

Programming Workshops

Principles of Computing

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Week 5

Today's Topics

Arrays

Unit Tests

Arrays

Arrays

- A way of storing a collection of items
- uses square brackets [] after the type
- Fixed size - once allocated size cannot be altered*

* sometimes can, depending on language.

Array Indexes

- Arrays are indexed from **zero**
- It's actually an offset from the start of a base memory address
- Tradition suck in other languages

Setting Arrays

- Created in much the same way as an object:
- `int[] myArray = new int[40];`
- would create an array of size 40

Accessing and Modifying arrays

- Can be accessed and set like a variable
- `myArray[i] = myVar;`
- `int myVar = myArray[i];`
- Accessing or setting a value in an array is usually fairly fast $O(1)$

- We can't alter the real size of the array after creation (usually)
- We can pretend the array is really shorter than it is (capacity vs size)
- If we need more space, we can make a bigger array and copy all the contents of our array into the new array
- Copying a whole array is usually quite slow ($O(N)$)
- This is actually how Java ArrayLists, C++ vectors, c sharp lists work

Unknown/Undefined values

- When we are doing tricks with size/capacity we usually treat the items beyond the last value as being in an unknown/undefined state
- This can cause problems in low-level languages (C/C++) if you don't do it properly
- C sharp is reasonably well behaved in this regard, but you do have to be careful about leaving references around

Sentinel Values

- There are many data structures where it is useful to have special values to indicate certain states
- One common thing we need to communicate a lot is where the end of something is
- We sometimes use special values in the last occupied slot to indicate this

Why Do We Care?

- This is an old trick, why do we care in 2023?
- Memory allocation is expensive
- We don't want a bunch of avoidable copying on our hot code paths!
- You do stuff in C++ next year

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- We don't want a bunch of avoidable copying on our hot code paths!
- You do stuff in C++ next year
- most importantly, I think it's cool.

Unit Tests

- Unit tests are an important part of software testing
- They help find issues in your code
- They help find out if issues in your code come back (regressions)
- Help other developers know how the code should work

Basic Idea

- Basic idea is that we isolate the code we're testing from the rest of the system
- We then define an expected value and what the arguments are for what we're testing
- We run the code
- Compare the result to what we expected