Canvas Tutorial
2D Canvas
(be sure to follow the links)

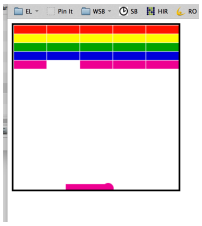
From Simple HTML to 2D Platform Game

Goal: next 2-3 weeks

- Create a platform game (side scrolling game) leveraging
  - HTML
  - HTML5
  - CSS, and
  - JavaScript
- Final product (after 2-3 Weeks)
  - Jumping player entity
  - Scrolling background
  - Parallax
  - Gamification elements: points, timer

Sub goals: Shorter Term

- We will start from the very beginning…
  - Learn HTML/ Some JavaScript
  - Starting from a simple html page
  - Draw on a canvas
  - Animate
  - Simple Shooter
  - Breakout (Tuesday next week)

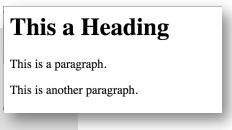


The Basics "HTML" Pages

- The language of the web,
  - A browser languages, enables browser to display webpages according to specified formats.
    - Fonts, color, tables, paragraphs
    - Basic Document:
      - Heading
      - Paragraph
      - Another Paragraph
  - A markup language is a set of markup tags
    - The tags describes the document content
    - HTML documents contain HTML tags and plain text
    - HTML documents are simply called web pages
- A Simple Example of a BASIC HTML document … next.

A simple and basic page

```
<html>
  <body>
      <h1>This a Heading</h1>
      <p>This is a paragraph.</p>
      <p>This is another paragraph.</p>
  </body>
</html>
```



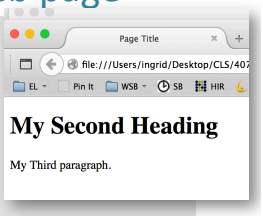
- Page full of 'tags'
  - <tagname> content </tagname>
  - HTML tags normally come in pairs like This is a paragraph
  - The first tag in a pair is the start tag, the second tag is the end tag
  - The end tag is written like the start tag, but with a slash before the tag name

0-mozilla-html-skeleton-no-canvas-00.html

Anatomy of a web page

```
<!DOCTYPE html>
<html>
    <head>
        <title>Page Title</title>
    </head>

    <body>
        <h1>My Second Heading</h1>
        <p> My  Third paragraph.</p>
    </body>
</html>
```



0-mozilla-html-skeleton-no-canvas-01.html

- The DOCTYPE declaration defines the document type to be HTML
- The text between <html> and </html> describes an HTML document
- The text between <head> and </head>
  - provides information about the document (preamble)
- The text between <title> and </title> provides a title for the document
  - Some browser put this text on the 'title bar'
- The text between <body> and </body> describes the visible page content
  - The text between <h1> and </h1> describes a heading
  - The text between and describes paragraph

The <!DOCTYPE> Declaration

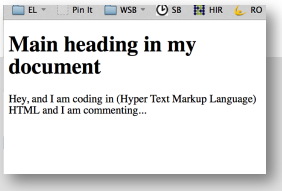
- Denote which language you use
  - DOCTYPE html is for the
    - Old school html, and the newer HTML5
  - <!DOCTYPE html>

Comments

- Comments in code, use a
  - <!--
    - 2 dashes
    - tag to denote the beginning of a comment, a comment
  - -->
    - concluded or 'closed' by a --> tag, see above:
  - A comment:
    - <!-- A COMMENT -->
  - Another comment:

```
<!--
    Another COMMENT,
    that spans multiple lines
-->
```

Example Comment




```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8" />
  <title>A tiny document</title>
</head>

<body>
  <h1>Main heading in my document</h1>

  <!-- COMMENT -->
  <!-- Note that it is "h" + "1", not "h" + the letter "one" -->
  <p>Hey!!!!  I am coding in (Hyper Text Markup Language)HTML.</p>
</body>
</html>
```

0-mozilla-html-skeleton-no-canvas-comment.html

HTML more in-depth

- Some great tutorials are available, one of my favorites, that have nice WYSIWYG interfaces:
  - http://www.w3schools.com/html/default.asp
- Need a good editor:
  - Simple:
    - vi, notepad, text edit, emacs
  - Professional:
    - Dreamweaver (expensive)
  - We will use simple ones – and I will use vi.
  - Webstorm's jetbrain? (will try to see if I can get a educational license for this one)

HTML5

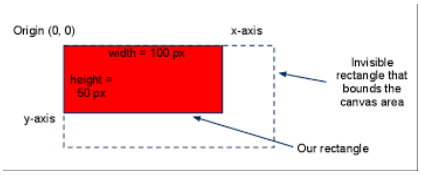
- As of October 2014 this is the new HTML standard:
  - Adds syntactic features to HTML:
  - new <video>, <audio> and the <***canvas***> elements
    - Handle Graphical and multimedia content without resorting to plug-ins, and new APIs
  - **<canvas>** is for graphics, and we use graphics for animation, and gaming.
    - It can draw graphics using scripting (usually javascript)
- It was a HTML5 before October 2014?
  - Yes, but now it is official, and it is standard.

http://en.wikipedia.org/wiki/HTML5

What is a <canvas>?

- A container for hosting graphics.
  - Can render Bitmap images (JavaScript)
- A rectangular area on an HTML page.
- Canvas has several methods for drawing:
  - Lines, paths, boxes, circles, text, and graphic images.
  - Defined by JavaScript methods (APIs) for drawing the graphics (lines, paths, boxes, circles, shapes).
  - JavaScript API
- Also for text, animation, and interaction
- … and games!

```
<canvas id= "drawing" width= "400" height= "200”
   style= "border:1px solid black"> </canvas>
```



- http://www.w3schools.com/tags/ref_canvas.asp
- http://www.pageresource.com/html5/canvas-2d-interface-reference/

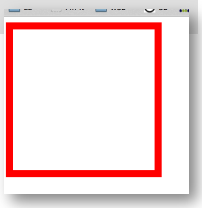
Simple Canvas

1-mozilla-canvas-skeleton-00-nojavascript.html

```
<!DOCTYPE html>
<html>
<body>

<canvas id="myCanvas" width="200" height="200” style="border:10px solid #FF0000;">
     Your browser does not support the HTML5 canvas tag.
</canvas>

</body>
</html>
```



- No JavaScript (yet)
- http://www.w3schools.com/html/html5_canvas.asp

Canvas Images

Background:

- After drawing a ‘shape’ on canvas it is ‘gone’ canvas does not know of the element anymore (bitmap, raster images)
- Fixed Sets of Dots
- This is in contrast to Scalable Vector Graphics (SVG), where you can manipulate the spapes

http://en.wikipedia.org/wiki/Scalable_Vector_Graphics

Strategy of Drawing Images on Canvas

Done by JavaScript in 3 steps:

1. Obtain a reference to the canvas element.
2. Obtain a 2D context from the canvas element.
3. Draw graphics using the draw functions of 2D context.
4. (not a 4ths step)

Drawing on the Canvas with JavaScript

What does this look like?

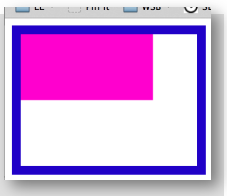
```
<!DOCTYPE html>
<html>
<body>

<canvas id="myCanvas" width="200" height=”200"
     style="border:10px solid #2200c3;">
     Your browser does not support the canvas element.
</canvas>

<script>
     var canvas = document.getElementById("myCanvas");  // find the canvas element
     var ctx = canvas.getContext("2d");                 // get 2D object ctx
     ctx.fillStyle = "#FF00CC";                         // now can draw
     ctx.fillRect(0,0,150,75);                          // using the methods of ctx
</script>

</body>
```

Drawing on the Canvas with JavaScript



```
<!DOCTYPE html>
<html>
<body>

<canvas id="myCanvas" width="200" height=”200"
     style="border:10px solid #2200c3;">
     Your browser does not support the canvas element.
</canvas>

<script>
     var canvas = document.getElementById("myCanvas");  // find the canvas element
     var ctx = canvas.getContext("2d");                 // get 2D object ctx
     ctx.fillStyle = "#FF00CC";                         // now can draw
     ctx.fillRect(0,0,150,75);                          // using the methods of ctx
</script>

</body>
```

1-mozilla-canvas-skeleton-1-js-.html

- How about modularization?
  - Pull out the javascript and put it elsewhere?

Drawing on the Canvas with 'external' JavaScript

```
<!DOCTYPE html>
<html>
<body>

<canvas id="myCanvas" width="200" height="200"
    style="border:10px solid #2200c3;">
    Your browser does not support the canvas element.
</canvas>

<script src="js/drawRectangle.js"></script>

</body>
```

1-mozilla-canvas-skeleton-1-js-ex.html

- Standard to have a subdirectory "js" for javascript.

CSS & canvas on-load

```
<html>
  <head>
    <title>Canvas tutorial</title>

    <script type="text/javascript">
      function draw(){
        var canvas = document.getElementById('tutorial');
        if (canvas.getContext){
          var ctx = canvas.getContext('2d');
        }
      }
    </script>

    <style type="text/css">
      canvas { border: 10px solid blue; }
    </style>
  </head>

  <body onload="draw();">
    <canvas id="tutorial" width="150" height="150"></canvas>
  </body>
</html>
```

1-mozilla-canvas-skeleton-2-css.html

Simple Graphics

- Examples
  - Drawing
  - Color
  - Opacity
  - Mouse
  - Keyboard

- http://www.w3schools.com/canvas/canvas_clock.asp

- http://www.html5-tutorials.org
- http://www.w3schools.com/html/default.asp
- http://en.wikipedia.org/wiki/HTML5
- http://www.w3schools.com/canvas/canvas_clock.asp

- http://tutorials.jenkov.com/html5-canvas/overview.html
- HTML, XML, XHTML, HTML5, HTML5 and Canvas, CCS, JavaScript