ID2216
Developing Mobile Applications

L2: HTML5, JS, and Mobile Web Apps

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ReCap – HTML5, JS, and Frameworks

{Mobile | Web} Apps {==|!=} Web Services?

Methods:

- Sitemaps, Clickstreams, Wireframes

Tools:

- Javascript + HTML5
- WebGL, Media, TypeScript, AMP, etc.. etc…

Frameworks:

- Firebase
- Embedded Social

HTML5 is the new standard for HTML

Some rules for HTML5 were established:

- New features should be based on HTML, CSS, DOM, and JavaScript
- Reduce the need for external plugins (like Flash)
- Better error handling
- More markup to replace scripting
- HTML5 should be device independent
- The development process should be visible to the public

Basic HTML5

```
①  <!DOCTYPE html>
②  <html>
③  <head>
④  <meta charset="UTF-8">
⑤  <title>Title of the document</title>
⑥  </head>
⑦  <body>
⑧    Content of the document......
⑨  </body>
⑩  </html>
```

http://www.w3schools.com/html/html5_intro.asp

Javascript

JavaScript is Scripting Language that can be inserted into HTML pages, can be executed by all modern web browsers. And soon also mobile web browsers

JavaScript is easy to learn:

- Writing Into HTML Output
- Reacting to Events
- Changing HTML Content
- Changing HTML Styles
- Validate Input

JavaScripts Example: Event + Date

```
①  <!DOCTYPE html>
②  <html>
③  <body>
④  <h1>My Second JavaScript</h1>
⑤  <button type="button"
   onclick="document.getElementById('demo').innerHTML =
   Date()">
⑥  Click me to display Date and Time.</button>

⑦  <p id="demo"></p>

⑧  </body>
⑨  </html>
```

http://www.w3schools.com/js/tryit.asp?filename=tryjs_myfirst

Web frameworks for Mobile Apps

Frameworks:

jQuery Mobile [old]

Bootstrap

PhoneGap (Cordova)

Intel XDK

Famo.us

Ionic [AngularJS]

Sencha Touch

Mobile Angular UI

Multiplatforms:

MoSync

Meteor

QT

Other platforms:

Unity

FireBase

EmbedeedSocial

http://en.wikipedia.org/wiki/Multiple_phone_web-based_application_framework
http://en.wikipedia.org/wiki/Mobile_application_development

How to start?

- w3schools tryit
  - Use Chrome and “Developer Tools” on your PC
  - In your mobile phone’s browser or download a mobile phone emulator
- Setup a local webserver
  - XAMPP (http://www.apachefriends.org/index.html)
  - Web Server for Chrome (https://www.chromebeat.com)
- Cloud
  - Docker
  - Heroku / Google App Engine
- Online
  - Codepen
  - Jsfiddle
  - jsbin

L2. Outline

- Javascript
- JQuery
- JQuery Mobile
- Boostrap
- Mobile Angular UI

JavaScript

- Scripts can be put in the <body> and in the <head> section of an HTML page, but also external JavaScripts
- Scripts in HTML must be inserted between <script> and </script> tags.

Test this:
http://www.w3schools.com/js/tryit.asp?filename=tryjs_whereto_head

Exercise 1: Port this example to Codepen

JavaScripts Example: Canvas

```
① <!DOCTYPE html>
② <html>
③ <body>
④ <canvas id="myCanvas" width="200" height="100"
  style="border:1px solid #d3d3d3;">
  Your browser does not support the HTML5 canvas
  tag.</canvas>
⑤ <script>
  var c=document.getElementById("myCanvas");
  var ctx=c.getContext("2d");
  ctx.moveTo(0,0);
  ctx.lineTo(200,100);
  ctx.stroke();
  </script>
⑥ </body>
  </html>
```

http://www.w3schools.com/html/tryit.asp?filename=tryhtml5_canvas_tut_path

Google Map in HTML5 / Javascript

```
① <!DOCTYPE html> <html> <body>
② <p id="demo">Click the button to get your position.</p>
③ <button onclick="getLocation()">Try It</button>
④ <div id="mapholder"></div>
⑤ <script>
var x = document.getElementById("demo");
function getLocation() {
 if (navigator.geolocation) {
  navigator.geolocation.getCurrentPosition(showPosition, showError);
 } else {
  x.innerHTML = "Geolocation is not supported by this browser.";
⑥  }}
⑦  function showPosition(position) {
  var latlon = position.coords.latitude + "," +
   position.coords.longitude;
  var img_url =
"https://maps.googleapis.com/maps/api/staticmap?center="
+latlon+"&zoom=14&size=400x300&key=AIzaSyBu-
916DdpKAjTmJNIgngS6HL_kDIKU0aU";
  document.getElementById("mapholder").innerHTML =
   "<img src='"+img_url+"'>";
 }
⑧  function showError(error) {…}
⑨ </script></body></html>
```

https://www.w3schools.com/html/tryit.asp?filename=tryhtml5_geolocation_map

Exercise 2: Add markers to the map

jQuery

- A JavaScript Library that greatly simplifies JavaScript programming.
- Wraps common tasks into methods that you can call with a single line of code.
- Contains the following features:
  - HTML/DOM manipulation
  - CSS manipulation
  - HTML event methods
  - Effects and animations
  - AJAX
  - Utilities

http://www.w3schools.com/jquery

JQuery example #1

```
①   <!DOCTYPE html>
②   <head>
③   <script
    src="https://ajax.googleapis.com/ajax/libs/jquery/3.1.1/jquery.min.js">
④   </script>
⑤   <script>
⑥   $(document).ready(function(){
⑦       $("button").click(function(){
⑧           $("p").hide();
⑨       });});
⑩   </script>
⑪   </head>
⑫   <body>
⑬   <h2>This is a heading</h2>
⑭   <p>This is a paragraph.</p>
⑮   <p>This is another paragraph.</p>
⑯   <button>Click me to hide paragraphs</button>
⑰   </body>
⑱   </html>
```

Exercise 3: Create a btn that both hide the paragraphs.

JQuery example #2

```
1  <!DOCTYPE html>
2  <head>
3  <script
   src="https://ajax.googleapis.com/ajax/libs/jquery/3.1.1/jquery.min.js">
4  </script>
5  <script>
6  $(document).ready(function(){
7      $("p").click(function(){
8          $(this).hide();
9      });
10 });
11 </script>
12 </head>
13 <body>
14 <p>If you click on me, I will disappear.</p>
15 <p>Click me away!</p>
16 <p>Click me too!</p>
17 </body>
18 </html>
```

http://www.w3schools.com/jquery/tryit.asp?filename=tryjquery_hide

JQuery Mobile

jQuery Mobile is a touch-optimized mobile web framework in JavaScript:

- Compatible with all major mobile platforms as well as all major desktop browsers
- Built on top of jQuery core so it has a minimal learning curve for people already familiar with jQuery syntax.
- Theming framework that allows creation of custom themes.
- Limited dependencies and lightweight to optimize speed.
- HTML5-driven configuration for laying out pages with minimal scripting
- Ajax-powered navigation with animated page transitions that provides ability to clean URLs through pushState.
- UI widgets that are touch-optimized and platform-agnostic

http://jquerymobile.com/

JQuery Mobile Example: Lists

```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet"
href="http://code.jquery.com/mobile/1.4.5/jquery.mobile-1.4.5.min.css" />
<script src="http://code.jquery.com/jquery-3.2.1.min.js"></script>
<script src="http://code.jquery.com/mobile/1.4.5/jquery.mobile-
1.4.5.min.js"></script>
</head>
<ul data-role="listview">
    <li><a href="#">Acura</a></li>
    <li><a href="#">Audi</a></li>
    <li><a href="#">BMW</a></li>
    <li><a href="#">Cadillac</a></li>
    <li><a href="#">Ferrari</a></li>
</ul>
</html>
```

Exercise 4: Browse http://demos.jquerymobile.com/1.4.5/ and test RIB

Bootstrap = Mobile-first

- Bootstrap was developed by Mark Otto and Jacob Thornton at Twitter as a framework to encourage consistency
- HTML and CSS-based design templates for typography, forms, buttons, navigation and other interface components
- Optional JavaScript extensions in the form of jQuery plugins.
- Bootstrap is compatible with the latest versions of all major browsers.
- No.1 project on GitHub (June 2014)

http://www.w3schools.com/bootstrap/

http://mobileangularui.com

Bootstrap

Bootstrap Grid System: 12 columns across the page

span1	span1	span1	span1	span1	span1	span1	span1	span1	span1	span1	span1
span 4				span 4				span 4			
span 4				span 8							
span 6						span 6					
span 12											

The Bootstrap grid system has four classes:

- xs (for phones - screens less than 768px wide)
- sm (for tablets - screens equal to or greater than 768px wide)
- md (for small laptops - screens equal to or greater than 992px wide)
- lg (for laptops and desktops - screens equal to or greater than 1200px wide)

Bootstrap Example

Three Equal Columns

```
<div class="row">
  <div class="col-sm-4">.col-sm-4</div>
  <div class="col-sm-4">.col-sm-4</div>
  <div class="col-sm-4">.col-sm-4</div>
</div>
```

Need a bit more: Mobile Angular UI is a mobile UI framework just like Sencha Touch or jQuery Mobile.

Exercise 5: Go to http://mobileangularui.com/docs/#learning-by-examples. Download and install on your machine, then browse the demo folder

Assignment 2: WebApp Prototype

High Fidelity prototype

- Expand the low fidelity prototype developed for A1 into a High Fidelity prototype. Use Figma and share the prototype link to your social contacts to get more detailed feedback on specific design aspects.
- Use these remote experimental settings to scale up the results and assess user preferences on specific open design issues. This can be achieved by defining a couple of slightly different prototype versions (varying only for the features to be tested) and performing an A/B testing on the experimental data points that will be returned with the Google Forms. Remember to add also some selector questions, e.g. 1-5, and not only open ended questions to be answered with text!

Web app prototype

- Based on your Balsamiq prototype develop a similar UI using one of the web application frameworks for mobile and touch applications, like Bootstrap or JQuery Mobile.
- Test your new prototype with real users (record and take notes for documentations).
- Compare and improve the prototype based on the outcomes from the real users' feedbacks.

Write a report of 2-4 pages including choice of Web App tools, implementation, pictures of your Web App prototype, and the results of the tests.

Exercises

1. Port a W3School example to Codepen, ie www.w3schools.com/js/tryit.asp?filename=tryjs_myfirst (5min)
2. Add markers to the map https://www.w3schools.com/html/tryit.asp?filename=tryhtml5_geolocation_map (10min)
3. Based on "JQuery example #1" create a btn that can both hide and show the paragraphs (10min)
4. Browse http://demos.jquerymobile.com/1.4.5/ and test to build a jquerymobile example in RIB https://01.org/rib/online/ (10min)
5. Download and install mobileangularui on your machine, then browse the demo folder http://mobileangularui.com/docs/#learning-by-examples (10min)
6. Xtra: Walk through Javascript examples in Appendix

Native – Hybrid - Web apps

NATIVE vs. WEB vs. HYBRID: 7 FACTORS OF COMPARISON

KEY: CON | PRO | NEUTRAL

	NATIVE	HYBRID	WEB
COST	Commonly the highest of the three choices if developing for multiple platforms	Similar to pure web costs, but extra skills are required for hybrid tools	Lowest cost due to single codebase and common skillset
CODE REUSABILITY/ PORTABILITY	Code for one platform only works for that platform	Most hybrid tools will enable portability of a single codebase to the major mobile platforms	Browser compatibility and performance are the only concerns
DEVICE ACCESS	Platform SDK enables access to all device APIs	Many device APIs closed to web apps can be accessed, depending on the tool	Only a few device APIs like geolocation can be accessed, but the number is growing
UI CONSISTENCY	Platform comes with familiar, original UI components	UI frameworks can achieve a fairly native look	UI frameworks can achieve a fairly native look
DISTRIBUTION	App stores provide marketing benefits, but also have requirements and restrictions	App stores provide marketing benefits, but also have requirements and restrictions	No restrictions to launch, but there are no app store benefits
PERFORMANCE	Native code has direct access to platform functionality, resulting in better performance	For complex apps, the abstraction layers often prevent native-like performance	Performance is based on browser and network connection
MONETIZATION	More monetization opportunities, but stores take a percentage	More monetization opportunities, but stores take a percentage	No store commissions or setup costs, but there are few monetization methods

https://html5test.com/compare/browser/index.html
https://developer.mozilla.org/en-US/docs/Web/Guide/API/Camera

HTML5 features presented

Working with images and links

HTML5 Media

- Audio and Video embedding
- YouTube and SoundCloud examples

Geolocation

Position and acceleration

Exercise: Point-Click-Connect (PCC) System

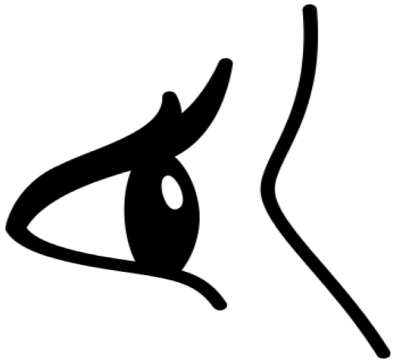
Getting started

Creating an HTML5 file
Notepad
Google Drive
Codepen (http://codepen.io/)

Online resources
HTML5:
- http://www.w3schools.com/html/html5_intro.asp
- http://www.codecademy.com/en/tracks/web

Javascript
- http://www.w3schools.com/js/default.asp
- http://www.codecademy.com/en/tracks/javascript
- http://eloquentjavascript.net/

Image links and buttons



EXAMPLE

Images as clickable links

Using images to open links

- Simple example from w3schools.com
  - http://codepen.io/pietro/pen/ByZXbb

Using maps within an image

- Associating different portions of the image to different links
  - W3 example: http://codepen.io/pietro/pen/pvwMmJ
  - Fashion app: http://codepen.io/pietro/pen/KwvPVV

Using buttons

- to trigger image changes
  - http://codepen.io/pietro/pen/jEwggE

Ideas

Syntax to use images as links

➢“style="display: block;”

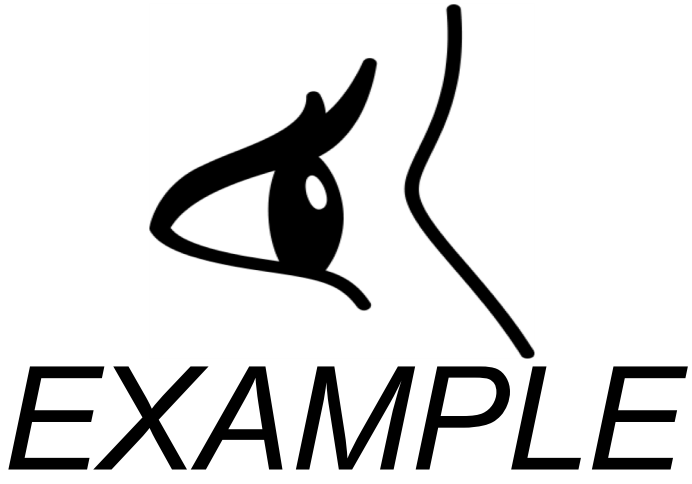
Definition of “Maps” within image

➢Declaration of areas of interest:

- Rectangles, Circles, Polygons

Address and modify HTML elements from JS

HTML Media



Video embedding

Various video format supported

- MP4, WebM, and Ogg
- Simple example from w3schools.com:
  - Autoplay vs. user control
  - *http://codepen.io/pietro/pen/YPQmmv*

Support for YouTube video embedding

- Autoplay vs. user control in YouTube
  - http://codepen.io/pietro/pen/azyoow

Audio embedding

Various audio format supported

- MP3, WAV, and Ogg audio
- Simple example from w3schools.com:
  - Autoplay vs. user control
  - *http://codepen.io/pietro/pen/bNRXXP*

Example on Codepen

- SoundCloud player embedded with artwork
  - Usage of SoundCloud API
  - http://codepen.io/pietro/pen/VYzKpb

Ideas

- Examples to get started embedding audio and video content
- YouTube embedding
- SoundCloud API usage example
- More info at CodeAcademy http://www.codecademy.com/en/tracks/soundcloud (example 6/15 using Souncloud API)

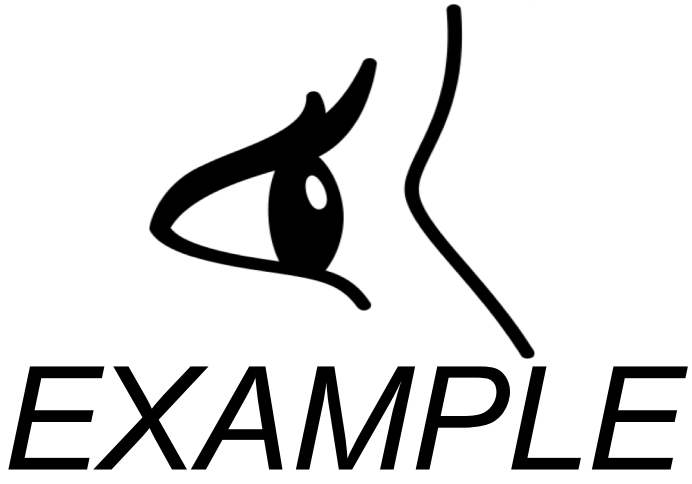
More on Soundcloud

•Random music player:
https://codepen.io/pietro/pen/VVajab

•Possibility to scale it easily up using their API:
https://api-v2.soundcloud.com/charts?kind=top&genre=soundcloud%3Agenres%3Aall-music&client_id=853fdb79a14a9ed748ec9fe482e859dd&limit=10&offset=0

•

Geolocation



Position info

Location logging

- Simple example from w3schools.com
  - http://codepen.io/pietro/pen/razBaj

Embedding maps to display results

- Using Google maps
  - With controls: http://codepen.io/pietro/pen/GgvKJP

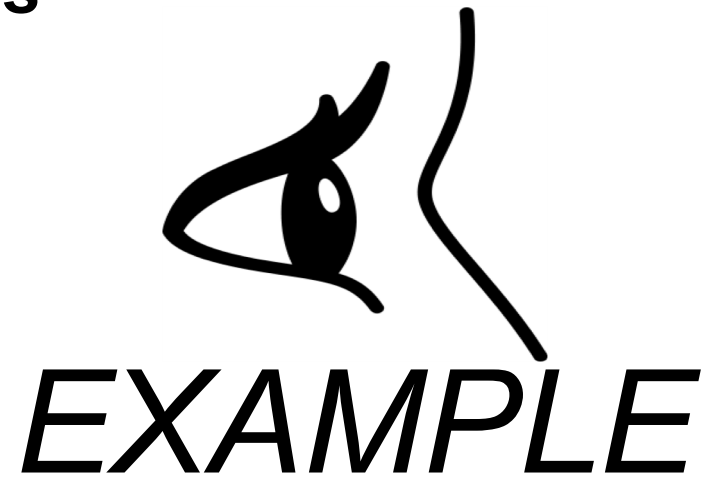
Geolocation.watchPosition()

- Handler function called each time the device position changes:
  - http://codepen.io/pietro/pen/OPjLVG

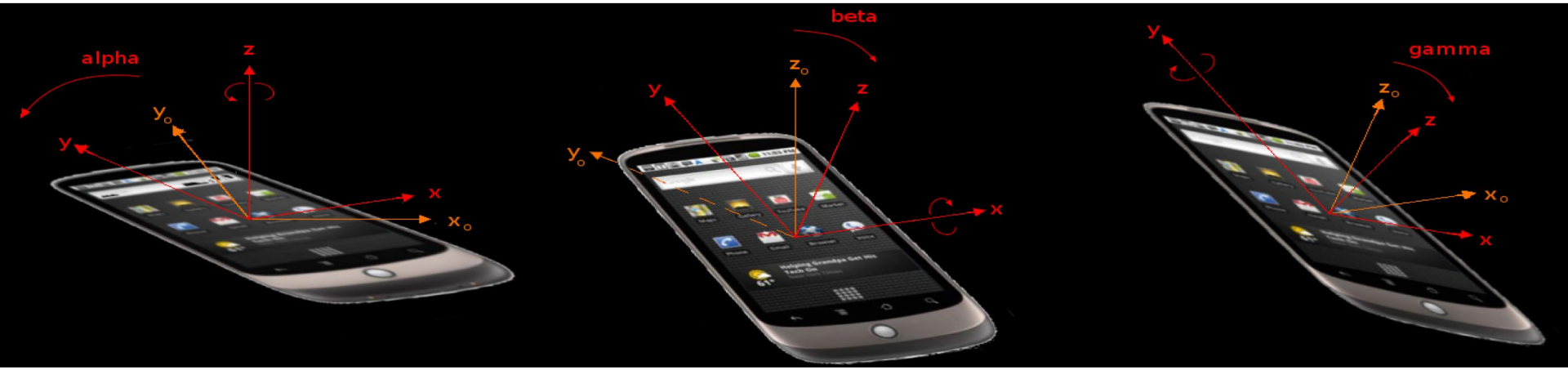
Ideas

- How to use location in HTML5
- Interactions with Google Maps
- Continuous monitoring of location updates
  - https://developer.mozilla.org/en-US/docs/Web/API/Geolocation.watchPosition

Device orientation and accelerometer sensors



Reference system



http://www.html5rocks.com/en/tutorials/device/orientation/

Orientation and acceleration

Orientation and acceleration logging

- Simple example using “event listeners”
  - window.addEventListener('deviceorientation', function(event)
  - window.addEventListener('devicemotion', function(event)
  - *http://codepen.io/pietro/pen/qEjegX*
  - Alternatively:
    - https://tinyurl.com/phone-data-exercise

Ideas

- How to access real time information on position and acceleration
- Getting acquainted with listeners

Using the phone camera to take photos

https://developer.mozilla.org/en-US/docs/Web/Guide/API/Camera

Example available at

http://codepen.io/pietro/pen/bELxGe

Very much central for many projects!!!!

Exercise: Point Click and Connect

https://vimeo.com/116342984

PCC System

- Concept developed at MSL for supporting intuitive user interactions (access of information and/or control) with the environment:
- Physical/Digital interactions with:
  - Connected objects
  - Everyday objects
- Examples and potential business models in retail, connected advertisement, real estate, navigation in general, IoT

Assumptions

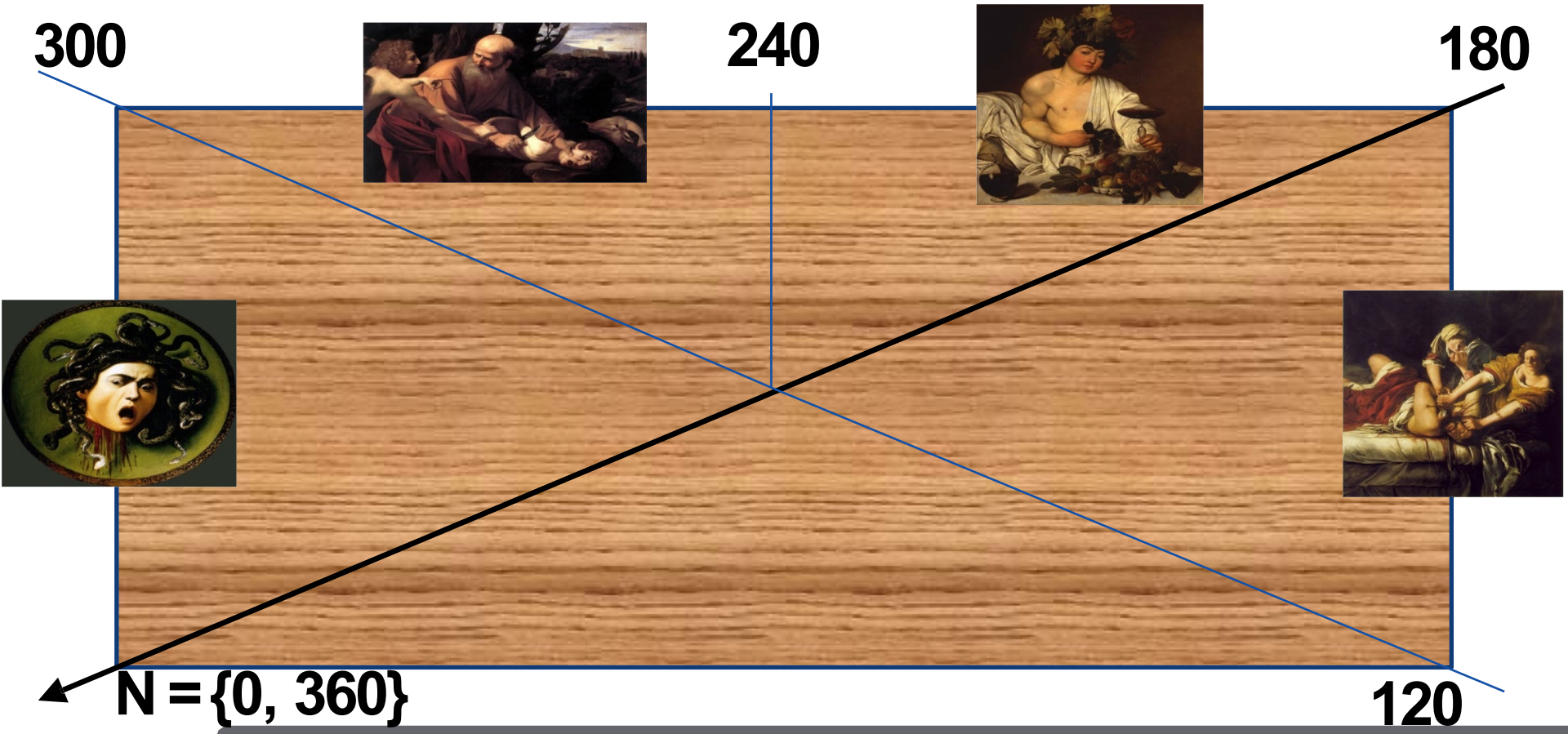
Commissioned a web app to improve UX of people inside various rooms of a museum.

The location can be assumed given, i.e. you know in which room you are

- WiFi SSID
- iBeacons

The art work in the room is clearly located and can be mapped into a spatial model depending only on the “compass” (alpha)

Floor plan (http://goo.gl/H9dRTH)



http://codepen.io/pietro/pen/azyNga

Implementation

- Construct a simple web app that returns different YouTube videos when the users click a button pointing in specific directions.
- Assume whatever video you want and directions intervals, e.g. [0-90], [90-180], [180-270],[270-360].
- Hint:
  - Bulb example but changing attributes of embedded video id
  - Use code from the device orientation example

Designing for improved UX

Moving from central point the “angles” of the PCC system should be adjusted

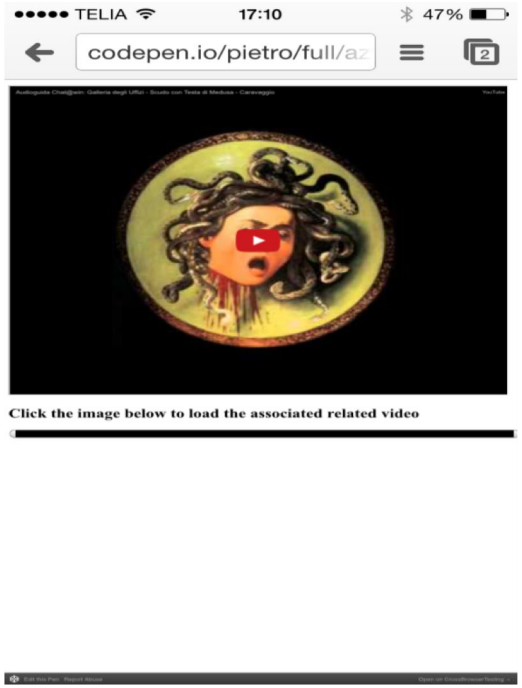
•Most likely unpractical

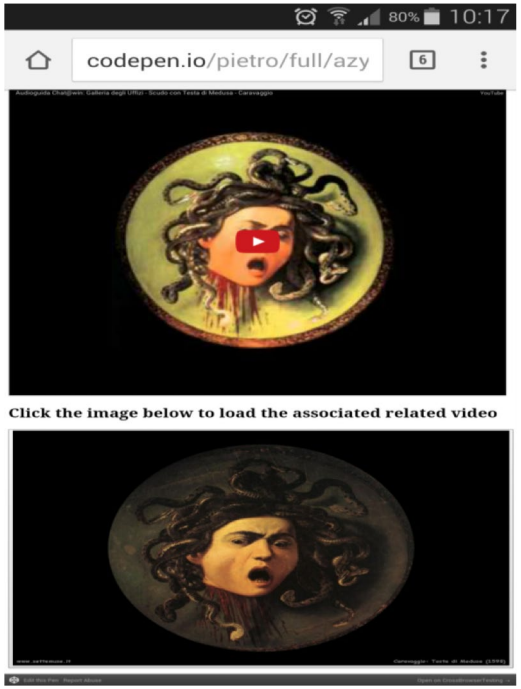
•Fluctuations in the magnetometers

“User-in-the-Loop” design

- Visual feedback to understand which content can be accessed.
- Button design that communicates both that new content and for which painting can be accessed.

IOS vs. Android issue





“Homework” ideas

Find a simple solution that fixes the UX across Andr

Include location in the web app

- Different videos in different places
- It could also be outdoor using GPS data (city guide)

Different media types in different location, e.g.

- Spotify songs
- Audio files (audioguide)

Find a simple solution that allow users to take a picture of a painting and retrieve a specific audio file, or a specific video.

- https://cloud.google.com/vision/

Check the site: https://whatwebcando.today/ for info and code snippets on several features that might be interesting for the project work!