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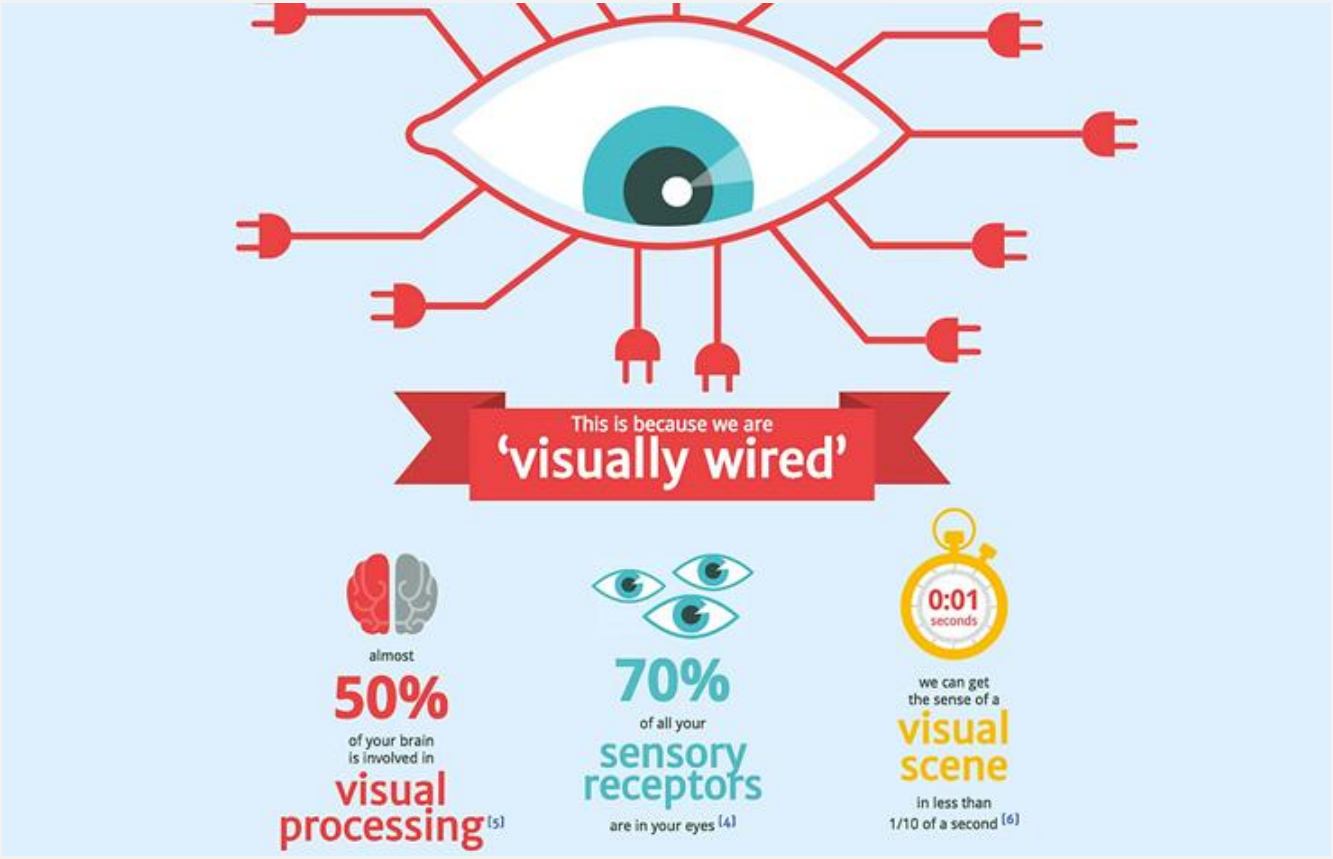
Syllabus

Web graphical animation:

- Goals
- Evolution
- Technologies
- Libraries and tools

Web graphical animation

- The use of information in graphic format has grown by about 9900% over the Internet (since 2007).



Web graphical animation

- One of the greatest innovations in Internet history was the ability to integrate images and other illustrations into texts on a web page
- Web page animation is any form of movement performed by objects and/or images
- Advantages:
  - Attract user attention to a specific section of the page
  - Enrich a demo text with a matching animation
  - Simply entertain the user

Web graphical animation

"Animation is no longer a novelty for web designers...it's becoming the basis of effective interaction design."

http://www.webdesignerdepot.com/2015/05/the-ultimate-guide-to-web-animation/

Animation is not just for cartoons anymore. From full-screen moving images to small hover effects, touches of animation are popping up everywhere. Animation is trendy, fun and user friendly.

https://designshack.net/articles/graphics/an-introduction-to-animation-in-web-design/

Web graphical animation

- GIF - Graphics Interchange Format: set of images that are presented in a certain order
- One of the first types of animation to be considered standard on the Web (1997):
  - the most natural way to add animations to a website is to upload a series of bitmap images that browsers show in sequence
- Advantages:
  - reduced file size
  - ease to work with
  - automatically recognized by all browsers

Web graphical animation

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- One of the first types of animation to be considered standard on the Web (1997):
  - the most natural way to add animations to a website is to upload a series of bitmap images that browsers show in sequence
- Disadvantages:
  - very simple animations
  - only 256 colors
  - no sound
  - short duration

Web graphical animation

- Flash and Shockwave: Adobe plug-ins widely used in web animations
- Support vector and bitmap graphics as well as two-way audio and video streaming
- Widespread among web designers
- Flash animations are mostly controlled using their programming language - Actionscript
- Advantages:
  - support audio and video
  - allow user interactivity

Web graphical animation

- Flash and Shockwave: Adobe plug-ins widely used in web animations
- Support vector and bitmap graphics as well as two-way audio and video streaming
- Widespread among web designers
- Flash animations are mostly controlled using their programming language - Actionscript
- Disadvantages:
  - resource consumption
  - in disuse since the arrival of HTML5 and CSS3
  - no longer supported by all major browsers!

Adobe Flash is technically gone, with Adobe having stopped development on it on December 30, 2020. This means that none of the major browsers – Chrome, Edge, Safari, Firefox – support it any more!

Web graphical animation

- HTML5: the web programming language, in its current version, allows native animation, i.e. it does not require to install plug-ins
- Lighter and compatible with latest browser versions
- Requires the use of CSS and JavaScript for graphic style application and animation control
- HTML elements for native animation:
  - Canvas
  - SVG (Scalable Vector Graphics)

Web graphical animation

Native Web Animation Technologies

Animation of DOM elements
- CSS3 Animations ✓
- DOM API Animations (JS) ✓
- Web Animations API (JS) 

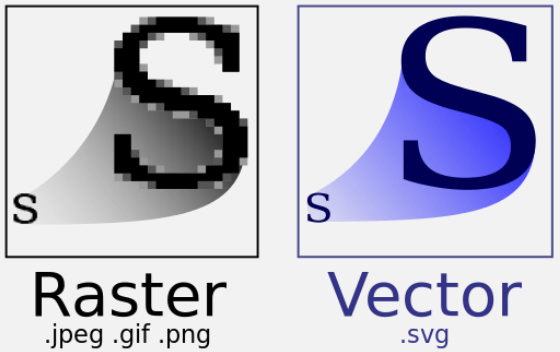
2D drawing
- SVG ✓
- Canvas API (JS) ✓

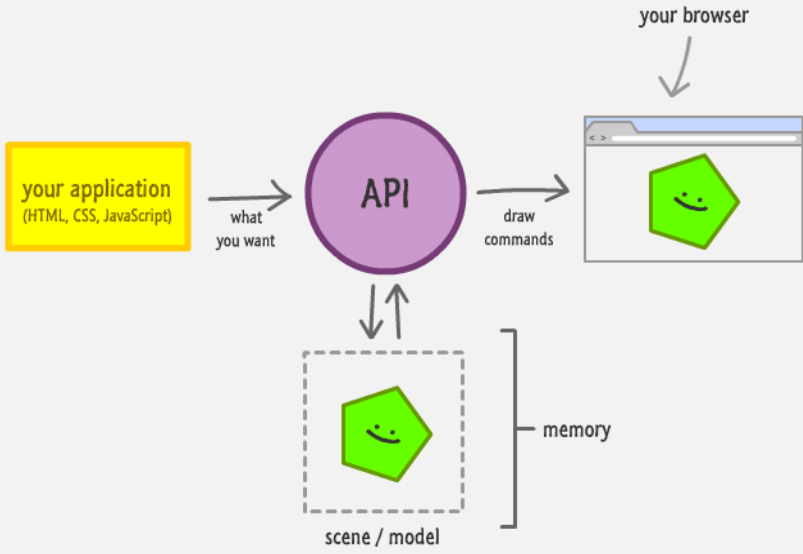
3D rendering → WebGL (renders on Canvas) ✓

Web graphical animation

SVG

- vector graphic elements
- multiple elements that belong to the DOM
- retained mode rendering:
  - the elements persists in a memory model that can be manipulated through code
- events interaction made by element



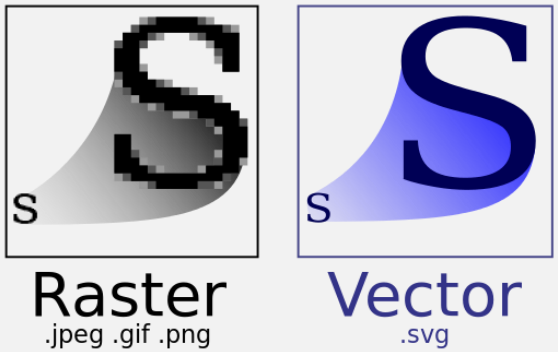


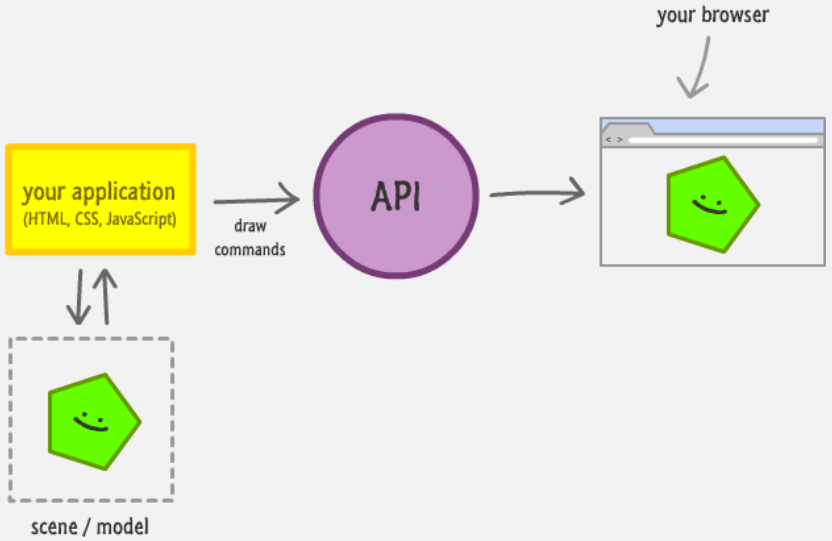
https://www.kirupa.com/html5/dom_vs_canvas.htm

Web graphical animation

Canvas

- bitmap (raster) graphic elements
- single HTML element
- immediate mode rendering:
  - graphics are displayed directly on the screen, leaving no context whatsoever with what was done in terms of drawing or what was animated
- granular (pixel) event interaction





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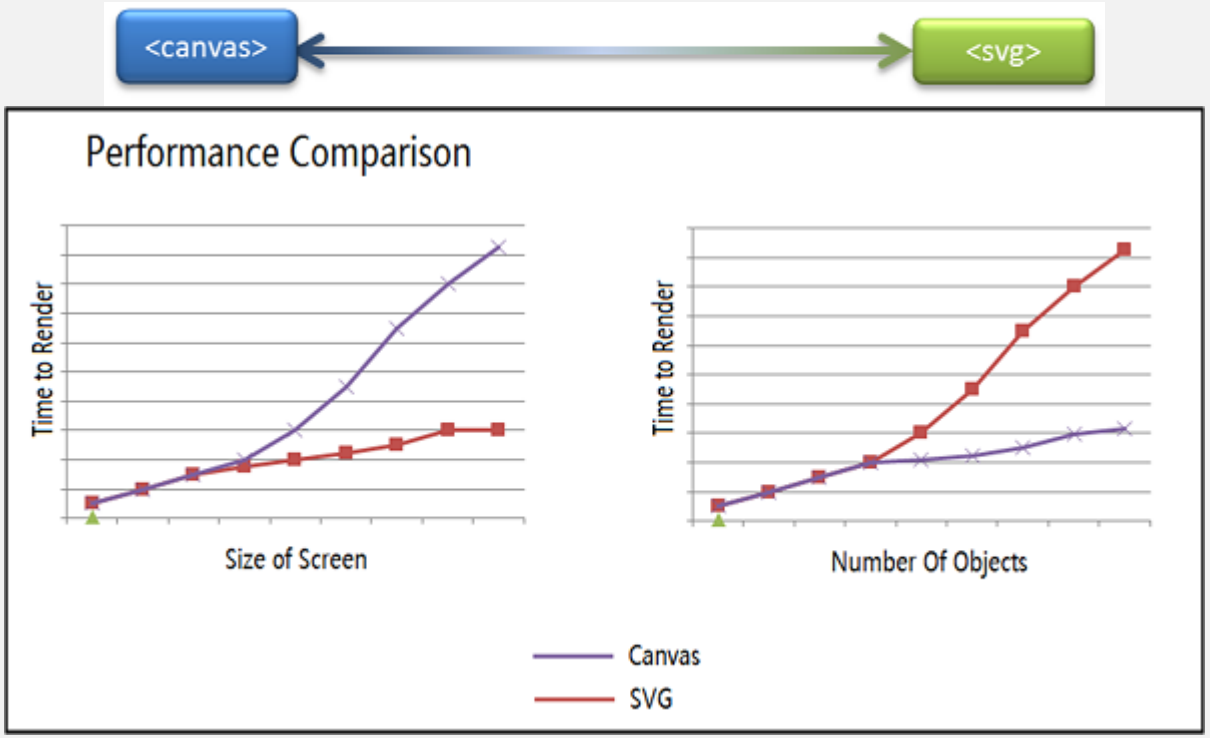
Web graphical animation

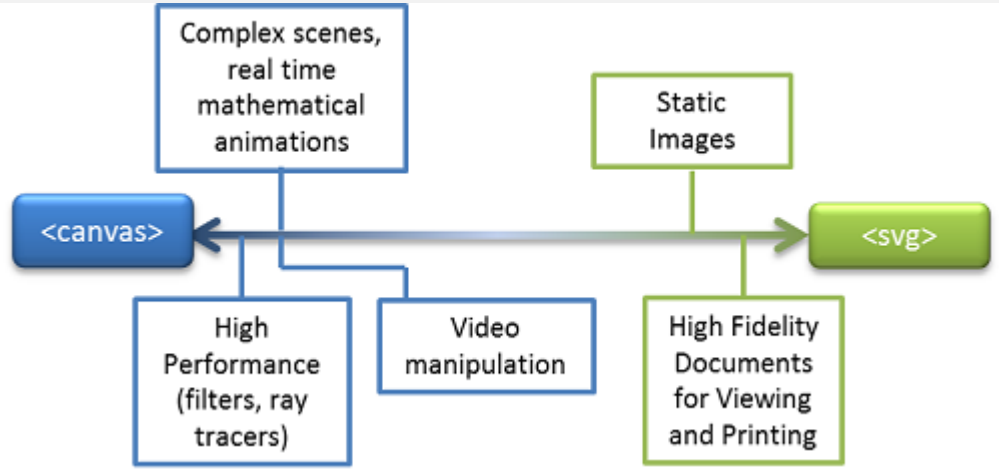
Canvas vs SVG



https://msdn.microsoft.com/pt-pt/library/gg193983(v=vs.85).aspx

Web graphical animation

Canvas vs SVG



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Web graphical animation

CSS3

- CSS animations are a feature of the CSS3, the ongoing draft specification of CSS
- declarative animation of DOM elements
- Pros:
  - great potential for performance without much effort
  - simple, responsive animations and transitions
- Cons:
  - can’t create complex physics effects
  - can’t imitate realistic motion
  - access to limited events

Web graphical animation

CSS3 versus JavaScript

CSS
https://codepen.io/MarkupPro/pen/KMzJGO

JS
https://codepen.io/MarkupPro/pen/MeyxvJ

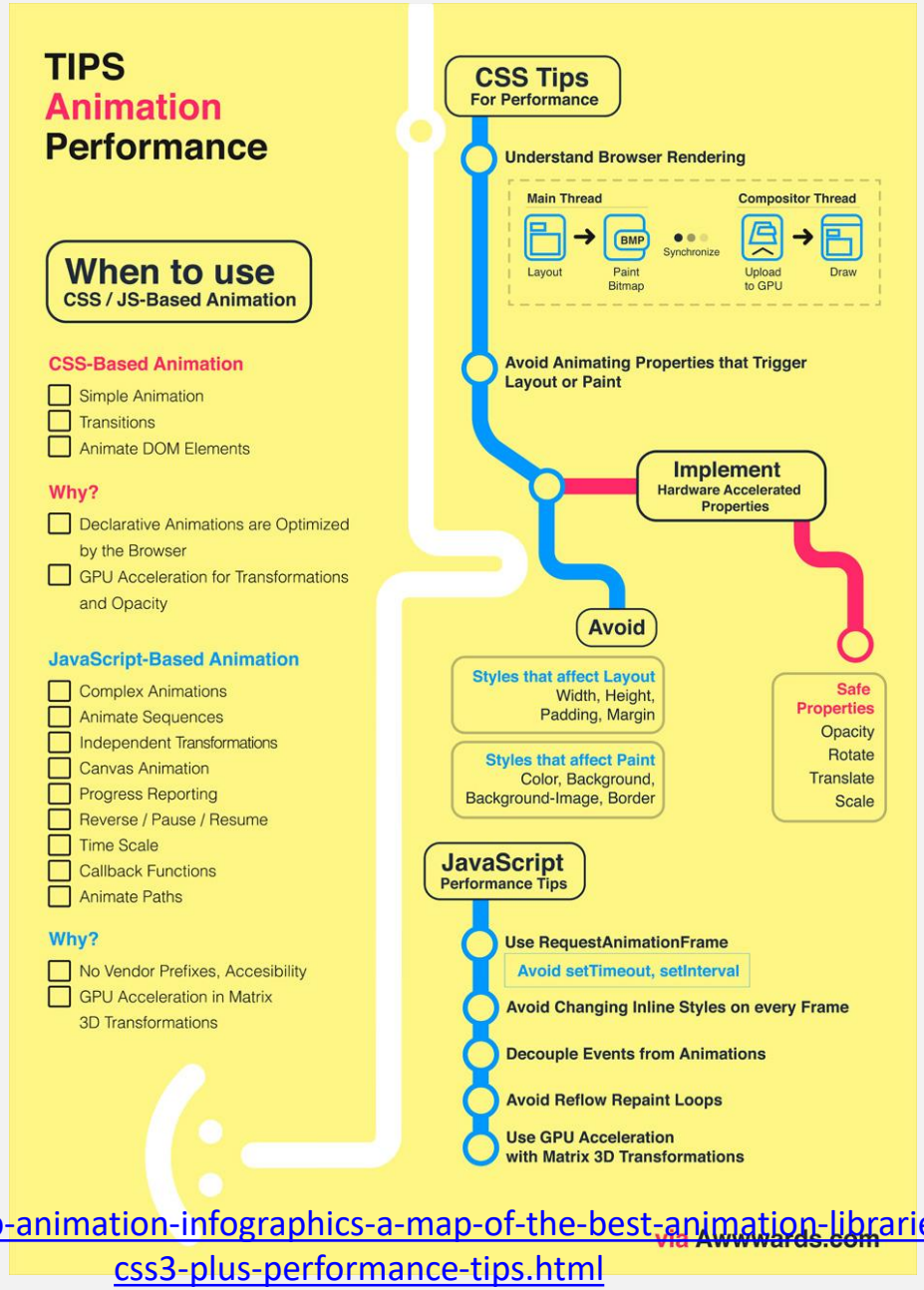
This graphic segregates libraries which use **CSS3 transition** to animate elements from libraries which **call on JS** instead.
Also selects libraries geared towards animations for SVG, WebGL or HTML5 Canvas

https://www.awwwards.com/web-animation-infographics-a-map-of-the-best-animation-libraries-for-javascript-and-css3-plus-performance-tips.html

This graphic is dedicated to the various **methods for animating UI elements** and any others objects in the DOM like scroll animation, parallax, sprites, 3D transformations, physics engines, and transitions

https://www.awwwards.com/web-animation-infographics-a-map-of-the-best-animation-libraries-for-javascript-and-css3-plus-performance-tips.html

This last graphic lays out some **basic performance tips to help choose between CSS or Javascript** - based animation depending on the requirements of any given project



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