

Welcome!

COMP1511 18s1

Programming Fundamentals

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— Lecture 16 —

Linked Lists

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Overview

after this lecture, you should be able to...

have a better understanding of **linked lists**

write code to **create** a linked list

write code to **traverse** a linked list

solve simple problems using **linked lists**

(**note:** you shouldn't be able to do all of these immediately after watching this lecture. however, this lecture should (hopefully!) give you the foundations you need to develop these skills. remember: programming is like learning any other language, it takes consistent and regular practice.)

Admin

Don't panic!

assignment 2

(if you haven't started yet, start **ASAP**)

deadline extended to **Sunday 13th May**

assignment 1

tutor marking/feedback in progress

week 9 weekly test out now

don't forget about **help sessions!**

see course website for details

Help Sessions

Wednesday

6-8pm, J17 201

Thursday

6-8pm, J17 201

Friday

10am-12pm, Brass Lab (J17 Level 3)

2pm-4pm, Brass Lab (J17 Level 3)

4pm-6pm, Oboe Lab (J17 Level 3)

note: Brass Lab = Bugle/Horn

The node struct

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

Interacting with a node struct

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

// "struct node hello" (no *)
// "hello" is an actual node in the function's memory
struct node hello;
hello.data = 10;
hello.next = NULL;

// in the function's memory
//
// hello | 10 |
//       |-----|
//       | NULL |
//       |_____|
```

Making a new node

```
// Allocates memory for a new node; returns its address
struct node *make_node(int value) {
    struct node *new = malloc(1 * sizeof(struct node));
    new->data = value;
    new->next = NULL;

    return new;
}

// "struct node * hello"
// "hello" is a pointer to a node,
// it just stores the _address_
// (of the memory we get from malloc)
struct node *hello = make_node(10);

// in the heap (malloced memory)
//
// hello | 10 |
//      |-----|
//      | NULL |
//      |_____|
```


Freeing a node

```
// In accordance with Newton's 3rd Law of Memory Allocation
// "For every malloc, there is an equal and opposite free"
void free_node(struct node *node) {
    free(node);
}

struct node *hello = make_node(10);
free_node(hello);
```

Node pointers vs allocated nodes

reference to a node

arrow

```
struct node *curr ...
```

vs

making (**allocating**) a new node

circle

```
... = malloc(1 * sizeof(struct node));
```

Node pointers vs allocated nodes

reference to a node

arrow

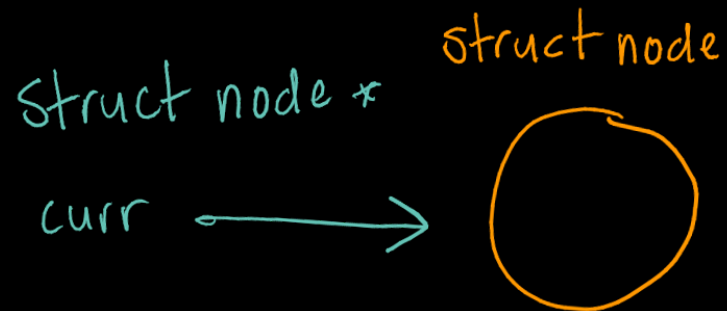
```
struct node *curr ...
```

vs

making (**allocating**) a new node

circle

```
... = malloc(1 * sizeof(struct node));
```



Node pointers vs allocated nodes

reference to a node (arrow) vs
making (**allocating**) a new node (circle)

struct node *

struct node



(arrow called
"curr")

memory allocated
by malloc

```
struct node * curr = malloc(1 * sizeof(struct node))
```

array/list “traversal”

(going through every element)

Traversing... an Array

```
void fillArray (int array[ARRAY_SIZE], int value) {  
    int i = 0;  
    while (i < ARRAY_SIZE) {  
        array[i] = value; // set the value  
        i++;              // move to next element  
    }  
}
```

Traversing... a Linked List

```
void fillList (struct node *list, int value) {
    struct node *curr = list;
    while (curr != NULL) {
        curr->data = value; // set the value
        curr = curr->next;  // move to next node
    }
}
```