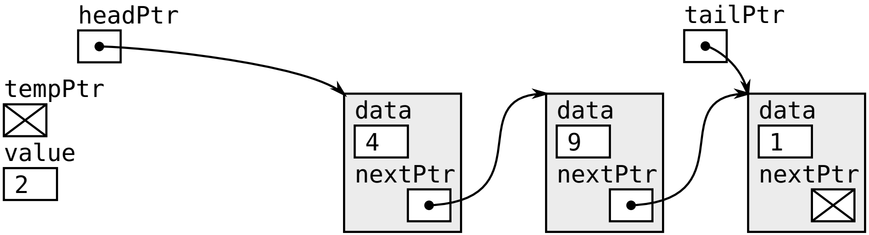

Perspective

Today

Dynamic Data Structures II

- Stacks
- Queues

Next lecture

Dynamic Data Structures III

- Trees

Homework

1. Study Sections 12.5-12.6 in Deitel & Deitel
2. Do Self Review Exercises 12.2, 12.3 in Deitel & Deitel
3. Do Exercise 12.11 in Deitel & Deitel