D3.js Introduction

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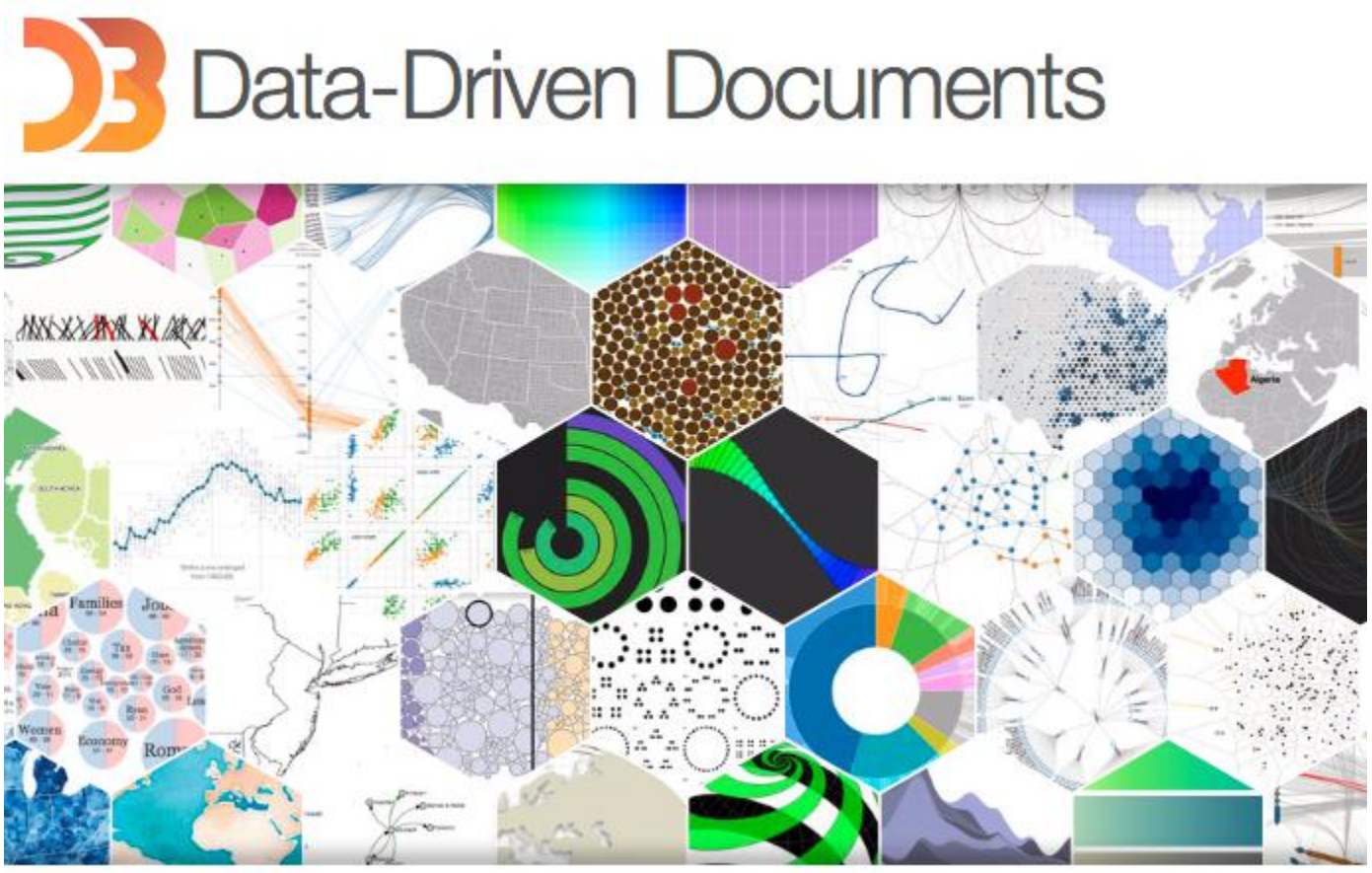


D3: Data Driven Documents

D3 - Introduction

- 1996: First browser with JavaScript
- 2005: J. Heer et al.'s prefuse toolkit
- 2007: J. Heer's Flare toolkit
- 2009: J. Heer + M. Bostock – Protovis
- 2011: D3

D3 – Data Driven Documents

- Visualization requires visual encoding: mapping data to visual elements.
- The HTML Document Object Model has a rich set of features and standards for visual display
- A tool not to replace the web and modern browser's toolbox but to expose it an easy way to use.
- D3 allows transformation of the HTML DOM from text document to Visualization

D3 – Web Standards

- “Learning D3” is largely learning web standards.

- The **Document** refers to the *W3C Document Object Model*

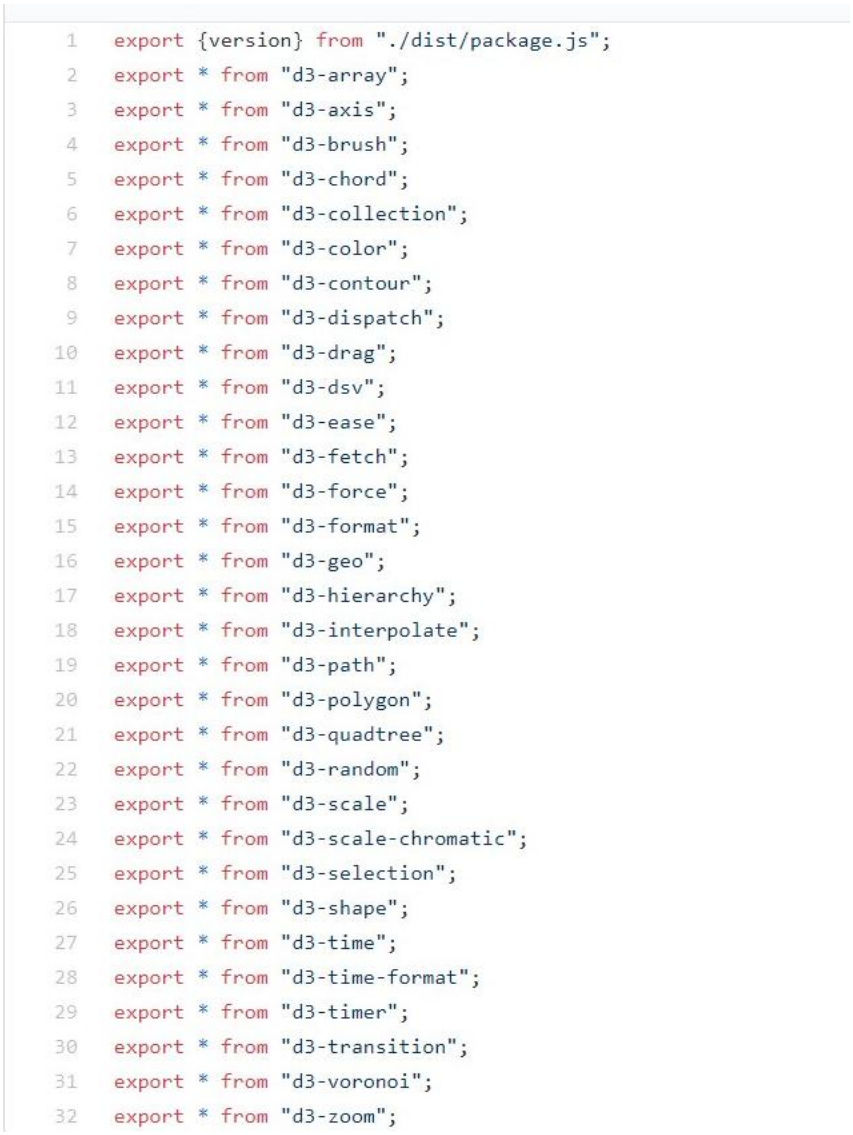
- Unlike Processing or Protovis, D3’s vocabulary of graphical marks comes directly from web standards: HTML, SVG, and CSS.

D3 - Library

- D3 allows you to bind arbitrary data to a Document Object Model (DOM), and then apply data-driven transformations to the document.

- D3 isn’t a monolithic framework; it’s a suite of small modules (31) for data analysis and visualization.

D3 - Library



```
export {version} from "./dist/package.js";
export * from "d3-array";
export * from "d3-axis";
export * from "d3-brush";
export * from "d3-chord";
export * from "d3-collection";
export * from "d3-color";
export * from "d3-contour";
export * from "d3-dispatch";
export * from "d3-drag";
export * from "d3-dsv";
export * from "d3-ease";
export * from "d3-fetch";
export * from "d3-force";
export * from "d3-format";
export * from "d3-geo";
export * from "d3-hierarchy";
export * from "d3-interpolate";
export * from "d3-path";
export * from "d3-polygon";
export * from "d3-quadtree";
export * from "d3-random";
export * from "d3-scale";
export * from "d3-scale-chromatic";
export * from "d3-selection";
export * from "d3-shape";
export * from "d3-time";
export * from "d3-time-format";
export * from "d3-timer";
export * from "d3-transition";
export * from "d3-voronoi";
export * from "d3-zoom";
```

D3.JS - Data Driven Documents

d3 – templates and gallery

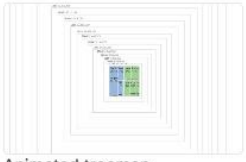
https://observablehq.com/@d3/gallery

D3 gallery

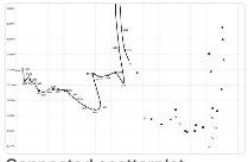
Looking for a good D3 example? Here's a few (okay, 173…) to peruse.

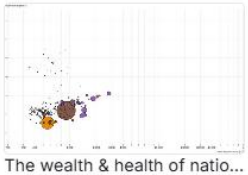
Animation

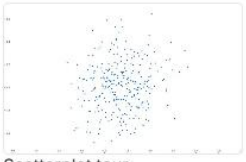
D3's data join, interpolators, and easings enable flexible animated transitions between views while preserving object constancy.


Animated treemap


Temporal force-directed gr…

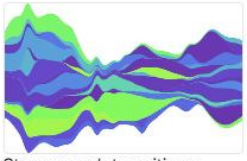

Connected scatterplot


The wealth & health of natio…


Scatterplot tour

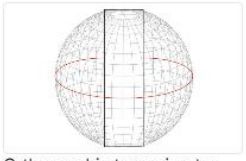
Bar chart race

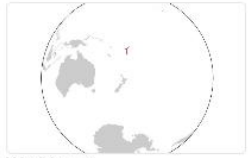

Stacked-to-grouped bars


Streamgraph transitions

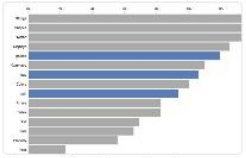

Smooth zooming


Zoom to bounding box

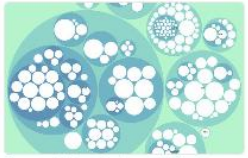

Orthographic to equirectan…


World tour


Walmart's growth


Hierarchical bar chart

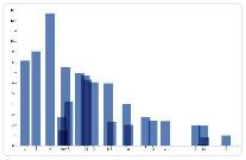

Zoomable treemap

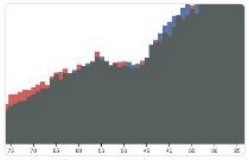

Zoomable circle packing


Collapsible tree


Zoomable icicle


Zoomable sunburst


Sortable bar chart


Icelandic population by age…


Pie chart update


Arc tween

Interaction

D3's low-level approach allows for performant incremental updates during

D3 - Introduction

- JavaScript library for creating data visualizations

- Data-Driven Documents
  - User provides the data
  - D3 does the driving
  - I.e., it connects the data to web-based documents

- Mike Bostock

- d3js.org

D3 - Introduction

- Generation and manipulation of web-documents with data
- How ?
  - Load the data into the browser's memory
  - Bind the data to document elements
  - Transform elements (i.e., set visual properties) according to each element's bound datum
  - Transition elements between states in response to user input

d3 - Introduction

- No support for older browsers

- No handling of bitmap map tiles
  - Vector graphics instead

- No hiding of original data
  - Client-side execution
  - Data must be sent to the client
  - Do not use D3 if your data cannot be shared !

d3 – Generating page elements

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8">
        <title>D3 Page Template</title>
        <script type="text/javascript“ src=“http://d3js.org/d3.v7.min.js"></script>
    </head>
    <body>
        <script type="text/javascript">
            <! D3 Code here >
        </script>
    </body>
</html>
```

Content Delivery Network (CDN)
src=“http://d3js.org/d3.v7.min.js”
Locally:
src=“../d3.min.js”

d3- Circle drawing

```
var dataset = [5, 10, 15, 20, 25];

var w = 500;
var h = 50;
var svg = d3.select("body")
            .append("svg")
            .attr("width", w)
            .attr("height", h);

var circles = svg.selectAll("circle")
            .data(dataset)
            .enter()
            .append("circle");

circles.attr("cx", "10")
            .attr("cy", "10")
            .attr("r", "10");
```

d3- Circle drawing

…

```
var circles = svg.selectAll("circle")
                 .data(dataset)
                 .enter()
                .append("circle");

circles.attr("cx", function(d, i) {
                 return (i * 50) + 25;
                 })
                 .attr("cy", h/2)
                 .attr("r", function(d) {
                          return d;
                  });
```

d3 - Resources

- https://bost.ocks.org/mike/d3/workshop/#0
- https://blockbuilder.org/
- https://observablehq.com/
- https://github.com/wbkd/awesome-d3
- https://observablehq.com/@d3/gallery
- https://d3-discovery.net/
- https://observablehq.com/@d3/