HTML-, CSS- and JavaScript techniques for mobile web applications

Stefan Schuster

Mobile Web

Statistics

Legend:
- Desktop NetApplications
- Desktop StatCounter
- Mobile NetApplications
- Mobile StatCounter

http://www.netmarketshare.com/
http://gs.statcounter.com/

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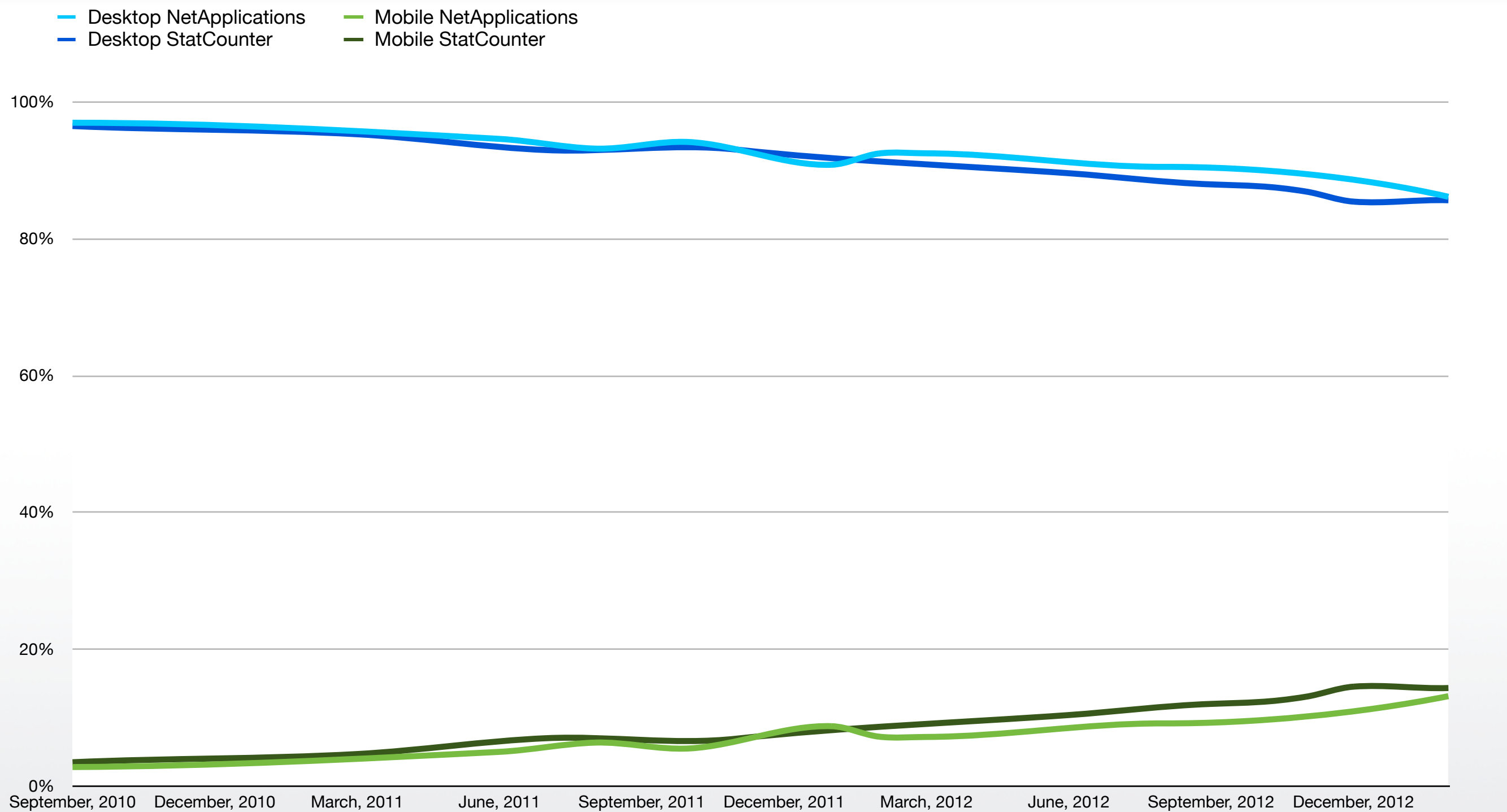
Agenda

- About me
- Browser
- HTML
  - Page setup
  - URL schemes
- CSS
  - CSS 3
  - High resolution
- JS
  - Touch events
  - Device APIs

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About me

- Stefan Schuster
- HTML/CSS/JS expert at IRIAN Solutions GmbH
- "R&D": iOS, Node, CouchDB, Redis, …

- Projects
  - Mind42 (http://mind42.com)
  - Spaaze (http://www.spaaze.com)
  - SimpleMeet.me (http://www.simplemeet.me)

- stefan.schuster@irian.at

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Browser

Smartphones

- Smartphone browsers are modern browsers
  - Webkit dominant
- Many HTML5 technologies available on nearly all smartphones
  - http://mobilehtml5.org
  - Canvas
  - SVG
  - Webworkers
  - Websockets
  - ...

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HTML

Viewport

Default width · Width set to `device-width` · 980 pixels · 320 pixels · Visible area · Viewport width = 320 pixels scale = 1.5

- Viewport and scale much more dynamic
- Default behavior:
  - Desktop pages are shown completely zoomed out
  - iPhone default viewport width: 980px
  - Real (logical) available width: 320px
  - Flexible scale (user can zoom)

Viewport

<meta name="viewport" content="width=device-width, user-scalable=no">

- Viewport Metatag
  - Viewport and scale configuration
- Available options
  - Viewport
    - width
    - height
  - Scale
    - (minimum-/maximum-) scale
    - initial-scale
    - user-scalable

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- URL schemes can be used as a method to switch between apps
  - The only applicable way on iOS
    - e.g.: twitter://user?screen_name=con_fess
  - Native Android apps usually use intents
    - But: URL schemes configurable using intent-filters

- URL Schemes are the only way for mobile web apps to switch between apps

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URL Schemes

- Mail Links
  - mailto:stefan.schuster@irian.at
- Phone Links
  - tel:+43-1-8905303-0
- Text message Links
  - sms:+43-664-80508-3900
- Everything else unfortunately problematic
  - e.g. Map Links:
    - iPhone (Android asks which app to open):
      - http://maps.google.com/maps?q=cupertino
    - Android
      - geo:0,0?q=vienna
- iOS overview: http://handleopenurl.com

- ## Homescreen App Icon (iOS & Android)

  ```
  <link rel="apple-touch-icon" href="/custom_icon.png">
  <link rel="apple-touch-icon-precomposed" href="/icon-pcomp.png">
  ```

- ## Startup Screen (iOS)

  ```
  <link rel="apple-touch-startup-image" href="/startup.png">
  ```

- ## No Browser UI / Fullscreen (iOS)

  ```
  <meta name="apple-mobile-web-app-capable" content="yes">
  ```

- ## Statusbar Styling (iOS)

  ```
  <meta name="apple-mobile-web-app-status-bar-style" content="black">
  ```

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CSS

- CSS3 probably the most important part for performant mobile web apps
  - Superior load times using CSS3 effects instead of images
    - RGBA
    - Gradients
    - Rounded corners
    - Shadows
    - Webfonts
    - Transformations
  - Superior performance due to (partial) hardware acceleration
    - CSS Transitions/Animations instead of JavaScript

RGBA

- Transparent colors
- CSS Property "opacity" probably well known
  - Makes whole Elements (including contained Text) translucent
- RGBA: Transparency, shades and tinting without side effects

  - HEX: #58b2d1
  - RGB: rgb(88, 178, 209)
  - RGBA: rgba(88, 178, 209, 0.5)
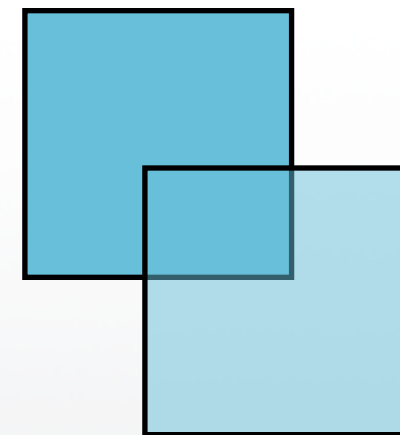
background: linear-gradient(to bottom, #88bfe8 0%,#0081dd 100%);

- Gradients with multiple color stops as CSS backgrounds
- Vendor prefixes (older vendor syntax variants) and fallback necessary

```
background: #88bfe8;
background: -moz-linear-gradient(top,  #88bfe8 0%, #70b0e0 100%);
background: -webkit-gradient(linear, left top, left bottom, color-stop(0%,#88bfe8),
                            color-stop(100%,#70b0e0));
background: -webkit-linear-gradient(top,  #88bfe8 0%,#70b0e0 100%);
background: -o-linear-gradient(top,  #88bfe8 0%,#70b0e0 100%);
background: -ms-linear-gradient(top,  #88bfe8 0%,#70b0e0 100%);
background: linear-gradient(to bottom,  #88bfe8 0%,#70b0e0 100%);
filter: progid:DXImageTransform.Microsoft.gradient( startColorstr='#88bfe8',
endColorstr='#70b0e0',GradientType=0 );
```

- http://www.colorzilla.com/gradient-editor/
- SASS/LESS recommended

border-radius: 4px;
border-radius: 4px 4px 0 0;
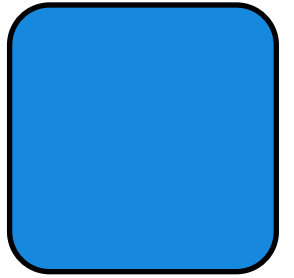
- Rounded corners on all or single corners

- -webkit vendor prefix only required for very old browsers

- border-radius also usable without border property

- DOM elements are usually rectangular

  – Using border-radius also circles are possible

  – e.g.: 100px width/height, 50px border-radius = circle

- http://css3generator.com

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box-shadow: 1px 1px 2px 0px rgba(0, 0, 0, 0.5);
text-shadow: 1px 1px 2px #000;

- Shadow effects for DOM elements or text
- -webkit vendor prefix for box-shadow partially required
- Complex declarations possible:
  - inset
  - multiple shadows
- Reduce performance
- http://css3generator.com

@font-face { font-family: "..."; src: url(...); }

- Enabled integration of custom fonts
- Format chaos (EOT, WOFF, TTF, …)
  - Google WebFonts: http://www.google.com/webfonts
  - Typekit: https://typekit.com
- Available system fonts
  - iOS: http://iosfonts.com
  - Unfortunately nearly no fonts available on Android

transform: rotate(15deg);

- Transformations of the coordinate system (e.g. like in canvas)
  - translate
  - scale
  - rotate
- -webkit vendor prefix necessary
  - http://css3generator.com
- 3D variants available: translate3d, scale3d, rotate3d
  - Better performance thanks to hardware acceleration
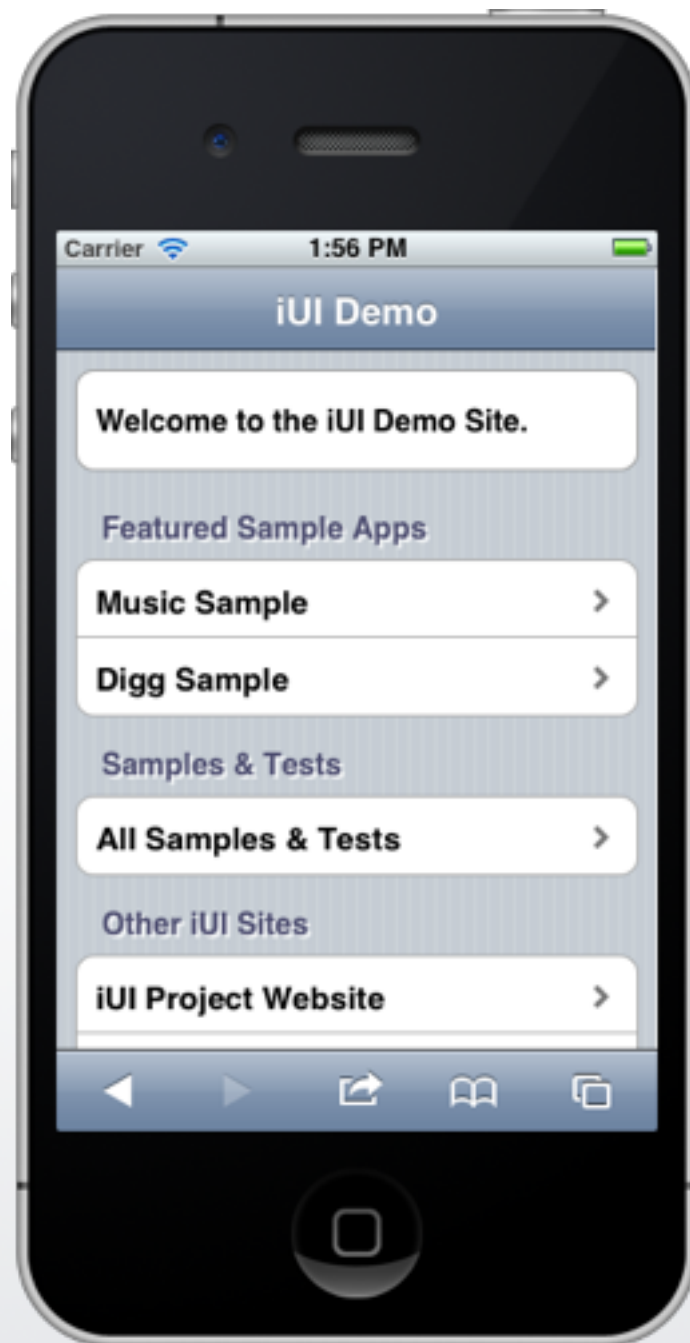 - Eventually a little bit buggy

- Sophisticated UIs possible when combining these effects
  - easier to maintain (code instead of graphics)
  - perfect for mobile: less images required

```css
.badge {
    width: 100px;
    height: 100px;
    background: #ff3019;
    background: -webkit-gradient(linear, left top, left bottom, color-stop(0%,#ff3019),
                                color-stop(100%,#cf0404));
    background: -webkit-linear-gradient(top, #ff3019 0%,#cf0404 100%);
    background: linear-gradient(to bottom, #ff3019 0%,#cf0404 100%);
    -webkit-transform: rotate(20deg);
    transform: rotate(20deg);
    -webkit-box-shadow: 5px 5px 4px rgba(0, 0, 0, 0.5);
    box-shadow: 5px 5px 4px rgba(0, 0, 0, 0.5);
    border-radius: 50px;
    border: 3px solid #eee;
    text-align: center;
    color: white;
    font-weight: bold;
    line-height: 100px;
    font-family: Helvetica;
    font-size: 30px;
}
```

Complex UIs

- Really a lot of stuff can be achieved without images

transition: background 500ms ease;

- Defines transition behavior for CSS property changes
- Property changes (e.g. caused by hover or JS) are smoothly animated
- -webkit vendor prefix necessary
- Can replace some JS animations

@-webkit-keyframes myAnim { from {...} to {...} }
#myObject { -webkit-animation-name: myAnim; ... }

- 1. Define CSS for animation states

- 2. Assign animations to elements

- Complex

- Can replace some JS animations

- Especially in combination with hardware accelerated 3D transforms:

  - fluid and performant animations

High resolution

- High resolution displays / Retina displays (Apple)
  - Newer smartphones, tablets and notebooks feature very high resolutions
  - 220 DPI ++
  - CSS pixels (px) are no longer mapped to display pixels 1:1
    - e.g.: 1px (CSS) = 2x2px (display)

- Consequences
  - 640px display width (iPhone 4) = 320px display width (iPhone 3GS)
    - No changes necessary
  - CSS3 effects (gradients, shadows) scale automatically
    - No changes necessary
  - Embedded images (<img>, CSS backgrounds) are scaled
    - 200px image rendered using 200px (logical) CSS
    - display/css px mapping of 1:2 causes the 200px (CSS) image to be rendered with 400px (display)
    - suboptimal rendering (pixelated)

- Possible approach
  - Using bigger images (400px images rendered with 200px CSS)
    - perfect rendering on high resolution displays
    - but unnecessary amounts of transferred data (and maybe performance relevant downscaling) on classical 1:1 (low resolution) devices
      - that's also suboptimal

- CSS/JS Pixel Ratio
  - CSS
    - <link rel="stylesheet" … media="screen and (min-device-pixel-ratio: 2)">
    - @media screen and (min-device-pixel-ratio: 2) { … }
    - vendor prefixes required
    - Use these high resolution CSS to include high resolution images
    - Careful: Offsets of sprites may change
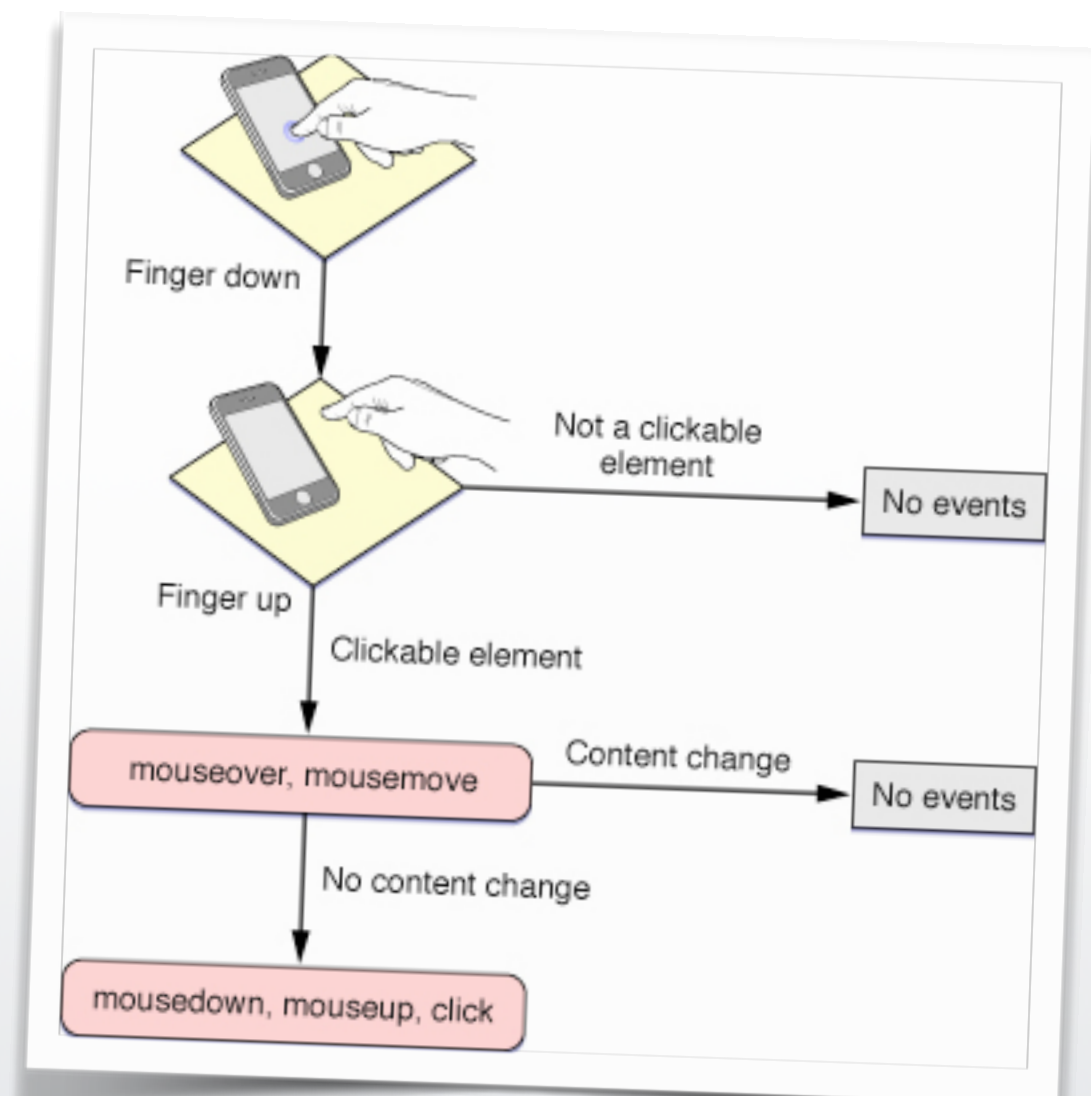 - JS: window.devicePixelRatio

  - http://coding.smashingmagazine.com/2012/08/20/towards-retina-web/

JavaScript

Touch API

- Classical JS mouse events "theoretically" useless
  - onclick, onmouseover/out/down/move/up
- They are simulated when no touch event handlers are registered
  - delayed

- Touch/Gesture APIs available
  - ontouchstart/move/end/cancel
  - ongesturestart/change/end

Apple Developer: Safari Web Content Guide
https://developer.apple.com/library/safari/documentation/AppleApplications/Reference/SafariWebContent/Introduction/Introduction.html#//apple_ref/doc/uid/TP40002051

- ontouchstart/move/end/cancel
  - Supports multi-touch
    - List of all touch points
      - event.touches
      - event.targetTouches
      - event.changedTouches
    - Touches have an identifier
      - event.touches[0].identifier
    - Otherwise similar to mouse events
      - touch.pageX/pageY
  - Compared to simulated mouse events there is no delay

Gesture API

- iOS only
- Simplifies use of gestures like pinch/rotate
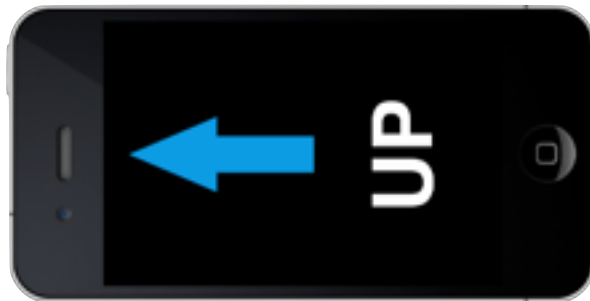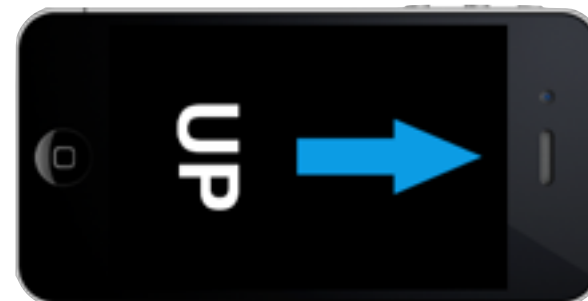- ongesturestart/change/end
  - event.rotation
  - event.scale

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- Device Orientation can be queried with JavaScript
  - window.orientation

| 0 | 90 | -90 | 180 |

- JS Event for changes
  - body.onorientationchange

Orientation

- Gyro / Compass
  - window.ondeviceorientation
    - event.alpha/beta/gamma
- Accelerometer
  - window.ondevicemotion
    - event.acceleration
    - event.accelerationIncludingGravity
    - event.rotationRate

http://dev.w3.org/geo/api/spec-source-orientation.html#devicemotion

If R resresents the vector r in the earth frame XYZ, then since the inital body frame is aligned with the earth, R is as follows.

$$R = ABCr$$

$$R = \begin{bmatrix} \cos(\alpha) & -\sin(\alpha) & 0 \\ \sin(\alpha) & \cos(\alpha) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\beta) & -\sin(\beta) \\ 0 & \sin(\beta) & \cos(\beta) \end{bmatrix} \begin{bmatrix} \cos(\gamma) & 0 & \sin(\gamma) \\ 0 & 1 & 0 \\ -\sin(\gamma) & 0 & \cos(\gamma) \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ -1 \end{bmatrix}$$

$$R = \begin{bmatrix} \cos(\alpha) & -\sin(\alpha) & 0 \\ \sin(\alpha) & \cos(\alpha) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\beta) & -\sin(\beta) \\ 0 & \sin(\beta) & \cos(\beta) \end{bmatrix} \begin{bmatrix} -\sin(\gamma) \\ 0 \\ -\cos(\gamma) \end{bmatrix}$$

$$R = \begin{bmatrix} \cos(\alpha) & -\sin(\alpha) & 0 \\ \sin(\alpha) & \cos(\alpha) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} -\sin(\gamma) \\ \sin(\beta)\cos(\gamma) \\ -\cos(\beta)\cos(\gamma) \end{bmatrix}$$

$$R = \begin{bmatrix} -\cos(\alpha)\sin(\gamma) - \sin(\alpha)\sin(\beta)\cos(\gamma) \\ -\sin(\alpha)\sin(\gamma) + \cos(\alpha)\sin(\beta)\cos(\gamma) \\ -\cos(\beta)\cos(\gamma) \end{bmatrix}$$

The compass heading θ is given by

$$\theta = \tan^{-1}\left(\frac{R_x}{R_y}\right) = \tan^{-1}\left(\frac{-\cos(\alpha)\sin(\gamma) - \sin(\alpha)\sin(\beta)\cos(\gamma)}{-\sin(\alpha)\sin(\gamma) + \cos(\alpha)\sin(\beta)\cos(\gamma)}\right)$$

provided that β and γ are not both zero.

As a consistency check, if we set γ = 0, then

$$\theta = \tan^{-1}\left(\frac{-\sin(\alpha)\sin(\beta)}{\cos(\alpha)\sin(\beta)}\right) = -\alpha$$

Geolocation

- GPS/WLAN/Cell Tower positioning

- Use requires approval by user

- navigator.geolocation.getCurrentPosition(callback)
  - one time positioning
  - position.latitude
  - position.longitude

- navigator.geolocation.watchPosition(callback)
  - updates on location changes

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