CS-174A Discussion 1C, Week 0

@ Xiao (Steven) Zeng

@ Instructor: Dr. Asish Law

@ https://github.com/NoctisZ/CS174A-1C-2020Fall (https://github.com/NoctisZ/CS174A-1C-2020Fall)

Outline

- About this course
- JavaScript, WebGL and tiny-graphics Basics
- Assignment 1

CS-174A Introduction

About Me:

- Xiao (Steven) Zeng, 2nd year Ph.D student in Computer Science, supervised by Prof. Demetri Terzopoulos
- Focus: Computer Vision and Graphics
- Office hours: Tuesday 1:00 PM - 3:00 AM. Access from **"Office Hours (All TAs)"** link in "Zoom Video Conferencing" on CCLE
- Email: stevennz@ucla.edu

What we can learn in CS174

- Math (mainly linear algebra)
- Basic elements and concepts aboug CG (modeling, transformation, projection, illumination, rendering, interaction, etc.)
- Demo: https://drive.google.com/file/d/1NTtpKI9if_a2ZdCu6Jx_iJwfDQpW9oVN/view (https://drive.google.com/file/d/1NTtpKI9if_a2ZdCu6Jx_iJwfDQpW9oVN/view)

Textbook (Optional)

- Interactive Computer Graphics, by Angel & Shreiner, 8th Edition

Cour Administration

Five project assignments:

- 4 individual projects
- Last one is an open ended group project

Grading breakdown (500 pts):

- 4 individual projects (0+25+25+25): 75 pts
- Team project: 150 pts
- Midterm: 100 pts
- Final: 175 pts

Tools

- CCLE
- Piazza (https://piazza.com/class/kfirp13mgg86zk (https://piazza.com/class/kfirp13mgg86zk))
- GitHub (https://classroom.github.com/a/0EYQsNCD (https://classroom.github.com/a/0EYQsNCD))

Purpose of CS174A Discussions

- Review the lectures
- Explain additional materials that are useful
- Introduce the assignments
- Help with the course projects

JavaScript Basics

- JavaScript is a programming language that adds interactivity to your website!
- We make full use of the 2015 **"ES6"** version of JavaScript, which adds further brevity and power to the language.
- Be sure to include “ES6” in all Google searches.
- Helpful material: https://github.com/NoctisZ/CS174A-1C-2020Fall/blob/master/174a_supplement_JavaScript%20from%20a%20C%2B%2B%20background.pdf (https://github.com/NoctisZ/CS174A-1C-2020Fall/blob/master/174a_supplement_JavaScript%20from%20a%20C%2B%2B%20background.pdf)

In [41]:
```
%%html

<p id="demo">JavaScript can change HTML content.</p>
<button type="button" onclick='document.getElementById("demo").innerHTML = "He
llo JavaScript!"'>Click Me!</button>
```

JavaScript can change HTML content.

Click Me!

JavaScript Basics

- Variable
- Function
- Class

Variable and Data types

JavaScript variables can hold many **data types**: numbers, strings, objects and more:

```
let length = 16;                               // Number
let lastName = "Johnson";                      // String
let x = {firstName:"John", lastName:"Doe"}; // Object
```

In [49]:
```
%%js

let num = 15;                                     // Number
//element.text("The number is " + num)
element.text("The number is " + (num+1))
```

The number is 16

var, const and let

- var: function-scoped
- [ES6] const, let: block-scoped

In [52]:
```
%%js

function start(){
    var j = 0
    for (let i = 0; i < 5; i++){
        //element.text(i);
        j += 2
    }
    //element.text(i);
    element.text(j)
}

start()
```

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Objects

A JavaSript objects is a key-value lookup table (like a dictionary), it's also everything's base class.

It behaves like C++ `std::map<string, >`, but can combine multiple types of values.

You define (and create) a JavaScript object with an object literal:

```
let person = {firstName:"John", lastName:"Doe", age:50, eyeColor:"blue"};
```

In [54]:
```
%%js
let person = {firstName:"John", lastName:"Doe", age:50, eyeColor:"blue"};
 element.text(person.firstName + "'s age is " + person["age"]);

// two ways for accessing the property of an object
let name = new String("John");
let name_2 = "John";

//element.text(name == name_2)
//element.text(typeof name_2)
```

John's age is 50

Functions

A JavaScript function is a block of code designed to perform a particular task.

A JavaScript function is executed when "something" invokes it (calls it).

In [9]:
```
%%js
function myFunction(p1, p2) {
  return p1 * p2;   // The function returns the product of p1 and p2
}

let a = 3;
let b = 4;
element.text("The product of a and b is " + myFunction(a,b))
```

The product of a and b is 12

Arrow Function

JavaScript arrow functions are roughly the equivalent of lambda functions in python or blocks in Ruby.

In [45]:
```
%%js

const add = (a, b) => a + b;
element.text(add(1,2))
```

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Object Methods

In [56]:
```
%%js
let person = {
  firstName: 1,
  lastName : "Doe",
  "id"       : 5566,
  fullName : function() {
    return this.firstName + " " + this.lastName + " " + this.id;
  }
};

element.text(person.fullName())
```

JavaScript Classes

ES6, also known as ECMAScript2015, introduced classes.

A class is a type of function, but instead of using the keyword `function` to initiate it, we use the keyword `class`, and the properties is assigned inside a `constructor()` method.

Class Definition

Use the keyword `class` to create a class, and always add a `constructor` method.

The `constructor` method is called each time the class object is initialized.

```
class Car {
  constructor(brand) {
    this.carname = brand;
  }
}
mycar = new Car("Ford");
```

In [58]:
```
%%js
class Car {
  constructor(brand) {
    this.carname = brand;
  }
}
let mycar = new Car("Ford");
//element.text(typeof mycar)
element.text(mycar.carname)
```

Ford

More Quick Ways to Learn JS

- https://www.w3schools.com/js/ (https://www.w3schools.com/js/)
- Recommended IDE: WebStorm (will automatically take care of server)

WebGL Basics

WebGL (Web Graphics Library) is a JavaScript API for rendering interactive 3D and 2D graphics within any compatible web browser without the use of plug-ins. WebGL does so by introducing an API that closely conforms to OpenGL ES 2.0 that can be used in HTML5 `<canvas>` elements.

- WebGL Wather (http://madebyevan.com/webgl-water/)
- Make me pulse wish 2017 (http://2017.makemepulse.com)

Tiny-graphics Basics

We will be actually using `tiney-graphics.js` for assignments. It is a small, single file JavaScript utility. It organizes WebGL programs to be less tedious and object-oriented. It gives WebGL program access to linear algebra routines, useful UI controls and readouts, and the drawing utilities needed by modern shader-based graphics.

More info: https://github.com/intro-graphics/tiny-graphics-js (https://github.com/intro-graphics/tiny-graphics-js)

Assignment 1: Environment Setup and Creating a Simple Rectangle

- https://www.jetbrains.com/webstorm/ (https://www.jetbrains.com/webstorm/)
- https://classroom.github.com/a/0EYQsNCD (https://classroom.github.com/a/0EYQsNCD)