Pointers

Help Sessions

Check timetable!

Research Project Signup Reminder

– Help shape the future of DCC
– Volunteer 30 mins
– Entirely optional
– No bearing on your course

Revision sessions Week 6

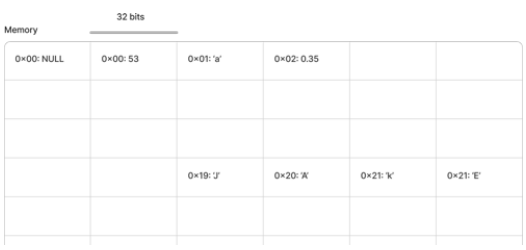
– Tuesday 2pm-4pm (Online)
– Wednesday 3pm-5pm (K17 Seminar Room)

Pointers

Pointers

– All data (variables) are stored in **memory**
– You can think of memory as a big grid
– Each segment of this grid has a unique identifier

Visualising memory with addresses

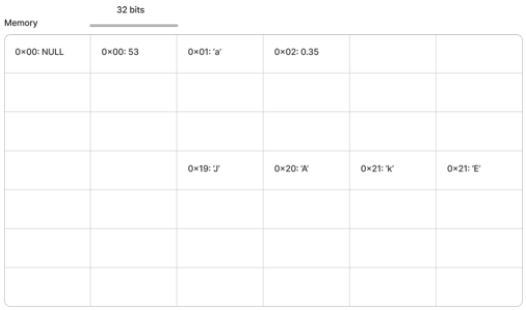


The actual data is stored in binary

So far, we have only dealt with values

– We can also access the address

– By storing that address in a variable, we have a **pointer**



Pointer Syntax

To declare a pointer

`<type> *<name_of_variable>`

^ The `*` means don't request the storage to store `<type>`, but requests memory to store a memory address of `<type>`

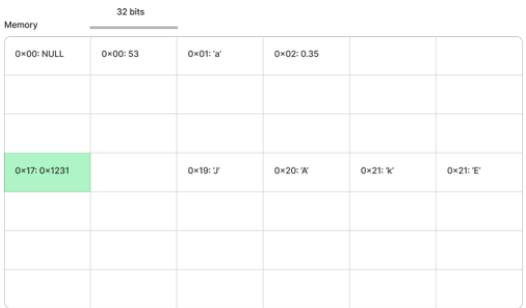
Syntax example:

`int *pointer`

`struct student *student`

Visualise pointer declaration

```
// declare a pointer to an integer
int *number; // operating system returns 0x17
```



Address of operator `&`

– What if we want to query what the address of a variable is?

– What if we want to query what the address of a variable is?
– We can use the address_of operator:

`&`

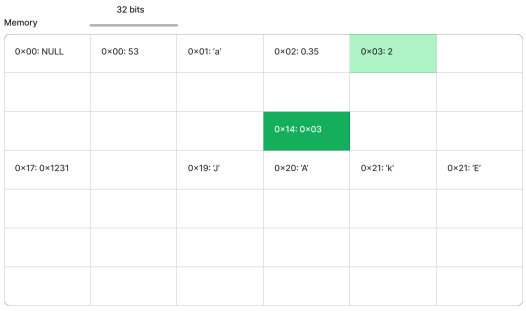
Syntax of address of: `&<variable>`

Example

```
int number = 2;
&number // the address of number
```

```
int number = 2;


int *pointer_to_number = &number
```



Dereferencing

– Dereferencing is simply accessing the value at the address of a pointer
– It uses the `*` symbol again (which causes confusion)
– `*my_int_pointer` -> will get the integer at the address location

Three components to pointers in code

```
int main(void) {
    // Declare an integer
    int my_age = 23;

    // Declare an integer pointer
    // Assign it the address of my_age
    int *pointer_to_my_age = &my_age;

    // Print out the address and value at the pointer
    printf("Pointer is: %p value is: %d\n", pointer_to_my_age, *pointer_-
```

```
to_my_age)
    return 0;
}
```

Common mistakes

```
int number;
int *number_ptr;
```

1. `number_ptr = number;`
2. `*number_ptr = &number;`
3. `number_ptr = &number`
4. `*number_ptr = number;`

Syntax cheat sheet

– Declare a pointer: `int *int_pointer;`
– Address of: `&my_variable;`
– Dereference (Get the value at a pointer): `*int_pointer;`

Demo

But JAKE, why are they *USEFUL*

– Let's look at an example with arrays and parameters

Feedback

https://forms.office.com/r/Ze4admEWnR