

Mapbox & D3.js

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https://github.com/iredelatorre/meetup_mapbox_d3

ROBOAT

A summer day in Amsterdam's canals

MIT Senseable City Lab

D3.js, Mapbox, Crossfilter, Canvas

ROBOAT

A SUMMER DAY IN AMSTERDAM'S CANALS

PLAY ANIMATION

Filter the categories to update the map and the graphs. Click on the circles to zoom in.

August 2017

- ☒ All of Amsterdam
- ☐ Canal Ring traffic only

Type of boats

- ☒ All
- ☐ Cargo
- ☐ Other
- ☐ Passengers

Research area

Centraal Station

Busiest canal intersection

Museum Quarter

AMS

SEN

senseable city lab.

mapbox

Data from Marine Traffic

© Mapbox © OpenStreetMap Improve this map

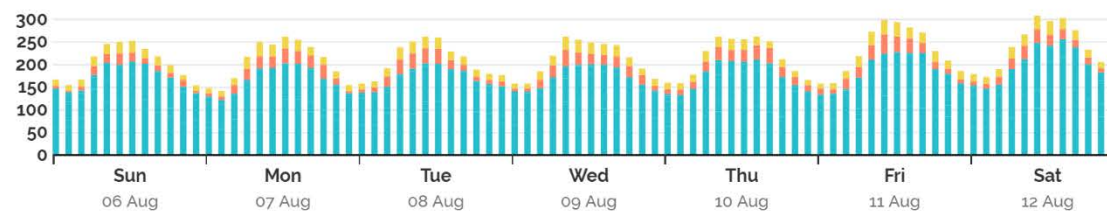
A SUMMER WEEK IN THE CANALS

This visualization shows the boats, ferries, and cargo ships sailing in Amsterdam during the week of 06-12 August 2017. Explore the different types of vessels in the water and their speeds, and watch the traffic ebb and flow as the day progresses—a few key events and areas where clear patterns emerge are highlighted.

About the project

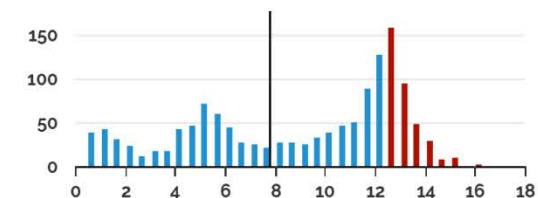
Number of boats in the canal

Every two hours



Average speeds of boats (Km/h)

N° of boats ■ Speed higher than limits — Avg. speed



ROBOAT

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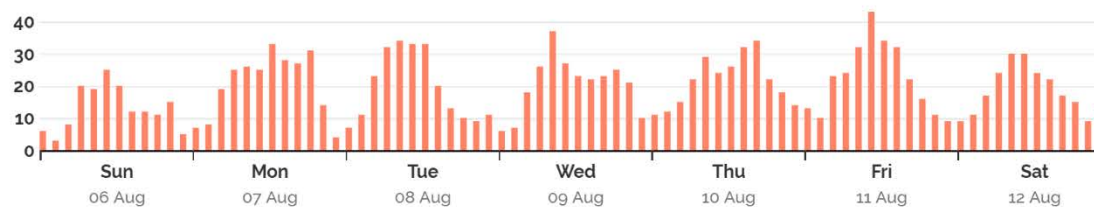
A SUMMER WEEK IN THE CANALS

This visualization shows the boats, ferries, and cargo ships sailing in Amsterdam during the week of 06-12 August 2017. Explore the different types of vessels in the water and their speeds, and watch the traffic ebb and flow as the day progresses—a few key events and areas where clear patterns emerge are highlighted.

About the project

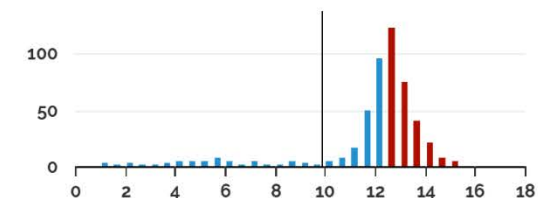
Number of boats in the canal

Every two hours



Average speeds of boats (Km/h)

N° of boats ■ Speed higher than limits — Avg. speed





Starting point

```
1 <!DOCTYPE html>
2 <html lang="en">
3   <head>
4     <meta charset="UTF-8">
5     <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/css/bootstrap.min.css" integrity="sha384-
      MCw98/SFnGE8fJT3GXwEOngsV7Zt27NXFoaoApmYm81iuXoPkFOJwJ8ERdknLPMO" crossorigin="anonymous">
6     <link href="https://fonts.googleapis.com/css?family=Fira+Sans:400,700" rel="stylesheet">
7     <link href="styles.css" rel="stylesheet"/>
8
9     <!-- mapbox styles-->
10    <link href='https://api.mapbox.com/mapbox-gl-js/v0.47.0/mapbox-gl.css' rel='stylesheet' />
11  </head>
12  <body>
13    <div class="container">
14      <h1>Using Mapbox and D3.js</h1>
15      <div id="map"></div>
16    </div>
17
18    <!-- scripts-->
19    <script src='https://api.mapbox.com/mapbox-gl-js/v0.47.0/mapbox-gl.js'></script>
20    <script src="https://d3js.org/d3.v5.min.js"></script>
21    <script src="script.js"></script>
22  </body>
23 </html>
```

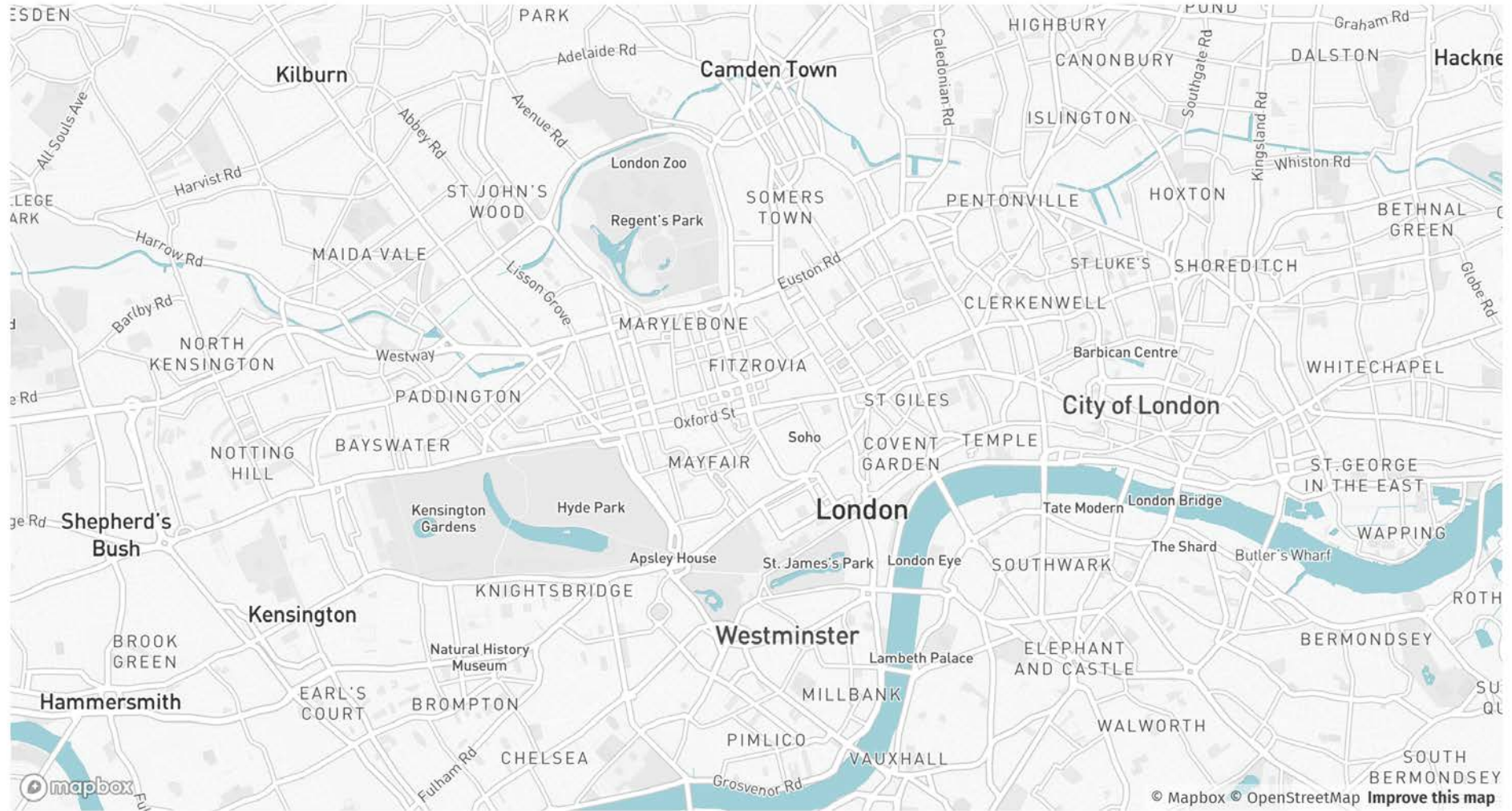
```
1 html,body,div,svg{
2   margin:0;
3   padding:0;
4   list-style:none;
5   font-family: 'Fira Sans','Helvetica', sans-serif;
6 }
7
8 h1{
9   margin-top: 20px;
10  font-size: 18pt;
11  text-transform: uppercase;
12  font-weight: 900;
13  letter-spacing: 0.1em;
14  color: #222;
15 }
16
17 #map{
18   width: 100%;
19   height: 600px;
20   background-color: #222;
21 }
```

Setting up the map

```
// mapbox access token
mapboxgl.accessToken = 'yourAccessToken'

//setup map
var mapboxMap = new mapboxgl.Map ({
  container: 'map', // id of the div where the map is going to be
  center: [-0.141099, 51.515419], //lonlat of the center of our map
  zoom: 15,
  style: 'mapboxURLStyle'
})
```

USING MAPBOX AND D3.JS



Projection function

```
// mapbox access token
mapboxgl.accessToken = 'yourAccessToken'

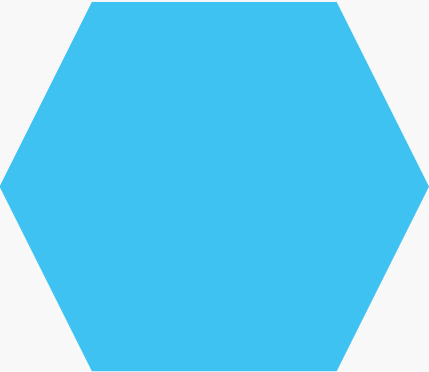
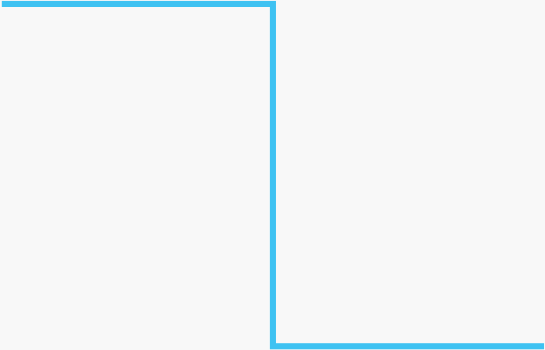
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  zoom: 15,
  style: 'mapboxURLStyle'
})

// projection function
function projection (lonlat){

  var p = mapboxMap.project(new mapboxgl.LngLat(lonlat[0],lonlat[1]));

  return [p.x, p.y]
}
```

Translating...



Let's draw!

```
// lets draw circles and paths
```

```
var points = [  
  {x:-0.141905, y: 51.515487}, //oxford circus  
  {x:-0.145231, y: 51.516949}  
]
```

```
var path = [points[0], {x:-0.142699, y: 51.517443}, points[1]]
```

Create an svg

```
// lets draw circles and paths

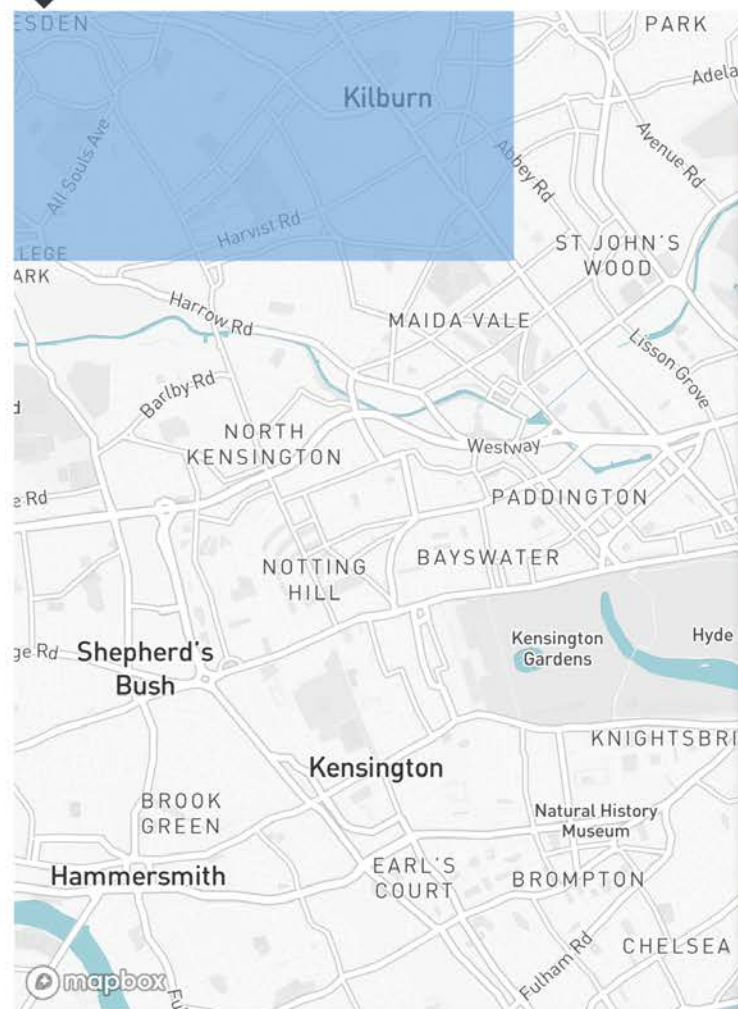
var points = [
  {x:-0.141905, y: 51.515487}, //oxford circus
  {x:-0.145231, y: 51.516949}
]

var path = [points[0], {x:-0.142699, y: 51.517443}, points[1]]

// create svg
var container = mapboxMap.getCanvasContainer();
var plot = d3.select(container).append("svg");
```

svg | 300 x 150

MAPBOX AND D3.JS



DevTools - 127.0.0.1:52051/index.html

Elements Console Sources Network Performance Memory Application Security Audits

```
<!doctype html>
<html data-brackets-id="72" lang="en">
  <head data-brackets-id="73">...</head>
  <body data-brackets-id="79"> == $0
    <div data-brackets-id="80" class="container">
      <h1 data-brackets-id="81">Using Mapbox and D3.js</h1>
      <div data-brackets-id="82" id="map" class="mapboxgl-map">
        <div class="mapboxgl-canary" style="visibility: hidden;"></div>
        <div class="mapboxgl-canvas-container mapboxgl-interactive mapboxgl-touch-drag-pan mapboxgl-touch-zoom-rotate">
          <canvas class="mapboxgl-canvas" tabindex="0" aria-label="Map" width="2775" height="1500" style="position: absolute; width: 1110px; height: 600px;">
            <svg/>
          </div>
          <div class="mapboxgl-control-container">...</div>
        </div>
        <!-- scripts-->
        <script data-brackets-id="83" src="https://api.mapbox.com/mapbox-gl-js/v0.47.0/mapbox-gl.js"></script>
        <script data-brackets-id="84" src="https://d3js.org/d3.v5.min.js"></script>
      </div>
    </body>
  </html>
```

Styles Computed Event Listeners

Filter :hov .cls +

element.style {

html, body, div, svg { styles.css:1

margin: 0;

padding: 0;

list-style: none;

font-family: 'Fira Sans', 'Helvetica', sans-serif;

}

body { reboot.scss:58

margin: 0;

font-family: ~~apple~~ system, BlinkMacSystemFont, 'Segoe UI', Roboto, 'Helvetica Neue', Arial, sans-serif, 'Apple Color Emoji', 'Segoe UI Emoji', 'Segoe UI Symbol', 'Noto Color Emoji';

font-size: 1rem;

font-weight: 400;

line-height: 1.5;

color: #212529;

html body

Console What's New

Highlights from the Chrome 68 update

Eager evaluation


Preview return values in the Console without explicitly executing expressions.

Argument hints

View a function's expected arguments in the Console.

Function autocompletion

View available properties and methods after calling a function in the Console.

 new

Add width and height attributes to the svg

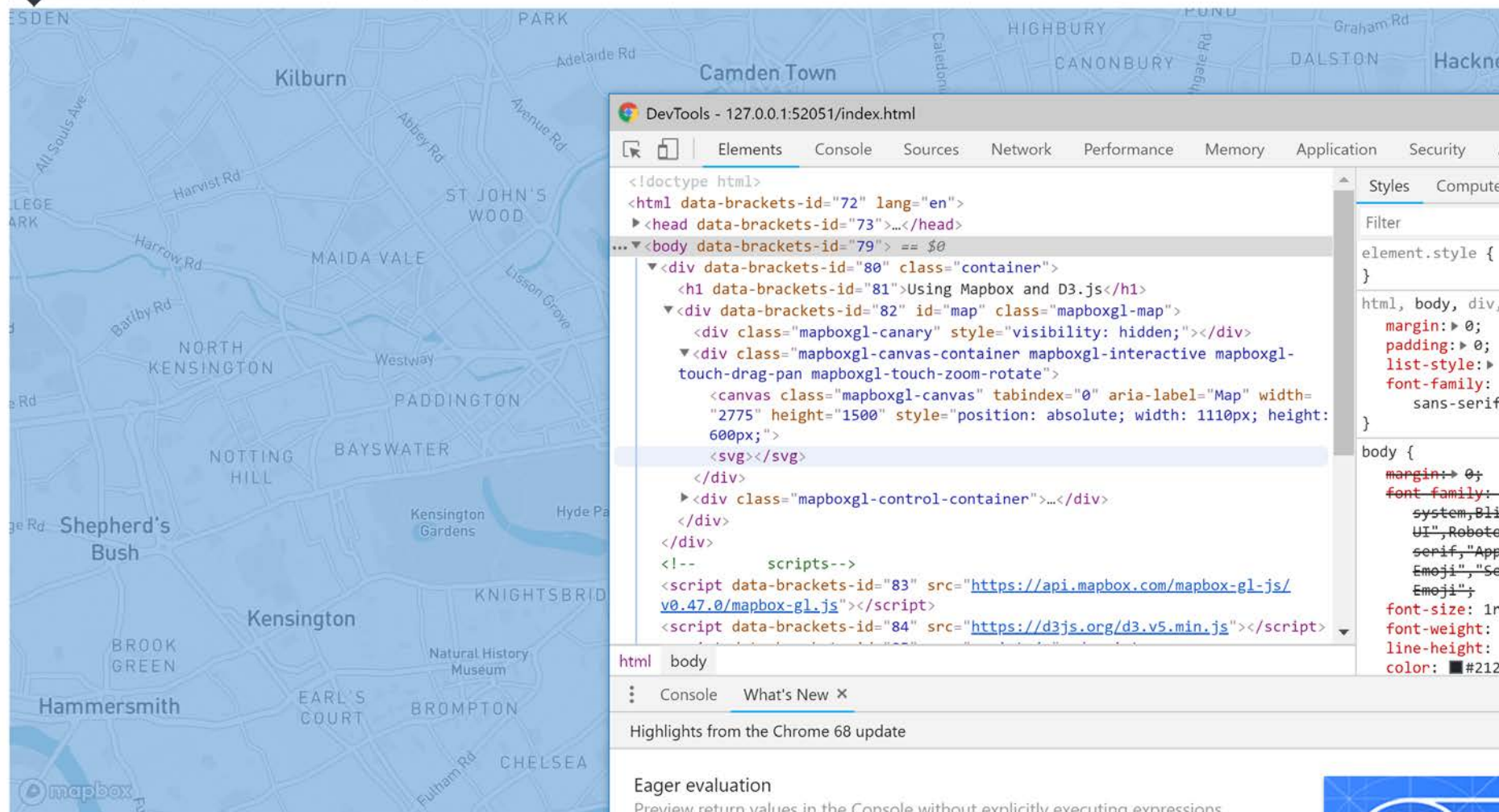
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  font-weight: 900;
  letter-spacing: 0.1em;
  color: #222;
}

#map, #map svg, #map #animation {
  width: 100%;
  height: 600px;
  /* background-color: #222*/
}
```

SVG | 1110 x 600

MAPBOX AND D3.JS



DevTools - 127.0.0.1:52051/index.html

Elements

Console

Sources

Network

Performance

Memory

Application

Security

Audits

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      </div>
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Styles

Computed

Event Listeners

>>

Filter

:hov .cls +

+

element.style {

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html, body, div, svg {

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reboot.scss:58

margin: 0;

font-family: apple-system, BlinkMacSystemFont, 'Segoe UI', Roboto, 'Helvetica Neue', Arial, sans-serif, 'Apple Color Emoji', 'Segoe UI Emoji', 'Segoe UI Symbol', 'Noto Color Emoji';

font-size: 1rem;

font-weight: 400;

line-height: 1.5;

color: #212529;

}

html

body

Console

What's New

×

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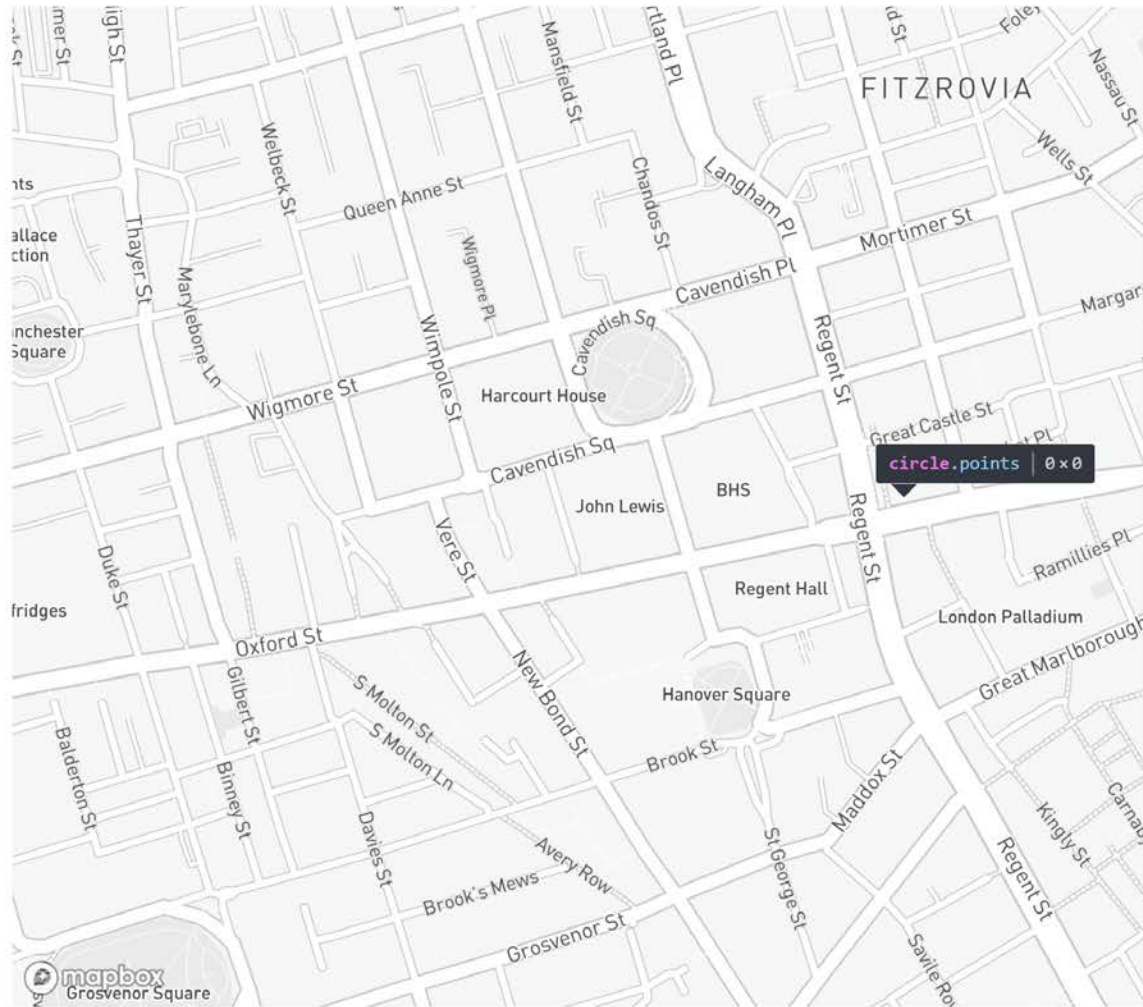


Let's draw circles

```
// draw circles
var circles = plot.selectAll(".points")
    .data(points);

circles.enter()
    .append("circle")
    .attr("class", "points")
    .attr("cx", function(d) {return projection([d.x, d.y])[0]})
    .attr("cy", function(d) {return projection([d.x, d.y])[1]})
    .attr("r", 15)
    .style("fill", "#00afff");
```

USING MAPBOX AND D3.JS



DevTools - 127.0.0.1:52051/index.html

Elements Console Sources Network Performance Memory Application Security


```
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        <div class="mapboxgl-canvas-container mapboxgl-interactive mapboxgl-touch-drag-pan mapboxgl-touch-zoom-rotate">
          <canvas class="mapboxgl-canvas" tabindex="0" aria-label="Map" width="2775" height="1500" style="position: absolute; width: 1110px; height: 600px;">
            <svg>
              <circle class="points" cx="517.4376775105794" cy="294.9075820965237" style="fill: rgb(0, 175, 255);"></circle> == $0
              <circle class="points" cx="362.4348430220286" cy="185.41875831392076" style="fill: rgb(0, 175, 255);"></circle>
            </svg>
          <div class="mapboxgl-control-container">...</div>
        </div>
      </div>
    </div>
  </body>
</html>
```

html body div #map div svg circle.points

Console What's New

Highlights from the Chrome 68 update

- Eager evaluation
Preview return values in the Console without explicitly executing expressions.
- Argument hints
View a function's expected arguments in the Console.
- Function autocompletion
View available properties and methods after calling a function in the Console.



Add width and height attributes to the svg

```
html,body,div,svg{
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  padding:0;
  list-style:none;
  font-family: 'Fira Sans','Helvetica', sans-serif;
}

h1{
  margin-top: 20px;
  font-size: 18pt;
  text-transform: uppercase;
  font-weight: 900;
  letter-spacing: 0.1em;
  color: #222;
}

#map, #map svg, #map #animation {
  width: 100%;
  height: 600px;
  /* background-color: #222*/
}

#map canvas {
  mix-blend-mode: multiply
}
```


USING MAPBOX AND D3.JS



Draw a path

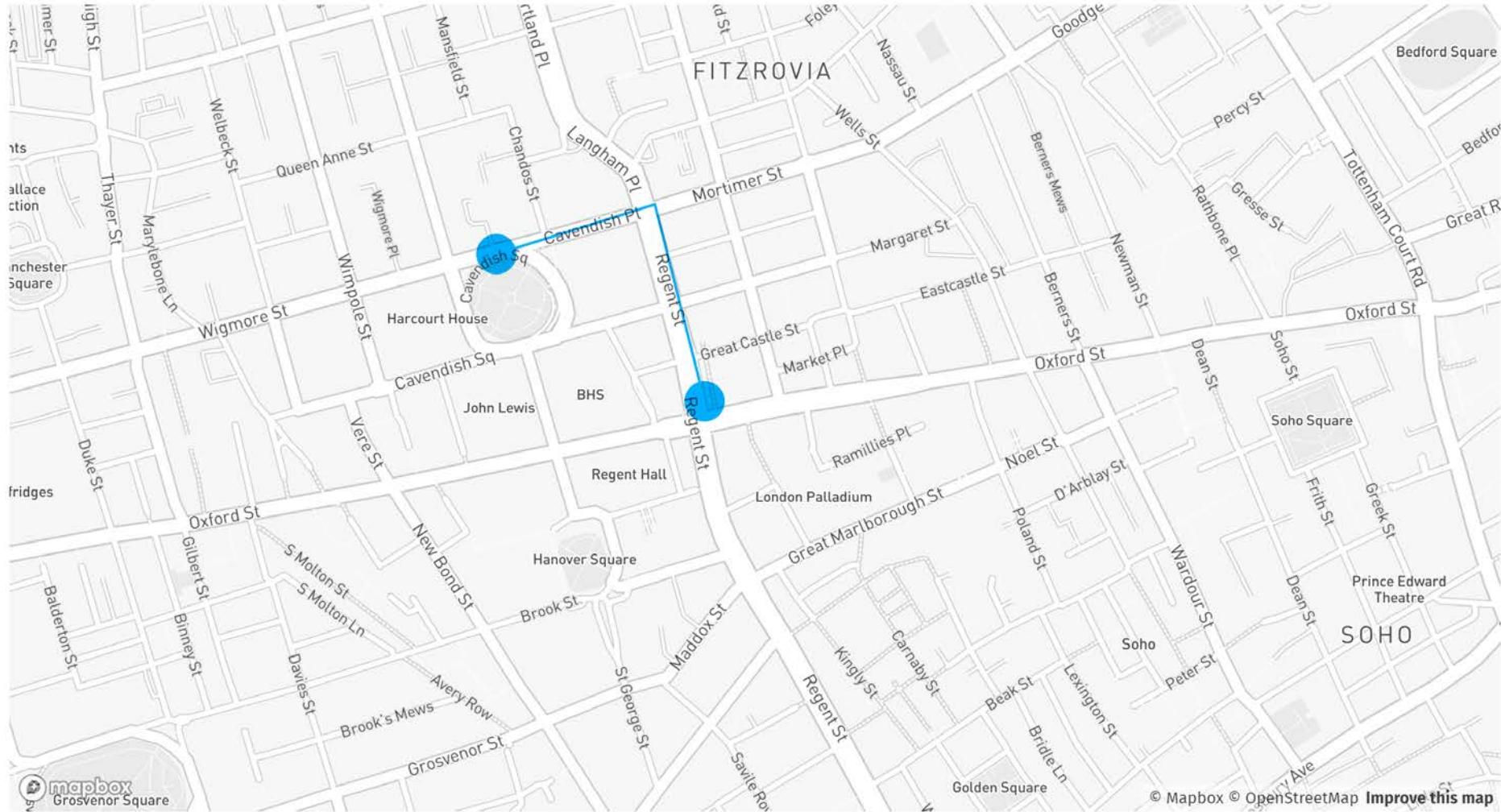
```
// draw lines
```

```
var pathLine = d3.line()  
  .x(function (d) {  
    return projection([d.x,d.y])[0]  
  })  
  .y(function (d) {  
    return projection([d.x,d.y])[1]  
  });
```

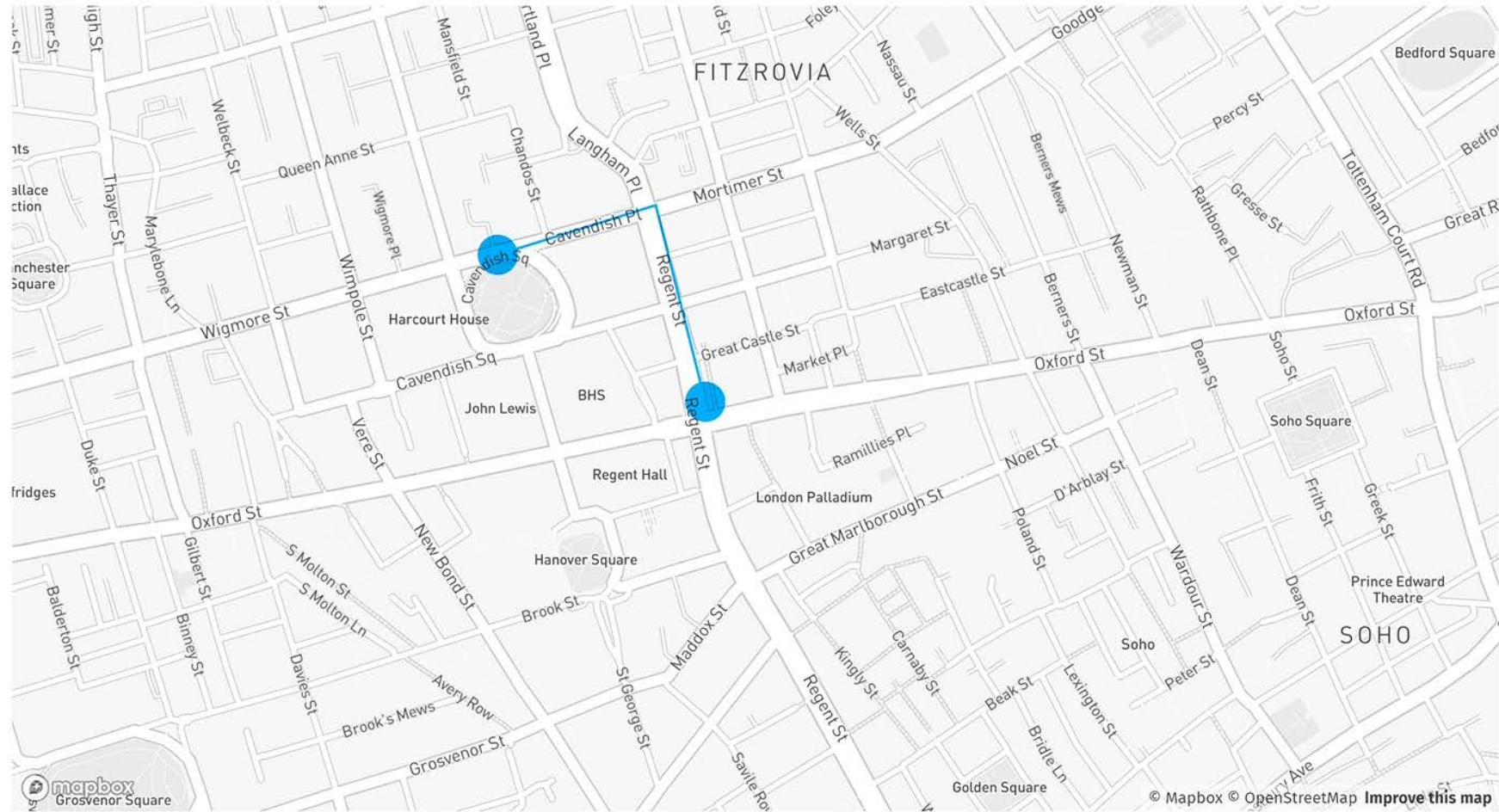
```
plot
```

```
.append("path")  
.attr("d",pathLine(path))  
.style("fill","none")  
.style("stroke-width",2)  
.style("stroke", "#00afff");
```

USING MAPBOX AND D3.JS



USING MAPBOX AND D3.JS



Updating elements when map moves

```
// update when map moves

mapboxMap.on("viewreset", update);
mapboxMap.on("moveend", update);

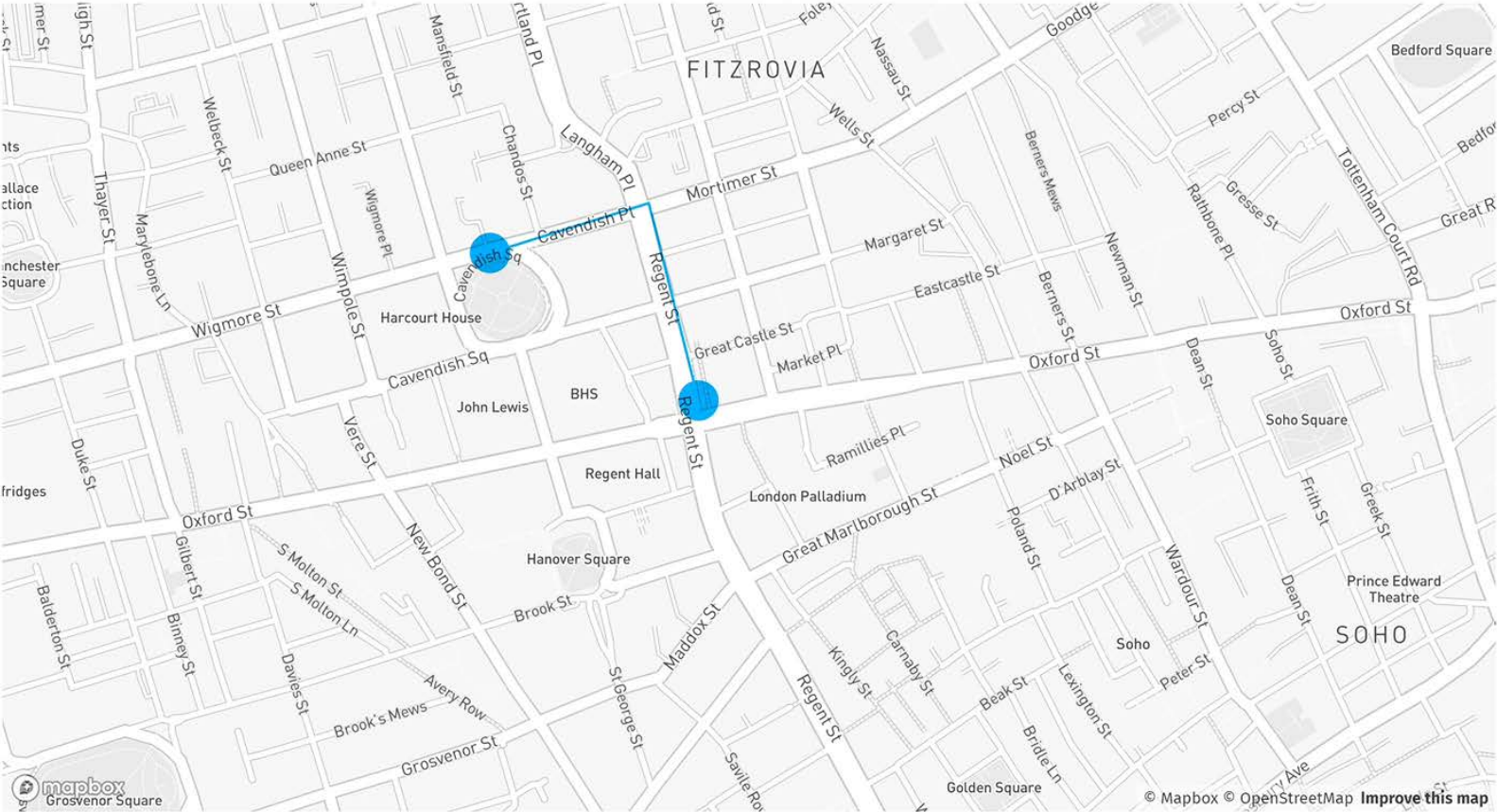
function update(){

  plot.selectAll(".points")
    .attr("cx",function(d){return projection([d.x,d.y])[0]})
    .attr("cy",function(d){return projection([d.x,d.y])[1]});

  plot.selectAll("path")
    .transition()
    .duration(1000)
    .attr("d",pathLine(path))

}
```


USING MAPBOX AND D3.JS



And the animation?

Container with canvas

```
// create svg
var container = mapboxMap.getCanvasContainer();

// get width and height of map div
var width = d3.select('#map').node().clientWidth,
    height = d3.select('#map').node().clientHeight;

// create canvas
d3.select(container).append("div").attr("id", "animation");

var canvas = d3.select("#animation").append("canvas").attr("id", "dots-moving").node();

canvas.width = 2 * width;
canvas.height = 2 * height;

var ctxPLOT = canvas.getContext("2d");
```

And the animation?

Animation settings: t and speed

```
// animation settings
var t = 0; // starting time
var speed = 0.5; // animation speed
var color = '#00afff';

ctxPLOT.globalCompositeOperation = 'normal';
ctxPLOT.imageSmoothingEnabled = false;
ctxPLOT.globalAlpha = 1;
ctxPLOT.scale(2,2);

var pathLine = d3.line()
  .x(function (d) {
    return projection([d.x,d.y])[0]
  })
  .y(function (d) {
    return projection([d.x,d.y])[1]
  })
  .context(ctxPLOT);

function draw (){}

```

And the animation?

Request animation frame

```
var requestAnimationFrame = window.requestAnimationFrame ||
    window.mozRequestAnimationFrame ||
    window.webkitRequestAnimationFrame ||
    window.msRequestAnimationFrame;

window.cancelRequestAnimFrame = (function () {
    return window.cancelAnimationFrame ||
        window.webkitCancelRequestAnimationFrame ||
        window.mozCancelRequestAnimationFrame ||
        window.oCancelRequestAnimationFrame ||
        window.msCancelRequestAnimationFrame ||
        clearTimeout
})();
```

And the animation?

The animation

```
window.requestAnimationFrame(draw);

function draw (){

    ctxPLOT.clearRect(0, 0, width, height);

    // select point in time
    var drawPoint = animation.filter(function(d){return d.t >= t && d.t<= t+speed});
    var drawLine = animation.filter(function(d){return d.t < t});

    // line of past points
    ctxPLOT.globalAlpha = 1;
    ctxPLOT.beginPath();
    pathLine(drawLine);
    ctxPLOT.lineWidth = 2;
    ctxPLOT.strokeStyle = color;
    ctxPLOT.stroke();
    ctxPLOT.globalAlpha = 1;

    // last position
    var xy = projection([drawPoint[0].x,drawPoint[0].y]);

    ctxPLOT.fillStyle = color;
    ctxPLOT.beginPath();
    ctxPLOT.arc(xy[0], xy[1], 5, 0,2*Math.PI);
    ctxPLOT.fill();
    ctxPLOT.closePath();

    points.forEach(function(d){
        var xyCircle = projection([d.x,d.y]);

        ctxPLOT.fillStyle = "rgba(255,255,255,0)";
        ctxPLOT.strokeStyle = "black";
        ctxPLOT.lineWidth = 3;
        ctxPLOT.beginPath();
        ctxPLOT.arc(xyCircle[0], xyCircle[1], 15, 0,2*Math.PI);
        ctxPLOT.stroke();
        ctxPLOT.closePath();
    })

    if (t<20){
        t = t + speed;
    }else{
        t = 0
    }

    window.requestAnimationFrame(draw);
}
```


USING MAPBOX AND D3.JS. ANIMATION

