

CSC309 Winter 2016

Lecture 7

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Announcements

- A2 extension: Sunday Feb 28, 6:00 PM + 4 hours of penalty period until Sunday 10:00 PM.
- This week's tutorial: A2 problem solving session.
 - The TA will help you with issues in A2.
- A3 will be available soon after A2 is due; the first step to submit a proposal, not details next week.

A2 submission notes

- Make it easy for the TA to mark your submission.
 - You need to have one live version running under your account, and its link should be in readme.txt
 - There should be a schema that populates the database with some initial data, so all features in your service can be shown.
 - In case the sign-up function could malfunction, you need to create a dummy account, include its information in readme.txt, so that the TA can use it to login to your service, bypassing the sign-up.
- etc

Today's agenda

- Things that are useful for developing the game in A3
 - OO Javascript
 - HTML5 Canvas
 - HTML5 Mobile API

Object-Oriented Javascript

OO Javascript

- This is no “**class**” in Javascript
 - How can we do OO without class?
- We do **prototype-based** programming
 - Implement a class as a **prototype**, and other classes reuse it by decorating it.

Constructor

- The constructor is just a function which will be called when instantiating a new object.

This also works:

```
function Person () {  
    console.log('instance created');  
}
```

```
1  var Person = function () {  
2      console.log('instance created');  
3  };  
4  
5  var person1 = new Person();  
6  var person2 = new Person();
```

Property (object attribute)

```
1  var Person = function (firstName) {  
2      this.firstName = firstName;  
3      console.log('Person instantiated');  
4  };  
5  
6  var person1 = new Person('Alice');  
7  var person2 = new Person('Bob');  
8  
9  // Show the firstName properties of the objects  
10 console.log('person1 is ' + person1.firstName);  
11 console.log('person2 is ' + person2.firstName);
```

Methods

- define a method by assigning a function to a named property of the class's **prototype** property.

```
1  var Person = function (firstName) {  
2    this.firstName = firstName;  
3  };  
4  
5  Person.prototype.sayHello = function() {  
6    console.log("Hello, I'm " + this.firstName);  
7  };  
8  
9  var person1 = new Person("Alice");  
10 var person2 = new Person("Bob");  
11  
12 // call the Person sayHello method.  
13 person1.sayHello(); // logs "Hello, I'm Alice"  
14 person2.sayHello(); // logs "Hello, I'm Bob"
```

OO JavaScript demo

<http://www.cs.toronto.edu/~ylzhang/csc309w16/canvas/oo.html>

Reference:

[https://developer.mozilla.org/en-US/docs/Web/JavaScript/
Introduction to Object-Oriented JavaScript](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Introduction_to_Object-Oriented_JavaScript)

HTML5 Canvas

drawing stuff

Canvas is an HTML element

```
<canvas id="myCanvas" width="200" height="100" style="border:1px solid #000000;">  
</canvas>
```

We then draw on Canvas using JavaScript.

Draw stuff: general pattern

```
// select the canvas element  
var canvas = document.getElementById('myCanvas');
```

```
// get the drawing tool  
var context = canvas.getContext('2d');
```

```
context.beginPath(); // start one drawing action
```

```
...  
// define the style of the drawing
```

```
...  
context.stroke(); // actually draw it
```

```
context.beginPath(); // start another drawing action
```

```
...  
// define the style of the drawing
```

```
...  
context.stroke(); // actually draw it
```

Demos

<http://www.html5canvastutorials.com/>

How to do animation in Canvas

- Basically, draw one frame, clear the frame, then redraw the frame with things moved, with a number of frames played per second, like in how movies work.
- Need to clear the canvas periodically, two ways to do this
 - use `setInterval`: refresh with fixed interval (fixed FPS)
 - use `requestAnimationFrame`: let the browser decide FPS
- OO JavaScript comes in handy for manipulating to motion of each object.
 - define methods for an object: `moveLeft()`, `moveRight()`, `growBigger()`, etc.

More Demos

<http://www.html5canvastutorials.com/>

<http://www.cs.toronto.edu/~ylzhang/csc309w16/canvas/>

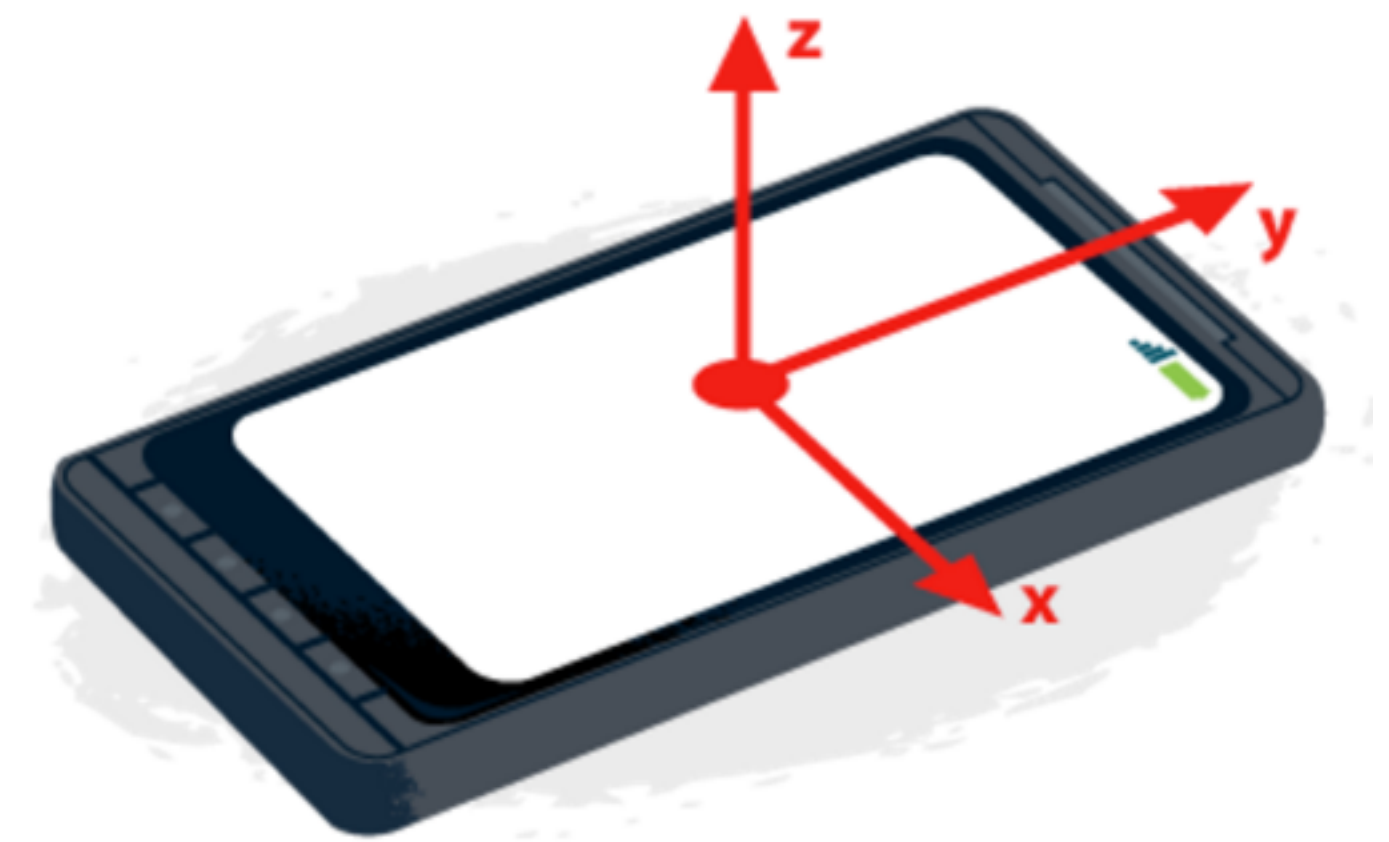
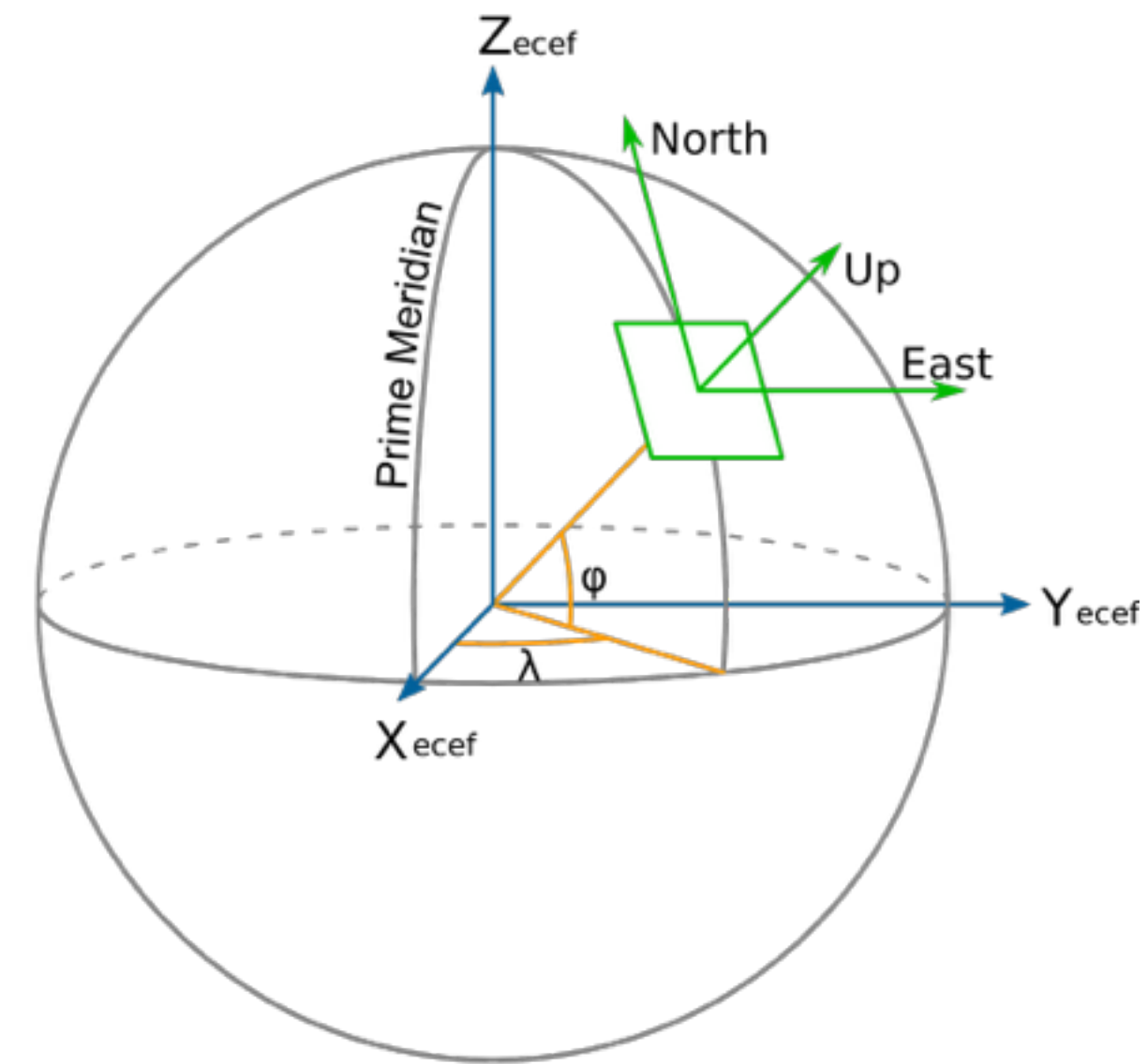
HTML5 Mobile API

Access hardware info from HTML

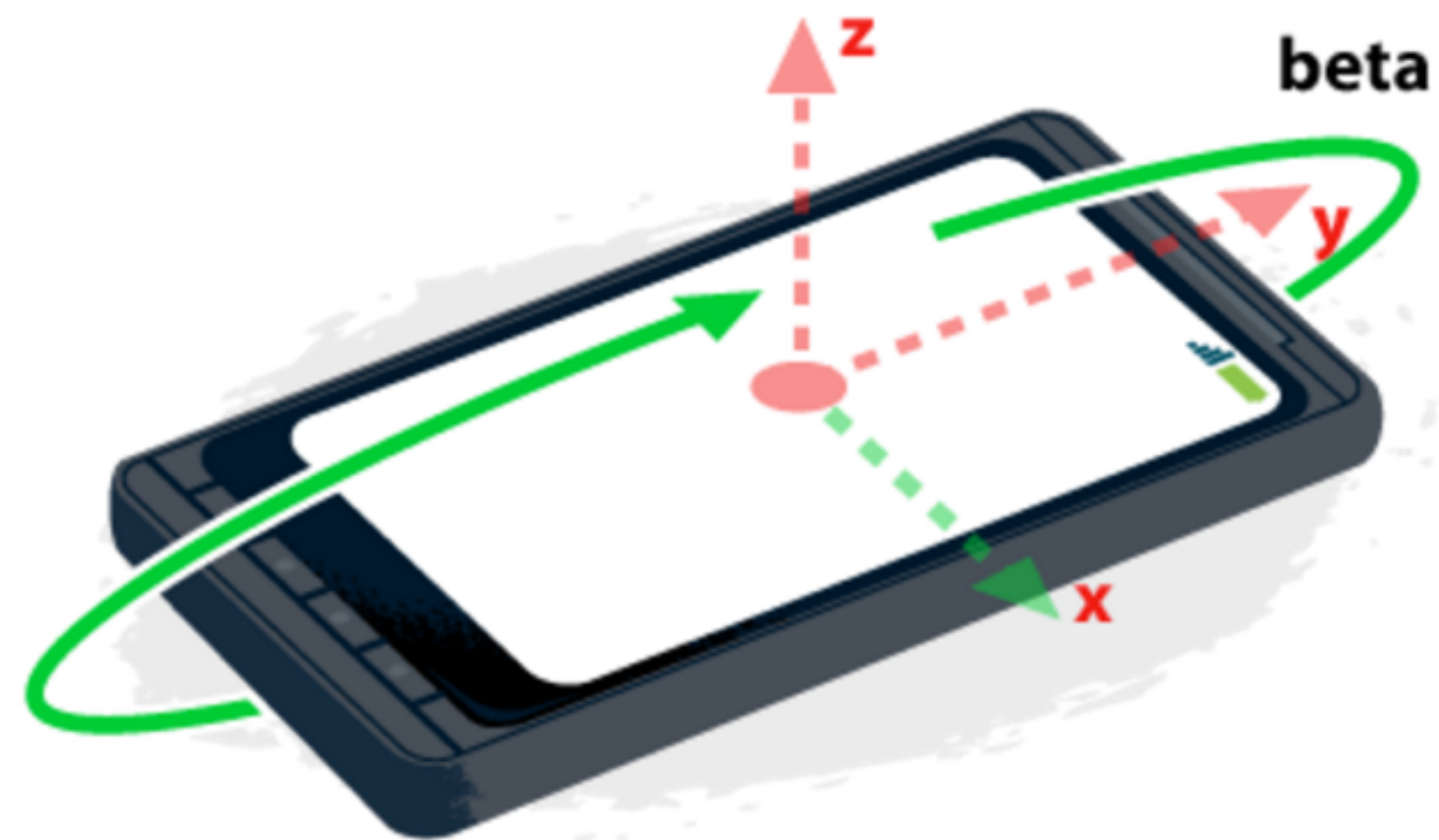
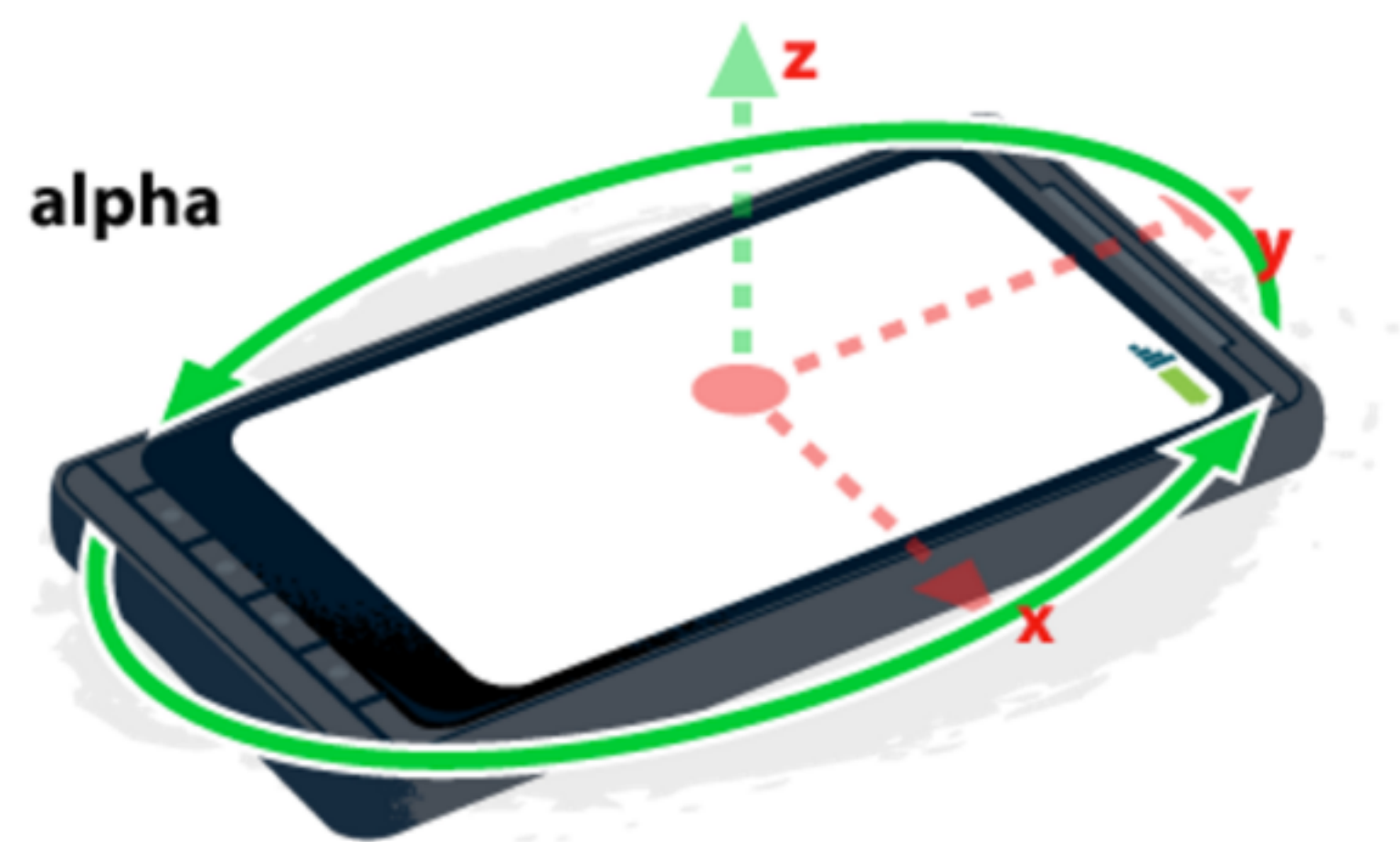
- Orientation
- Motion
- Touch
- Geolocation

Orientation

- **Earth** coordinate frame (X, Y, Z)
 - X : towards the east
 - Y : towards the true north (North pole, not magnetic north)
 - Z : towards the device from the centre of Earth
 - This is independent of device orientation
- Device coordinate frame (x, y, z)
 - x : to the right of screen
 - y : to the top of the screen
 - z : outwards from the screen



Rotation (alpha, beta, gamma)



Getting device orientation data

```
window.addEventListener('deviceorientation', function(eventData) {  
    var tiltLeftRight = round(eventData.gamma);  
  
    var tiltFrontBack = round(eventData.beta);  
  
    var direction = round(eventData.alpha);  
  
})
```

Motion

- **acceleration**: more useful in practice
- **accelerationIncludingGravity**: less useful but may be the only data available on the device without gyroscope.

Get motion data

```
1  function handleMotionEvent(event) {  
2  
3      var x = event.accelerationIncludingGravity.x;  
4      var y = event.accelerationIncludingGravity.y;  
5      var z = event.accelerationIncludingGravity.z;  
6  
7      // Do something awesome.  
8  }  
9  
10 window.addEventListener("devicemotion", handleMotionEvent, true);
```

Geolocation

- **`navigator.geolocation.getCurrentPosition()`**



Mobile Demo

<http://www.cs.toronto.edu/~ylzhang/csc309w16/mobile/>

Touch

Touch Event Types

- Touch start
- Touch move
- Touch end
- Touch cancel

Listen to touch events

- `someElement.addEventListener ('touchstart', function (event) { some callback action });`
- `event.touches`: a list of touch event
 - why a list?
- usually call `event.preventDefault()` to prevent mouse event from happening at the same time.



Mobile Demo

<http://www.cs.toronto.edu/~ylzhang/csc309w16/mobile/>

- What kind of game can you create using these APIs?