COMP6080: Web Front-End Programming

Tutorial 10 — The End

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Week 10, Term 3 2020

The End

We've made it to the last week of content! Personally, it's the last week of tutoring for me, which feels like it deserves reflection. Thanks for collectively being a really cool class!

Speaking of reflection, MyExperience is up — help us make this course better next time!

Oh, also, I have no idea what happens to my slides on Gitlab once I graduate, maybe download them if you want to keep them.

The Tutorial

Tutorial 10 is an opportunity for the tutor and their students to highlight particular topics that students feel might need a bit more exploration, particularly given the exam that is coming up.
A number of topics have come up that you may want your tutor to go through:

1. HTML
2. CSS — Selectors, Formatting, Layouts, Dev Tools
3. NodeJS — Basics
4. Javascript in browser — Importing, DOM manipulation, forms, events, `localStorage`
5. ReactJS — Components, hooks, routing
6. UI/UX principles
7. Accessibility principles
8. Testing principles

Giving You Some Thinking Time...

Please think of things you're a little confused about in this course! But in the meantime, I just wanted to cover one fun thing today — closures!

TL;DR

You can think of a closure as a tuple: `(function, environment)`.

An environment is a mappping from variables to values. That is, it's basically a function that gives you values for variables.

That's all the remembering you need to do, but it probably won't make much sense. Let's try and explain...

A Binary Adder

Let's create a function that we can use like `binaryAdd(2)(3) === 5`. An important thing to note is that we have first-class functions! (`binaryAdd` is a function that returns a function.)

```
const binaryAdd = x => (y => x + y)
```

(The => operator is right-associative, so you don't actually need those parentheses; it's there to emphasise that we're returning a function.)

Using It

We can use it like:

```
const binaryAdd = x => y => x + y
const add2 = binaryAdd(2);
console.log(add2(5)) // 7
```

Calling `binaryAdd(2)` returns a function that takes a number `y` and returns `x + y`. But notice that `x` is only available within the scope of `binaryAdd`?

Calling `add2(5)` will bind `y` to `5`, and then try to compute `x + 5`. This will try and find the value for `x` by performing scope resolution (checking the current environment, then all the outer environments).

Closures

What happens in languages with closures (like JavaScript) is that `binaryAdd(2)` returns a closure (i.e. `(function, environment)`), not just a function. So, the lifetime of `x` is extended beyond the lifetime of `binaryAdd`.

For example, we might do something like `window.onClick = () => alert(name);` Whenever `window.onClick` gets called, the value for `name` will be found in the closure!

That's Pretty Much It

It's honestly not the most important thing to know; it's hopefully already intuitively obvious. However, I think understanding *why* things work lets you talk about your code better (a very important thing).

There *is* More...

One thing to notice is that closures kind of let us do encapsulation. Before, the `x` variable wasn't available in the global scope, but we could run `add2(5)` successfully! We've hidden some state in our closure.

See the **Emulating private methods with closures** section of the MDN page for an example of how you can use functions as a simplified class!

Essentially, our closure is *one* function with as much encapsulated state (the variables we close over) as we like.

Bonus: Currying

A common technique in functional programming (which you can totally do in JavaScript) is currying.

Notice how we didn't do `const uncurriedAdd = (x, y) => x + y`, which would be called like `uncurriedAdd(2, 5)` instead of `binaryAdd(2)(5)`?

We've written a curried version, and now we can pass around partially applied functions. For example,

```
[1, 5, 2, 3].map(x => uncurriedAdd(2, x))
```

vs

```
[1, 5, 2, 3].map(binaryAdd(2))
```

Things to Cover

In the likely event that we run out of things to discuss, here are some ideas:

- Semantic HTML elements;
- Doing a random assignment 2 code review;
- Using a CSS framework like Bulma in React (rbx);
- Going through a lab question together;
- Trying to list UI/UX considerations on the fly;