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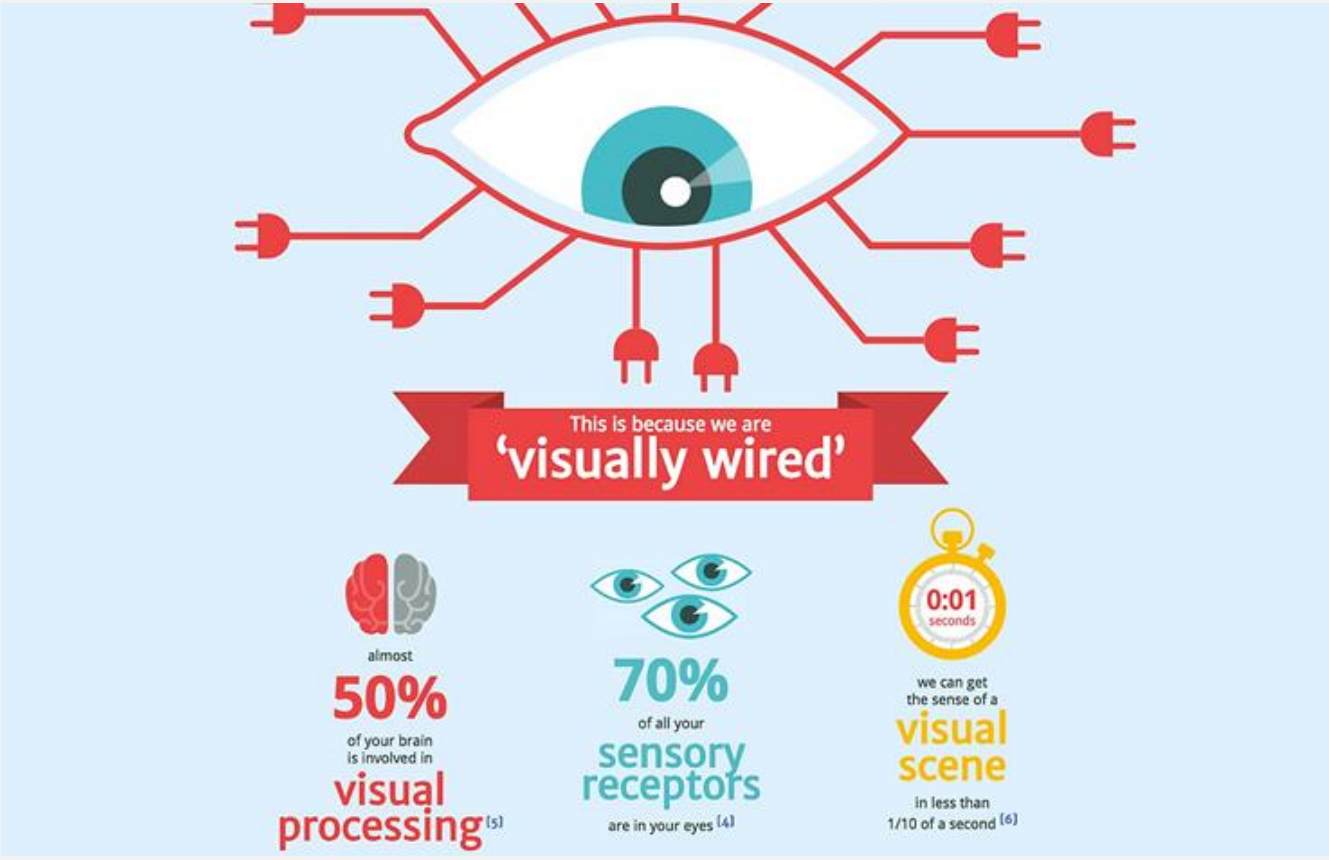
Syllabus

- Goals of Web graphical animation
- Evolution of Web graphical animation
- 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

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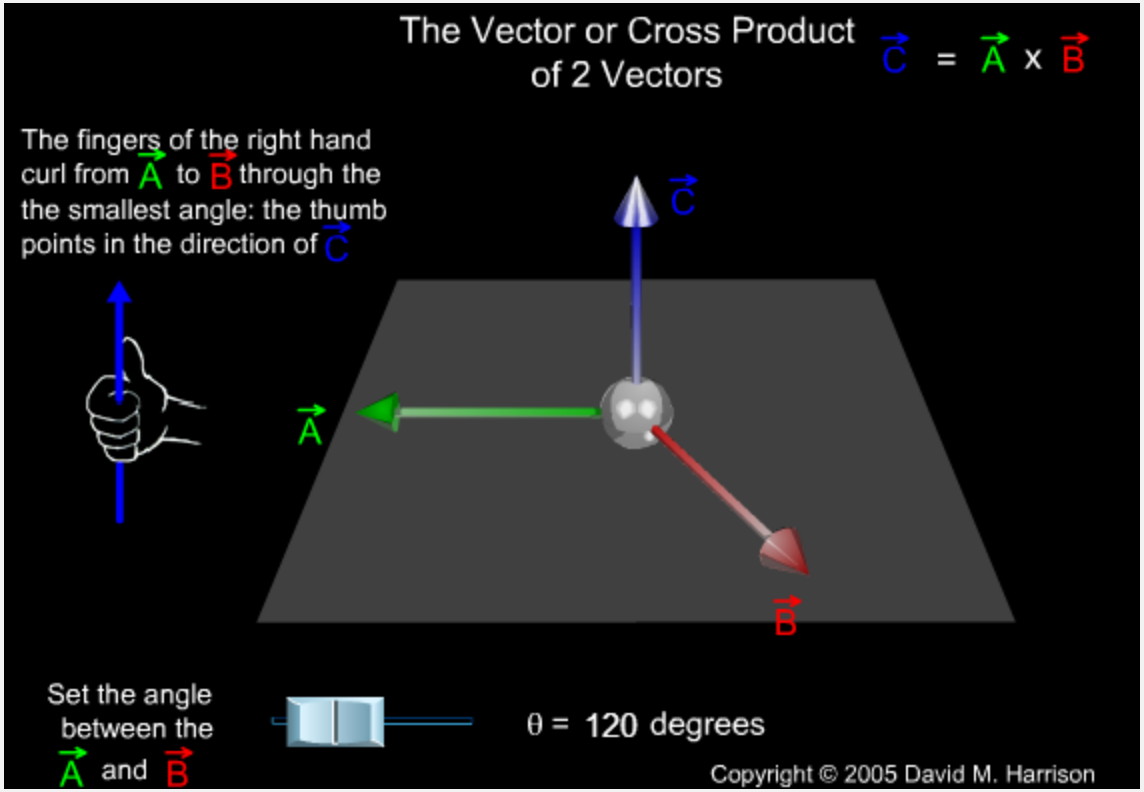
- Support vector and bitmap graphics as well as two-way audio and video streaming
- Widespread among web designers
- Flash animations are mostly controlled using their programming language - Actionscript
- Disadvantages:
  - resource consumption
  - in disuse since the arrival of HTML5 and CSS3
  - no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

Web graphical animation

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!



Flash animation demonstrating cross product between 2 vectors

http://www.upscale.utoronto.ca/GeneralInterest/Harrison/Flash/Vectors/CrossProduct/CrossProduct.html

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) 

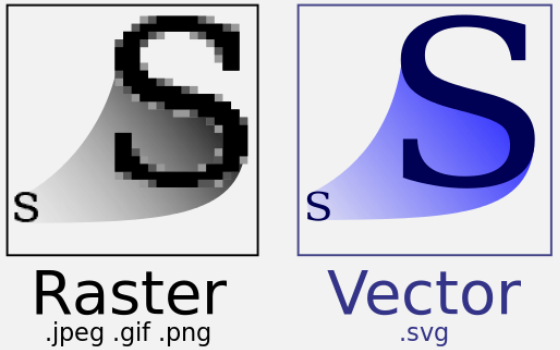
2D drawing
- SVG ✓
- Canvas API (JS) ✓

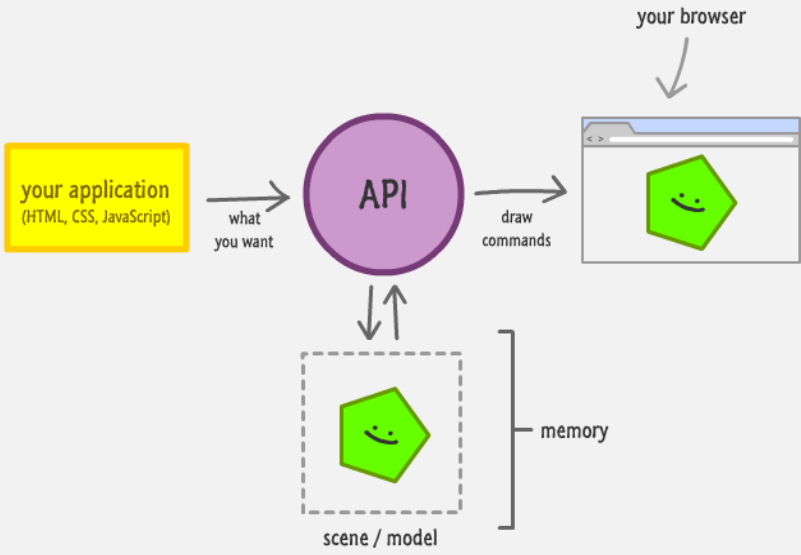
3D rendering → WebGL (renders on Canvas) ✓

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



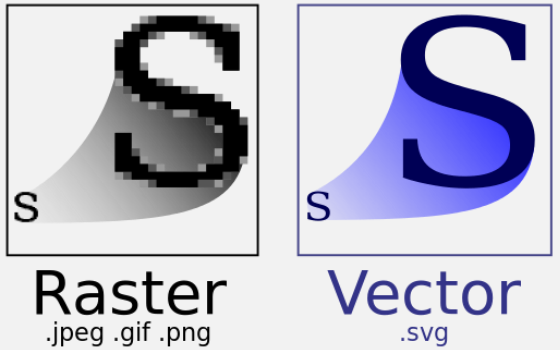


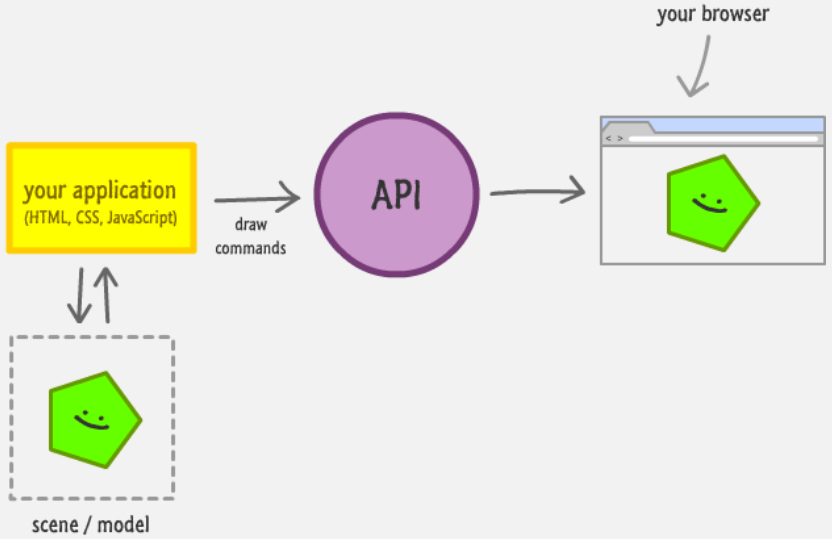
https://www.kirupa.com/html5/dom_vs_canvas.htm

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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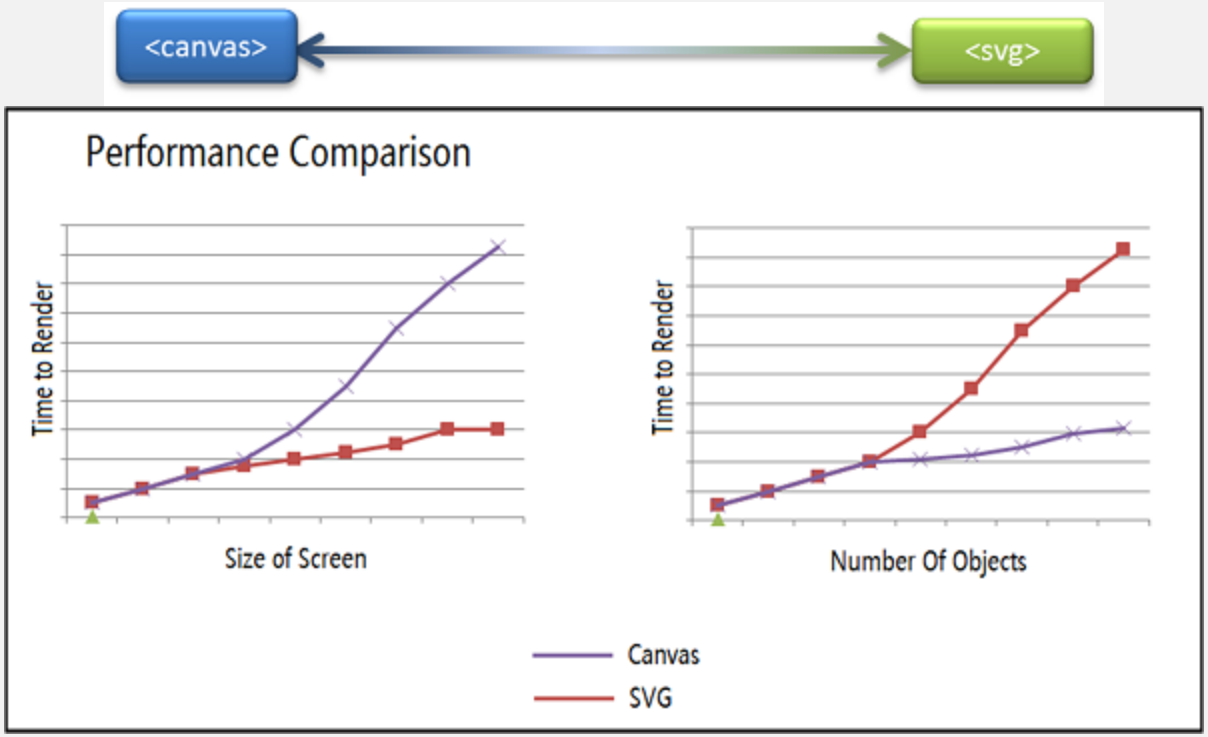
Web graphical animation

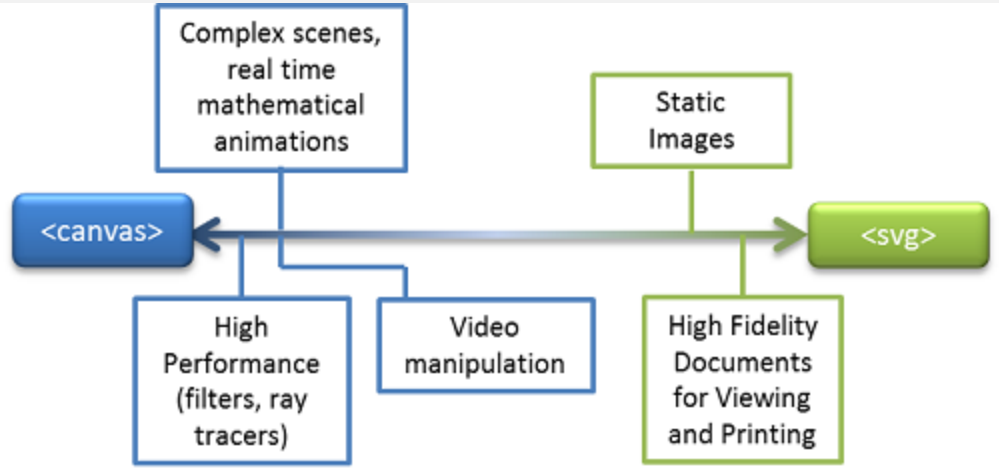
Canvas vs SVG



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

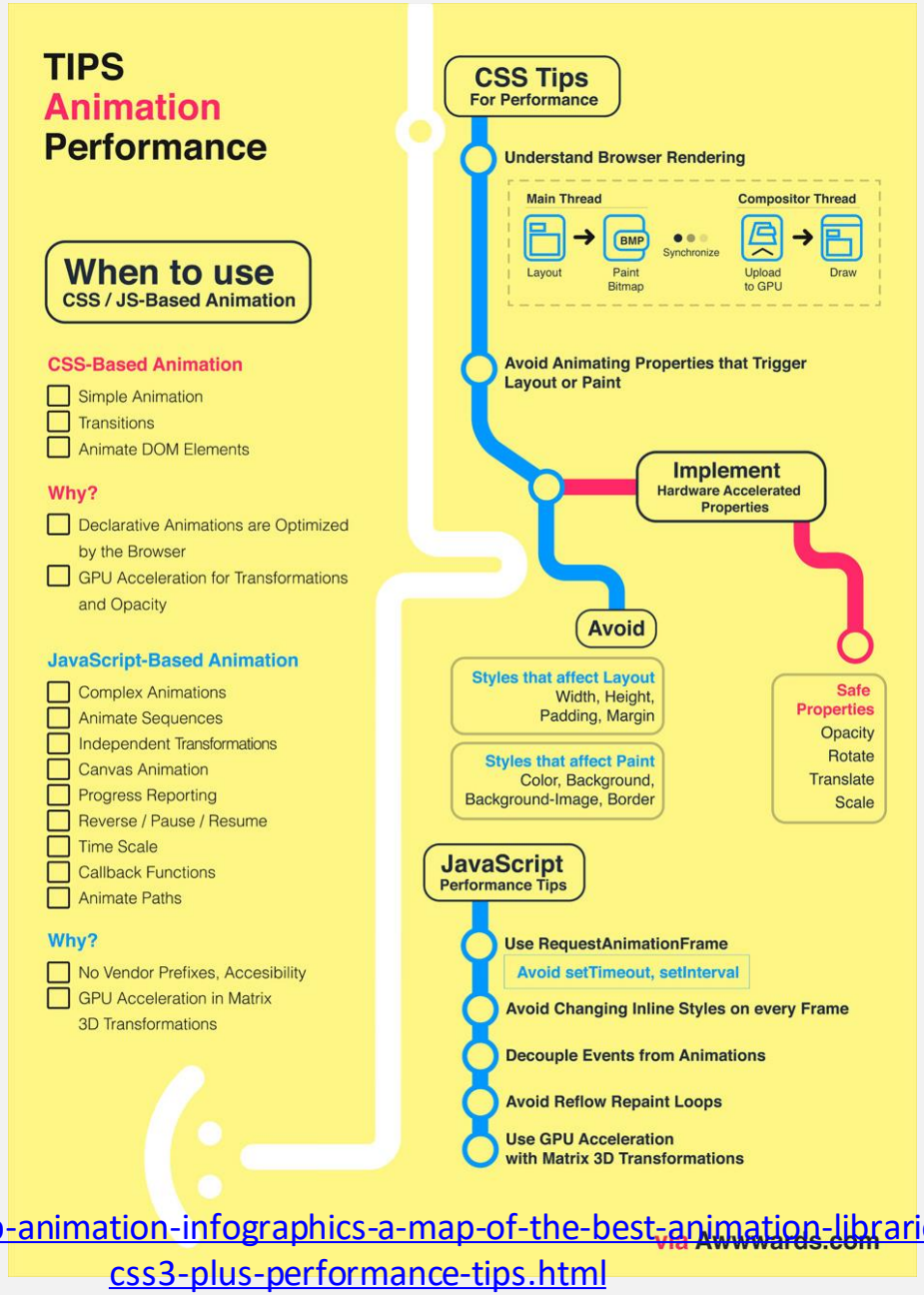
This graphic segregates libraries which use CSS3 transition to animate elements from libraries which call on JS instead.
Also selects libraries geared towards animations for SVG, WebGL or HTML5 Canvas

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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