

SVG can do THAT?!

Sarah Drasner

@sarah_edo : twitter || @sdras : codepen



Sarah Drasner

Sr. Developer Advocate at Microsoft

SVG!

This pen I made



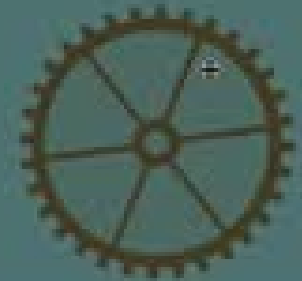
SVG!

- Crisp on any display
- Less HTTP requests to handle
- Easily scalable for responsive
- Small filesize if you design for performance
- Easy to animate
- Easy to make accessible
- Fun!

This pen.



ROTATE
THE GEAR



OR HIT PLAY

PLAY

SVG!

SVG (basic support) - REC

Global

97.04% + 0.75% = 97.79%

Method of displaying basic Vector Graphics features using the embed or object elements. Refers to the SVG 1.1 spec.

Current aligned Usage relative Date relative Show all									
IE	Edge	Firefox	Chrome	Safari	Opera	iOS Safari	Opera Mini	Android Browser	Chrome for Android
			49					1 4.3	
			54					4.4	
		50	55			9.3		4.4.4	
2 11	2 14	51	56	10	42	10.2	all	53	56
	2 15	52	57	10.1	43				
		53	58	TP	44				
		54	59						

 HTML

```
3 <rect width="200" height="200" fill="#f7941d"/>
4 <polygon points="117.3 188.3 70.4 143.8 7.2
157.2 35 98.9 2.7 42.9 66.8 51.3 110.1 3.3 121.9
66.9 180.9 93.2 124.1 124.1 117.3 188.3"
fill="#ef4136"/>
5 <polygon points="192.4 74.8 162.7 70.6 142.4
92.7 137.2 63.2 109.9 50.7 136.4 36.6 139.8 6.8
161.4 27.7 190.8 21.7 177.7 48.7 192.4 74.8"
fill="#be1e2d"/>
6 <polygon points="52.9 193.6 41.2 183.2 26.1 187
32.3 172.6 24.1 159.3 39.6 160.9 49.7 148.9 53.1
164.2 67.6 170.1 54.1 178 52.9 193.6"
fill="#f15a29"/>
7 </svg>
8 |
```

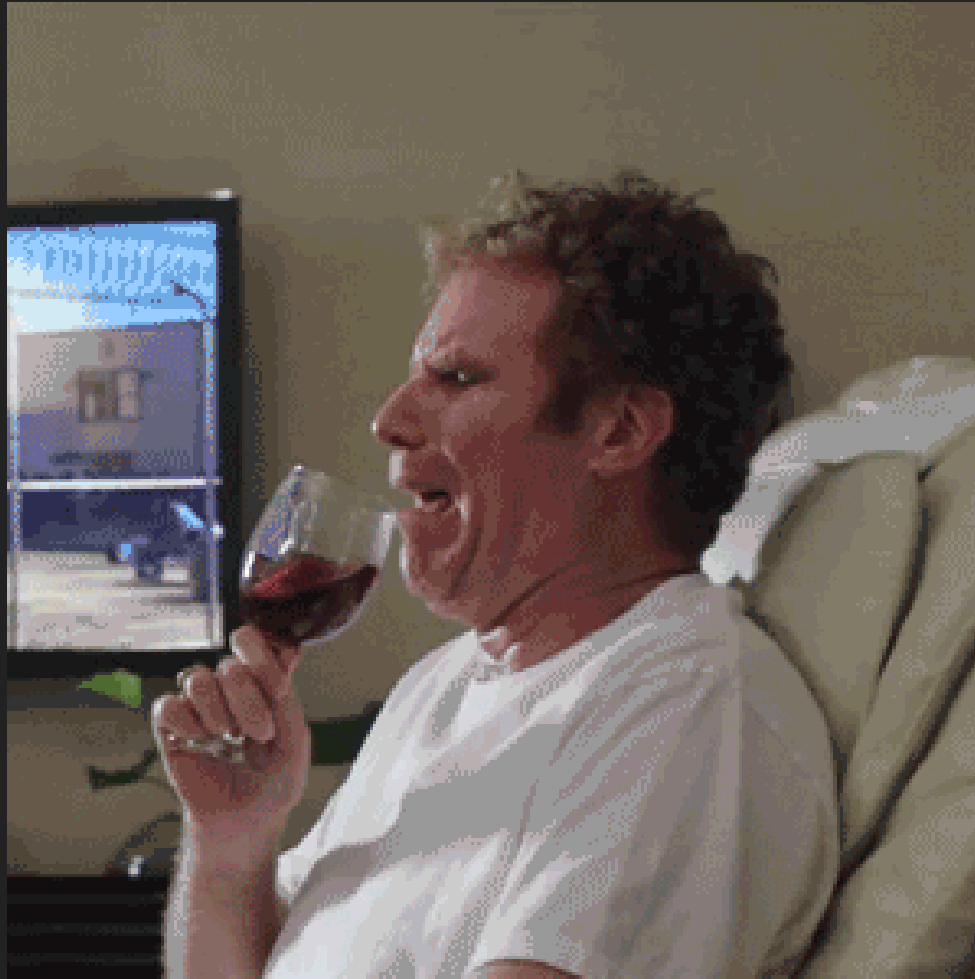
 CSS (SCSS)

```
1
```

 JS (Babel)

```
1
```

Positioning in CSS got you down?



This pen by Chris Coyier

ARCHAEOSTRONOMY

STARS OF THE DEAD

Mysterious tables of astronomical information have been found in 4,000-year-old coffins. What in the world was their purpose?

By Sarah Symons and Elizabeth Tasker

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Illum quærat quod nemo voluptas voluptatum itaque euque amet consequuntur cum quam error dolore facilis reprehenderit impedit,

alias accusamus similique reprehenderit aliquam non dolores quon, nisi nam aliquid beatae adipisci cumque?

Voluptates placet totam illo sapiente magni animi corrupti, aut

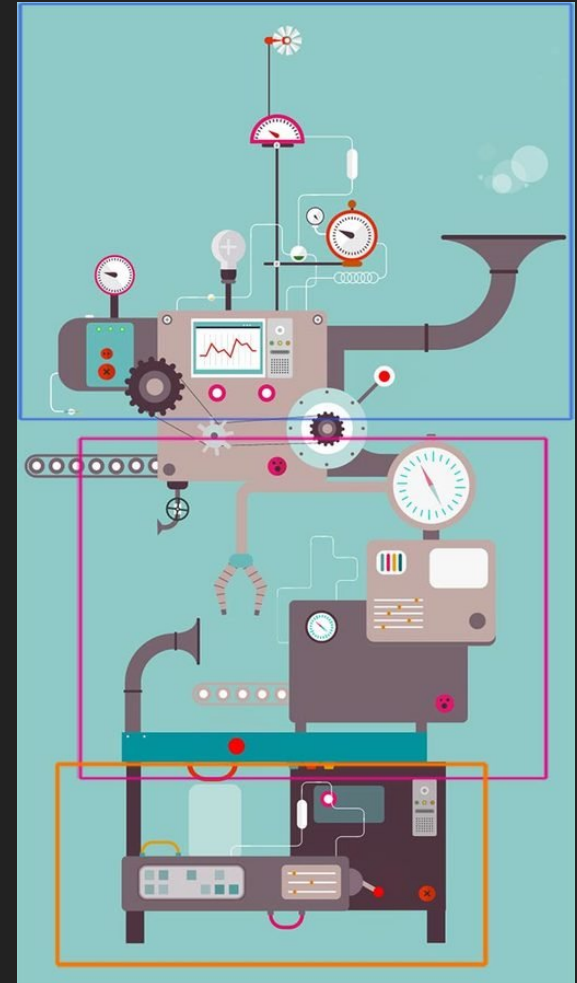
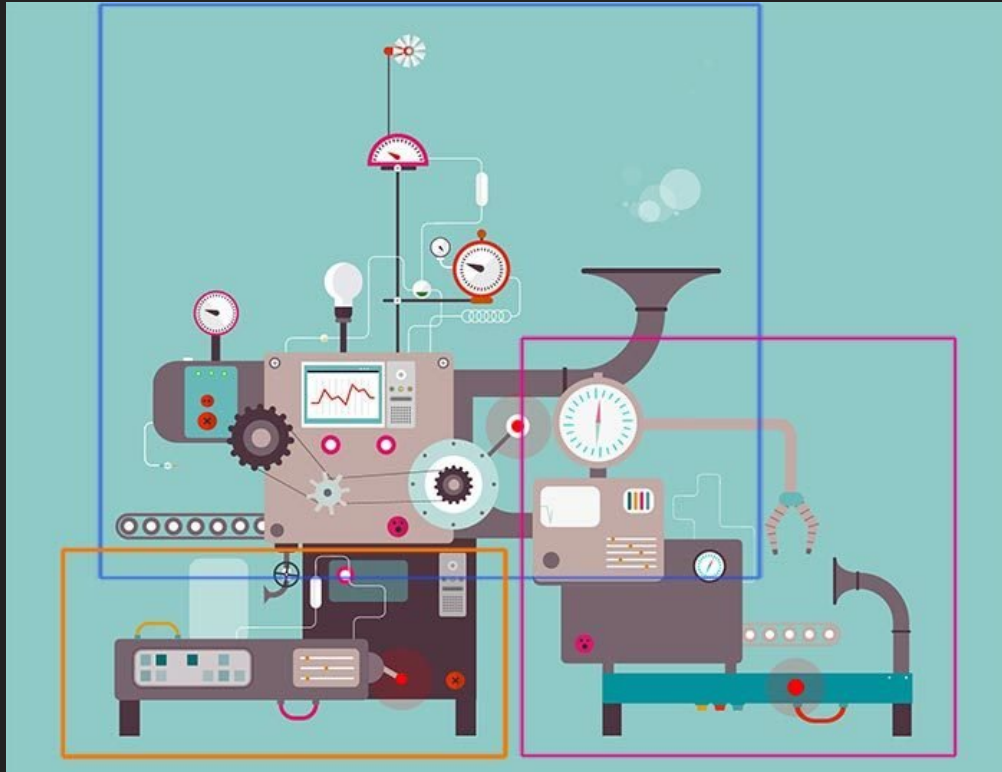
We can do stuff like this, All fully responsive in
every direction

SVG can mean conserving space in your UI until icons are needed

This pen made with Sara Soueidan's [circulus](#).

It doesn't necessarily have to be fully fluid, either. Let's Implement some Responsive Design.

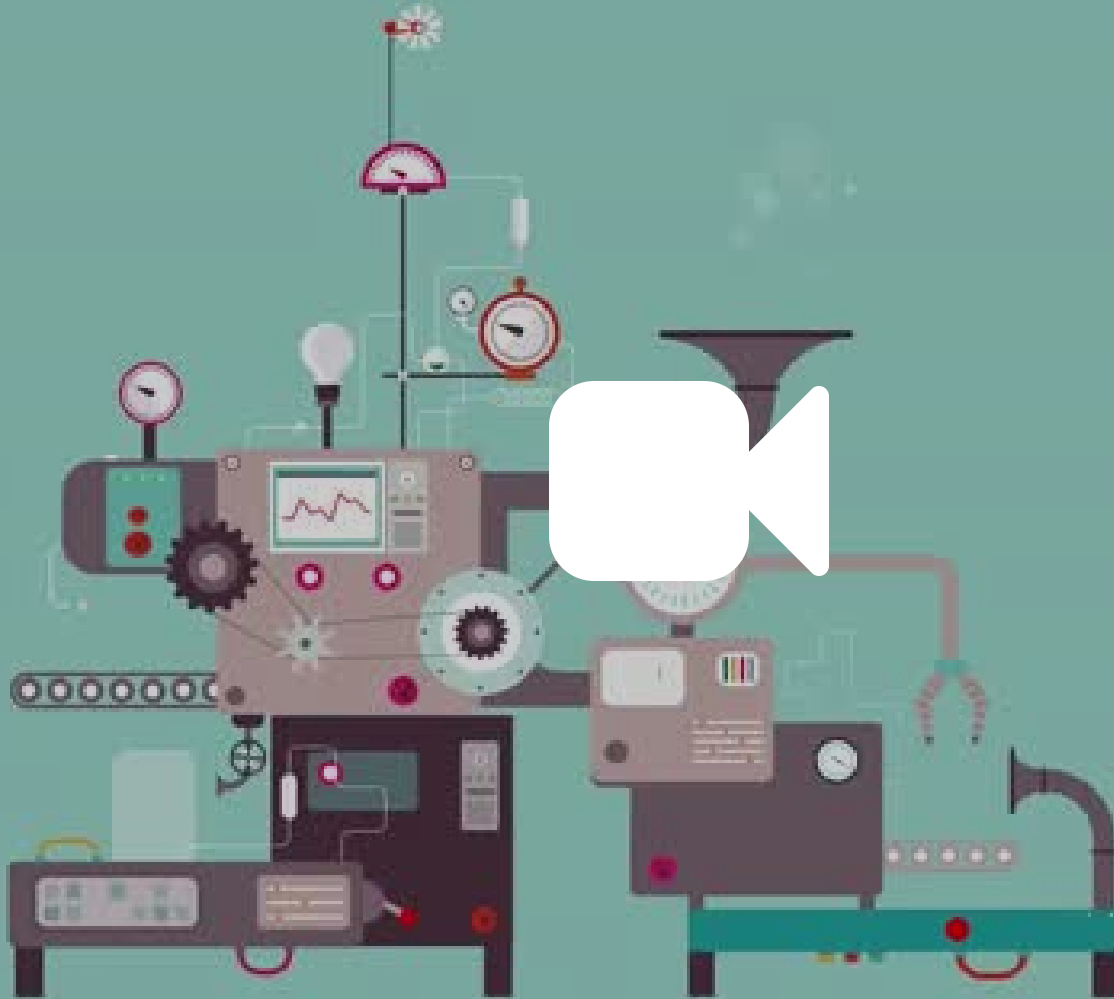
Like legos.



This pen.

Click the hotspots to make Huggy Laser Pandas

Size the
browser
window
down
horizontally



```
//variable declaration for the global repeated animation
const gear = $("#gear1, #gear2, #gear3");
...

//animation that's repeated for all of the sections
function revolve() {
  let tl = new TimelineMax();

  tl.add("begin");
  tl.to(gear, 4, {
    transformOrigin: "50% 50%",
    rotation: 360,
    ease: Linear.easeNone
  }, "begin");
  ...

  return tl;
}

const repeat = new TimelineMax({repeat:-1});
repeat.add(revolve());
```

```
function paintPanda() {  
  let tl = new TimelineMax();  
  
  tl.to(lh, 1, {  
    scaleY: 1.2,  
    rotation: -5,  
    transformOrigin: "50% 0",  
    ease: Circ.easeOut  
  }, "paintIt+=1");  
  ...  
  
  return tl;  
}
```

```
//create a timeline but initially pause it so that we can control it via cl  
const triggerPaint = new TimelineMax({ paused: true });  
triggerPaint.add(paintPanda());
```

```
//this button kicks off the panda painting timeline  
button.addEventListener("click", function() {  
  triggerPaint.restart();  
});  
  
...
```


We can use this stability for
Page Transitions

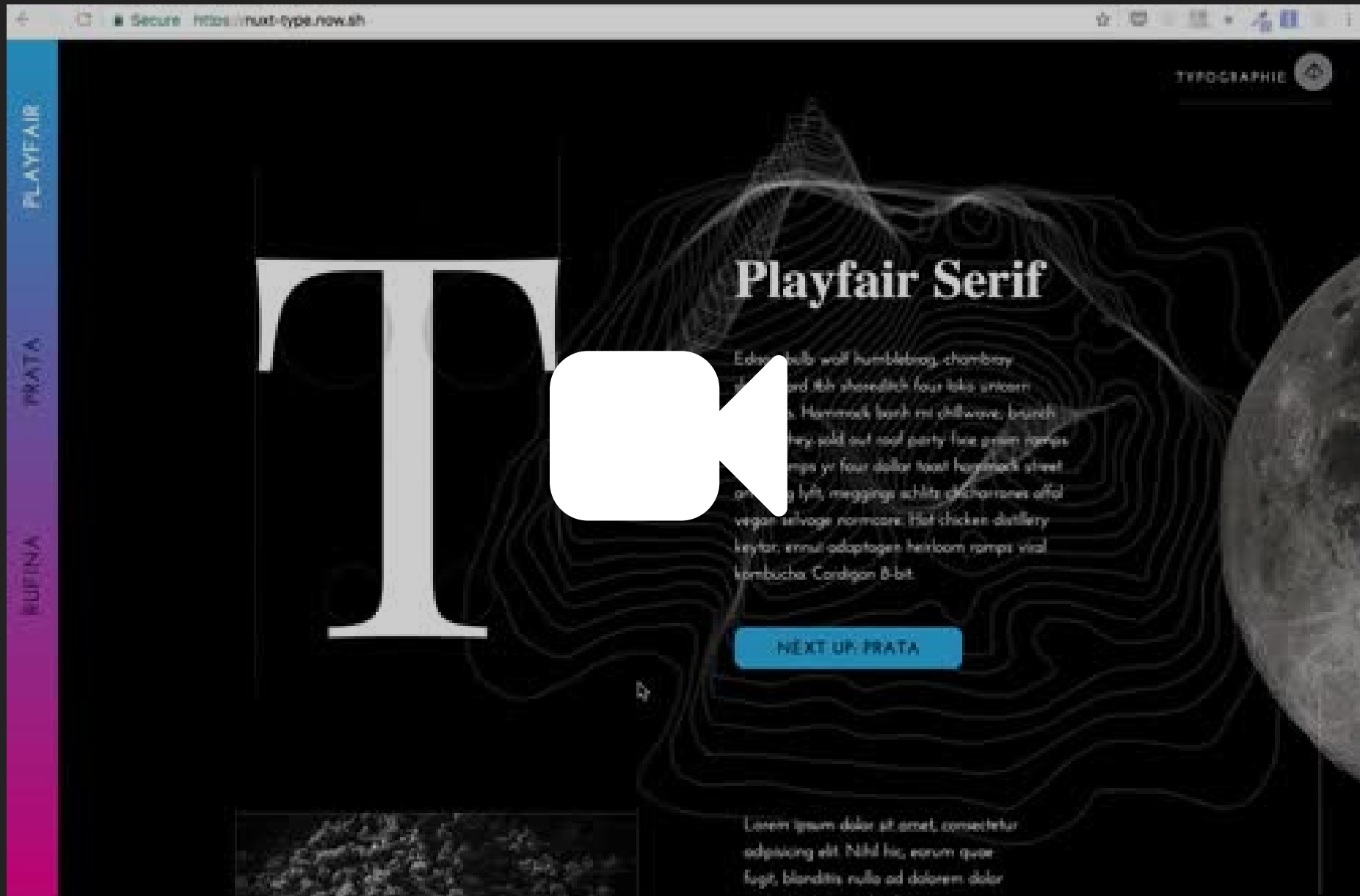
In React



```
toggleShape() {  
  if (this.state.screen === 0) {  
    this.animFire(this.state.splitText)  
  } ...  
  this.setState({  
    screen: (this.state.screen + 1) % 3  
  })  
}
```

```
animFire(splitText) {  
  const tl = new TimelineMax,  
    stA = 'start';  
  
  TweenMax.set([this.g1.childNodes, this.g2.childNodes], {  
    clearProps: 'svgOrigin'  
  })  
  
  tl.add('start')  
  tl.staggerFromTo(this.g1.childNodes, dur, {  
    drawSVG: '68% 100%'  
  }, {  
    drawSVG: '27.75% 0%',  
    ease: Back.easeOut  
  }, stD, stA)  
  ...  
}
```

In Vue.js with Nuxt



Repo:

<https://github.com/sdras/nuxt-type>

Demo:

<https://nuxt-type.now.sh/>

JS Hooks

```
export default {
  transition: {
    mode: 'out-in',
    css: false,
    enter (el, done) {

      let tl = new TimelineMax({ onComplete: done }),
          spt = new SplitText('h1', {type: 'chars' }),
          chars = spt.chars;

      TweenMax.set(chars, {
        transformPerspective: 600,
        perspective: 300,
        transformStyle: 'preserve-3d'
      })

      tl.add('start')
      tl.from(el, 0.8, {
        scale: 0.9,
        transformOrigin: '50% 50%',
        ease: Sine.easeOut
      }, 'start')
      ...
      tl.timeScale(1.5)
    }
  }
  ...
}
```

From Codrops

Position: fixed and morphed into pathdata:id

Southeast Asia
History of nations



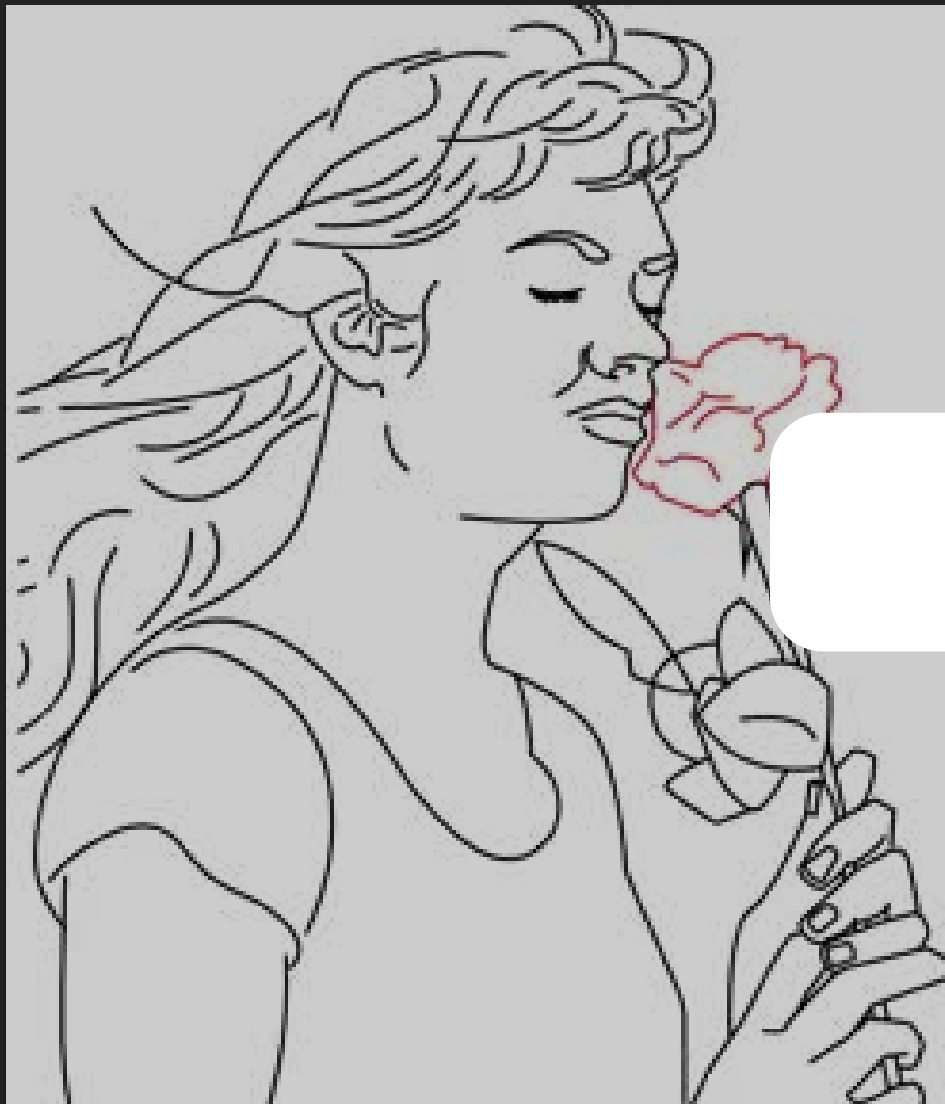
This pen by Sullivan Nolan

Women of the 20th Century

1900 - 2000

m ipsum dolor sit amet, consectetur adipiscing elit.
nc cursus, ipsum vel lobortis rhoncus, lorem nisl
ongue tortor, eu elementum ligula metus id elit.
llentesque efficitur vestibulum dolor at ultricies.

LEARN MORE



Use it FOR the layout

```
preserveAspectRatio="none"
```

Learn Web Animation From the Experts

Level up your web animation skills with Val Head and Sarah Drasner in this two-day web animation course. You'll learn everything you need to know to design and code expert level web animation through hands-on exercises and curated examples.

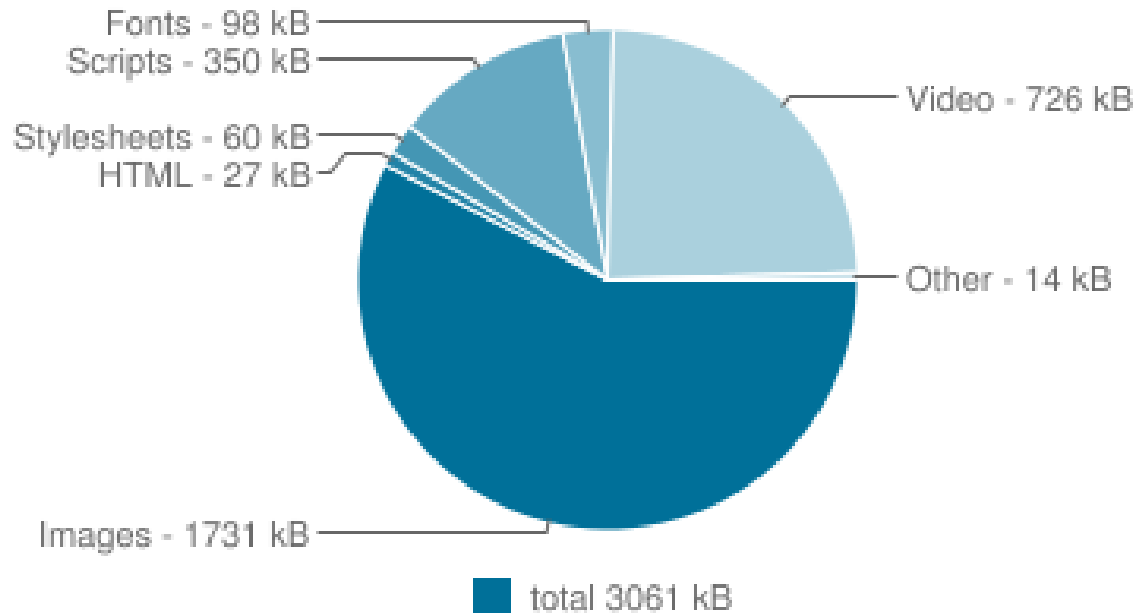


New Orleans, LA: October 11
Pittsburgh, PA: Oct 13

YOUR INSTRUCTORS

SVG can be TINY

Average Bytes per Page by Content Type



HTTP Archive



Jason Grigsby,  4
@grigs

Following



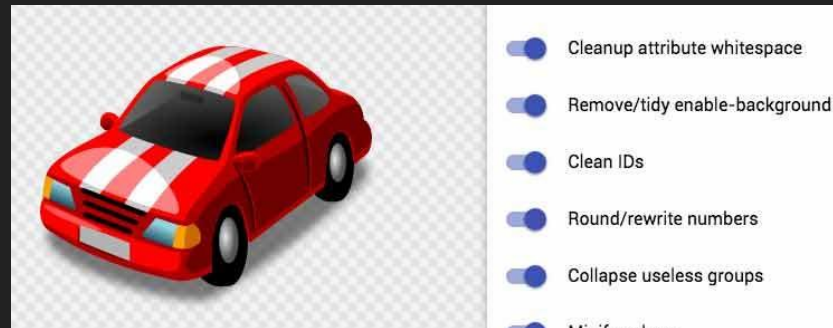
“You can’t be a web performance expert without being an image expert.” — [@tobint](#)
[#imagecon](#)

True statement that I hadn’t thought of before.

Before we get started:

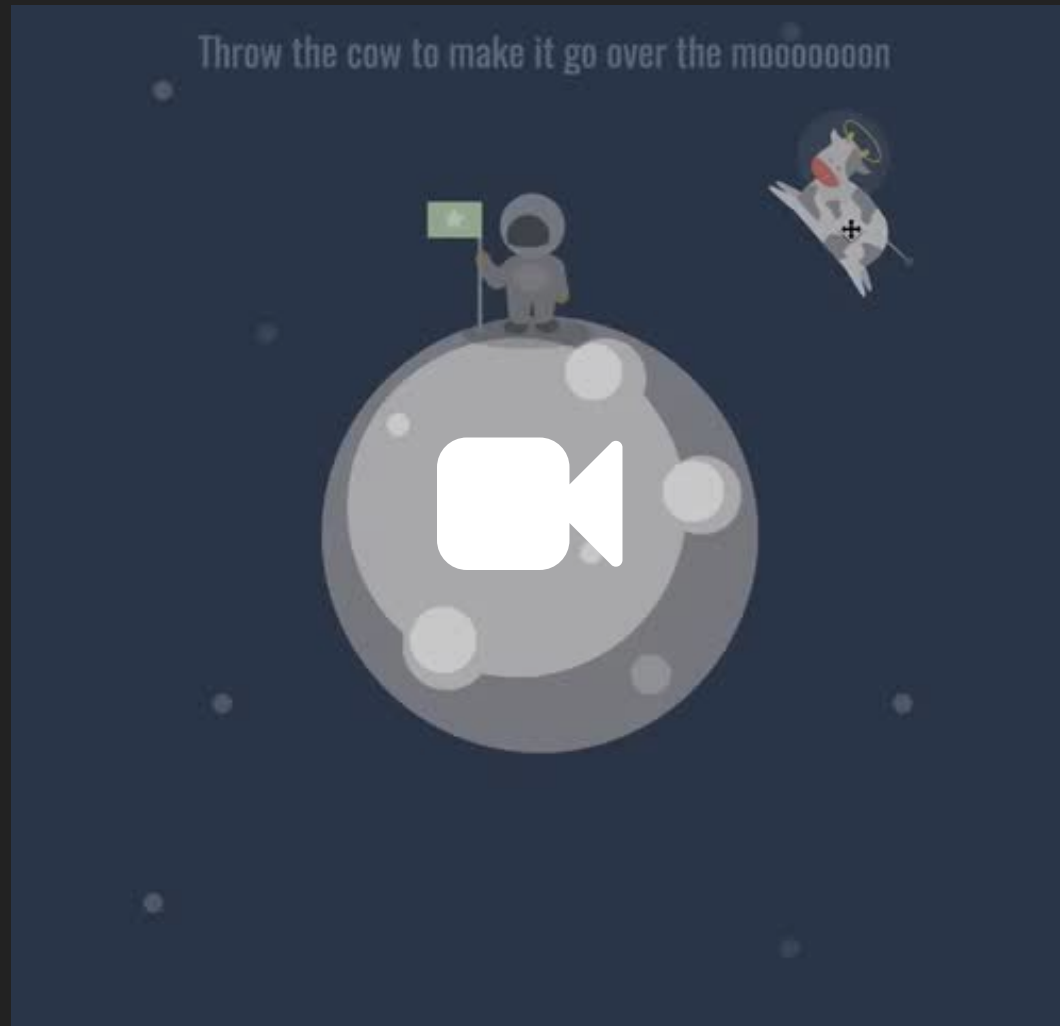
Optimize!

- SVGOMG
- Peter Collingridge's SVG Editor
- SVGO / SVGO-GUI



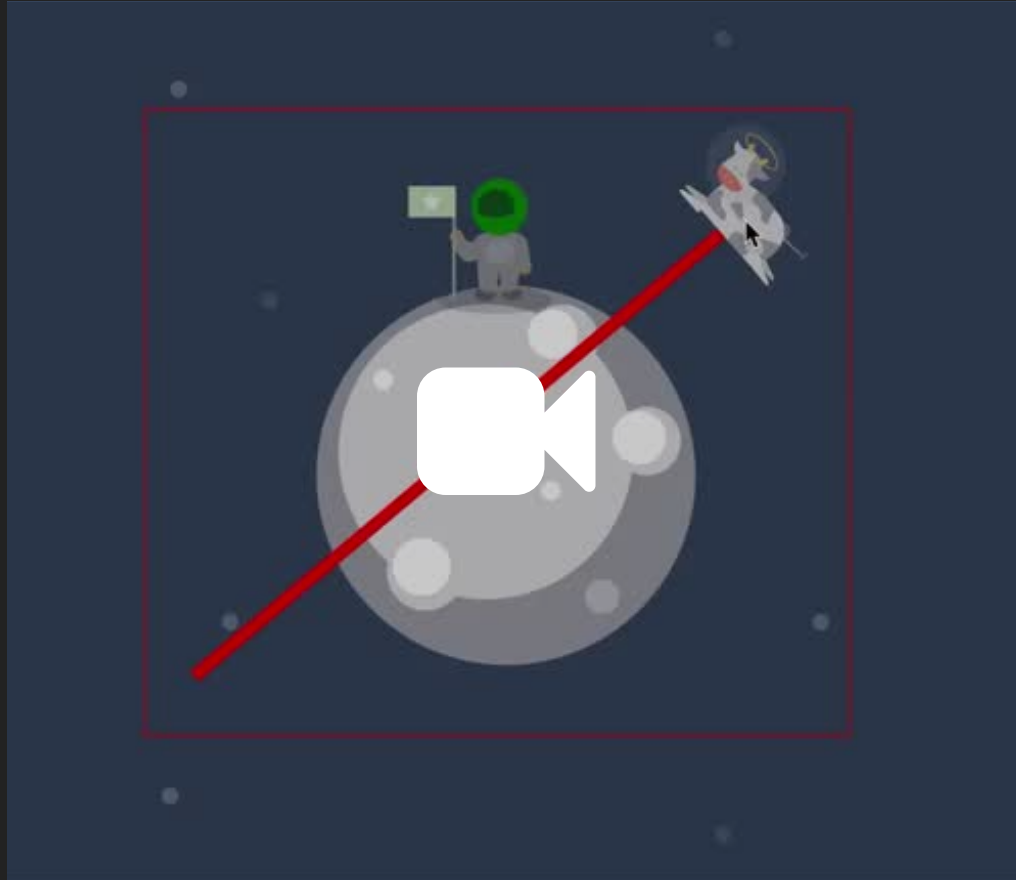
High Performance SVGs

Draggable for Responsive

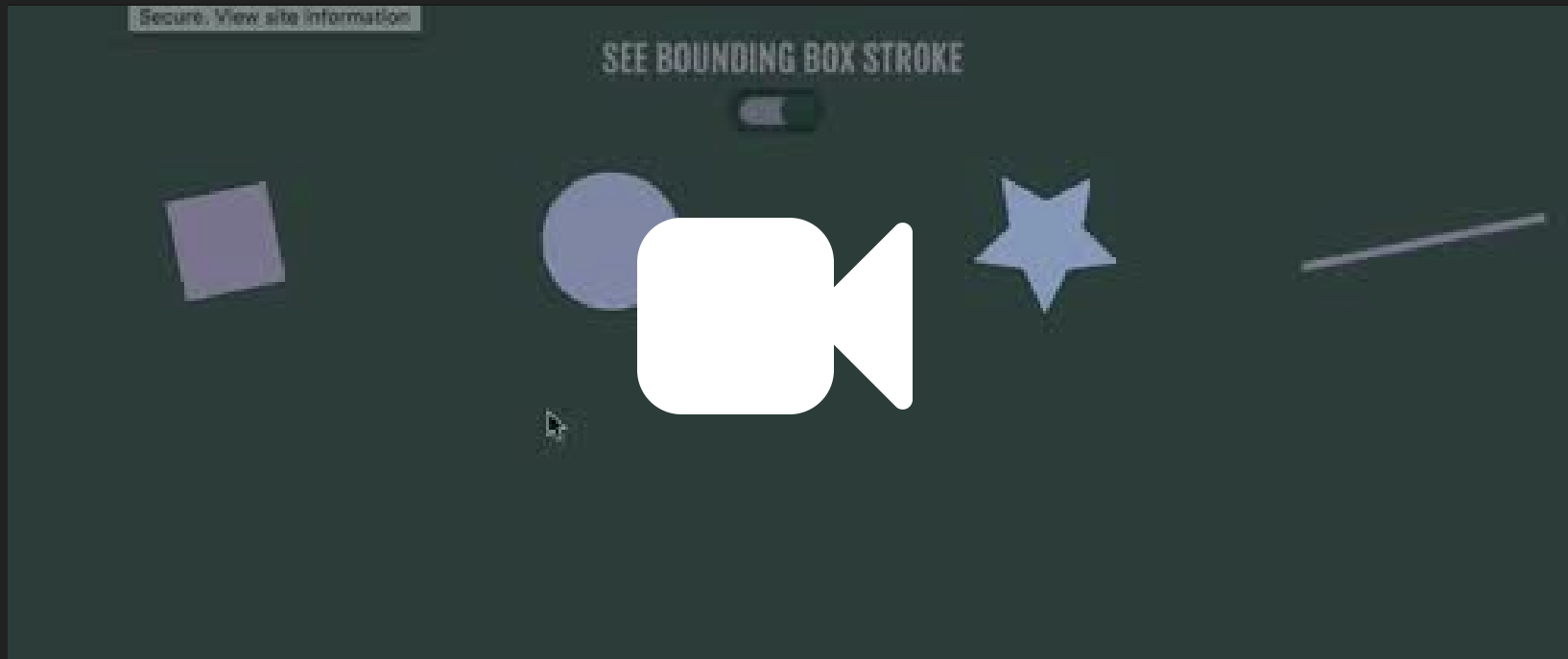


That whole SVG is 2KB!

What's happening?



What the DOM **actually** sees



Loaders!



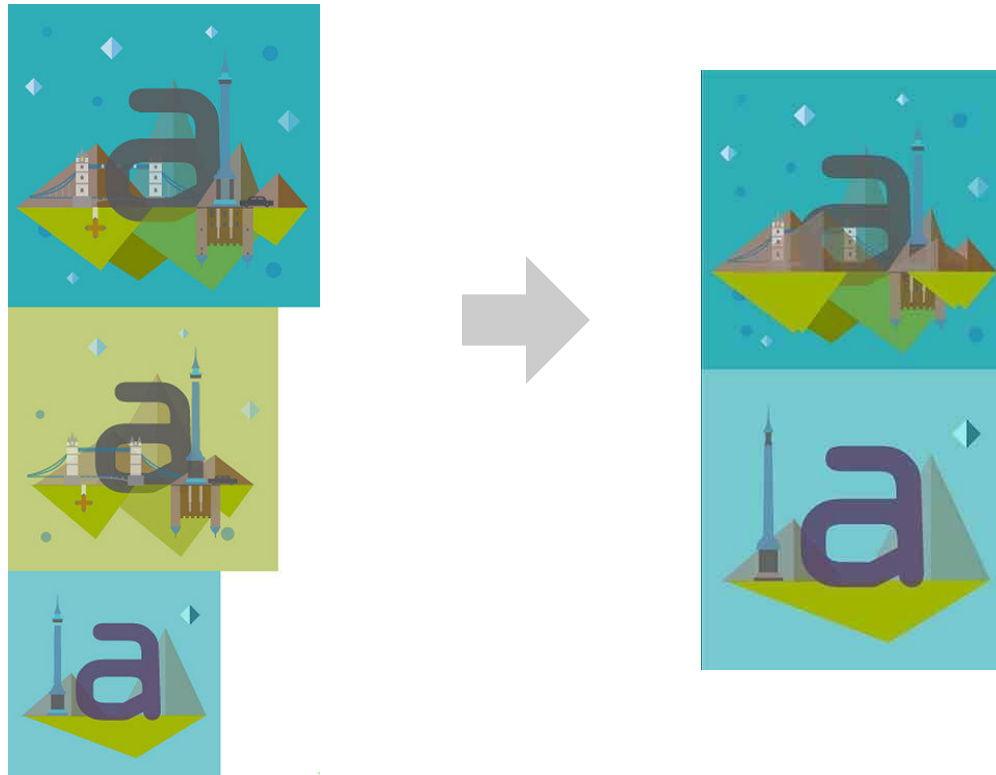
Entire filesize: 6KB!

SVG can make OTHER images smaller!

By [Shaw](#) (go follow him)

38kb => 16kb!

Make a Responsive SVG Animation Sprite



Viewbox Shift with a Sprite

This **pen**.



beautiful manuscript... four spells. It is Ireland's most precious medieval artifact, and is generally considered the finest surviving illuminated manuscript to have been produced in medieval Europe.

Origins and History

The Book of Kells was probably produced in a monastery on the Isle of Iona, Scotland, to honor Saint Columba in the early 9th century. After a Viking raid the book was moved to

ViewBox Shift with JavaScript

Acts like a window to show and hide the
requisite parts of the sprite

```
var shape = document.getElementById("shape");

// media query event handler
if (matchMedia) {
    var mq = window.matchMedia("(min-width: 500px)");
    mq.addListener(WidthChange);
    WidthChange(mq);
}

// media query change
function WidthChange(mq) {
    if (mq.matches) {
        shape.setAttribute("viewBox", "0 0 490 474");
    } else {
        shape.setAttribute("viewBox", "0 490 500 500");
    }
};
```

That Whole Animation
and SVG was

8KB Gzipped.

Compare to using text with photos to
illustrate an article.

SVG can be accessible

Title and associative aria tags:

```
<svg aria-labelledby="title"  
  id="svg"  
  role="presentation"  
  xmlns="http://www.w3.org/2000/svg"  
  viewBox="0 0 765 587">  
<title id="title"  
  lang="en">  
  Icons that illustrate Global Warming Solutions  
</title>
```

Title for elements in the SVG DOM

Role to let the screen reader know whether to traverse

This resource, with support charts.

This article by Heather Migliorisi.

SVG can be styled like text

The original question code

```
<svg class="icon" width="24" height="14" alt="Menu">
  <use xlink:href="/svg/sprites.svg#icon-hamburger"></use>
</svg>

<!-- the svg -->
<?xml version="1.0" encoding="UTF-8"?><!DOCTYPE svg PUBLIC "-//W3C//DT
<svg xmlns="http://www.w3.org/2000/svg" xmlns:xlink="http://www.w3.org
  <symbol id="icon-hamburger" viewBox="0 0 24 14">
    <g fill="#FFF" fill-rule="evenodd">
      <!-- I guess this is the part I need to style..
           But I have tried everything..
           literally, I tried styling * {fill: red} -->
      <path d="M0 0h24v2H0zM0 6h24v2H0zM6 12h18v2H6z"/>
    </g>
  </symbol>
</svg>
```

The secret: fill needs to be `currentColor`

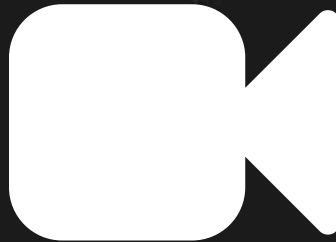
SVG can BOUNCE

This pen.

Start

Increase height

Increase radius



Vue.js

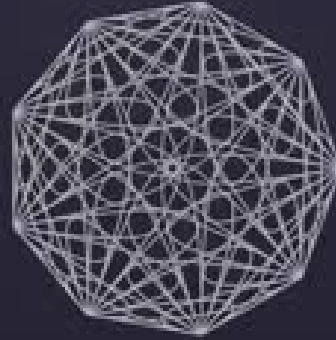
```
data() {  
  return {  
    total: 200,  
    radius: 15,  
  }  
},  
methods: {  
  incrementHeight() {  
    this.total += 100  
  },  
  incrementRadius() {  
    this.radius += 1  
  },  
  bounceBall() {  
    this.vy += this.g; // gravity increases the vertical speed  
    this.x1 += this.vx; // horizontal speed increments horizontal position  
    this.y1 += this.vy; // vertical speed increases vertical position  
  
    if (this.y1 > this.total - this.radius) { // if ball hits the ground  
      this.y1 = this.total - this.radius; // reposition it at the ground  
      this.vy *= -0.8; // then reverse and reduce its speed  
    }  
  },  
  ...  
}
```



```
<button @click="animateBall" v-if="!running">Start</button>
```

```
animateBall() {  
  //use rAF to animate but put a boundary on it so it doesn't run forever  
  let start,  
    vueThis = this;  
  this.running = true;  
  
  function step(timestamp) {  
    if (!start) start = timestamp;  
    var progress = timestamp - start;  
    if (progress < 13000) {  
      vueThis.bounceBall();  
      vueThis.req = window.requestAnimationFrame(step);  
    } else {  
      vueThis.x1 = this.radius;  
      vueThis.y1 = this.radius;  
      vueThis.running = false;  
    }  
  }  
  this.req = window.requestAnimationFrame(step);  
},
```

This pen by Tiffany Rayside



#Points

SVG can SNAP



ES6 Template Literals

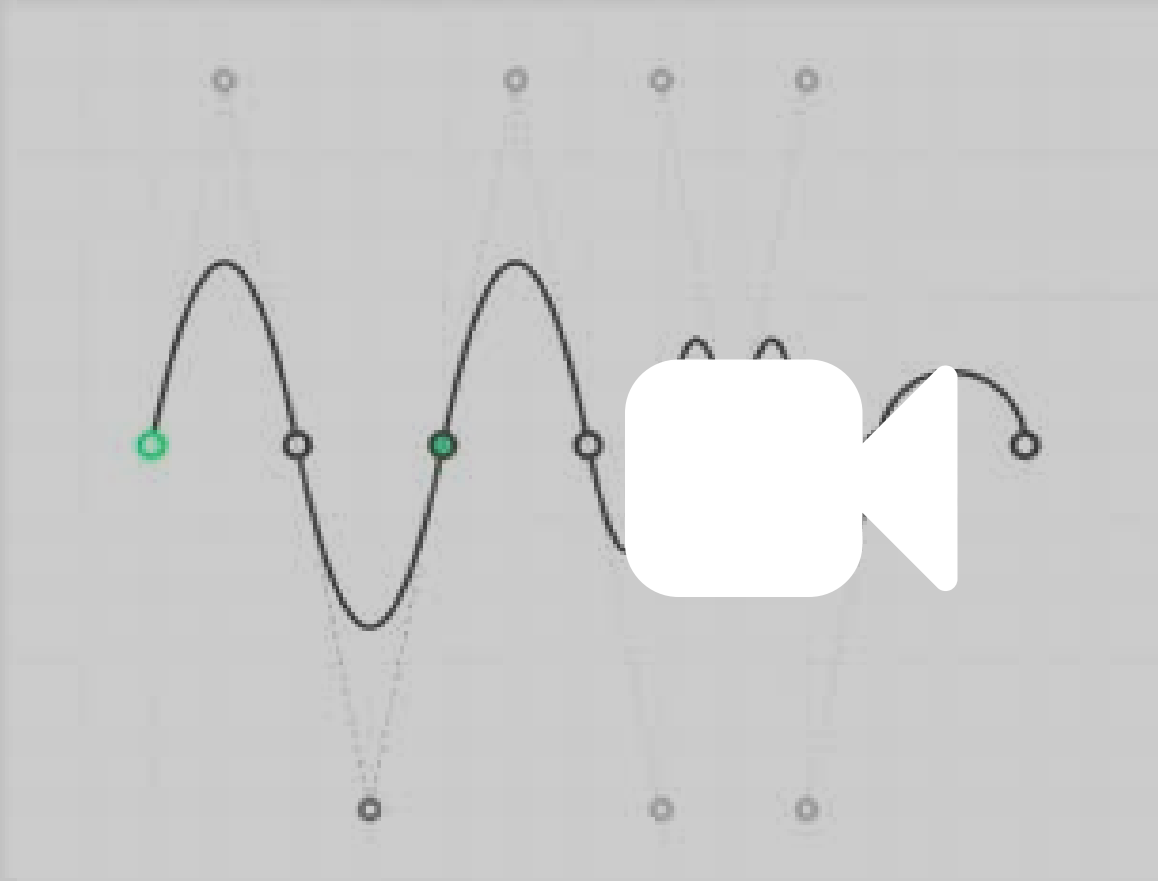
Previously: String Concatenation

```
var stringie = "Hi, I ordered " + num1 + " " +  
product1 + "s and " + num2 + " " + product2 + "s.";
```

Hi, I ordered 5 apples and 2 oranges.

```
const stringie = `Hi, I ordered ${num1}  
${product1}s and ${num2} ${product2}s.`;
```

This pen by Anthony Dugois



CLICK TO SELECT A POINT
CTRL + CLICK TO ADD A POINT

button, line, and corner
or (check the online version)

Parameters

width: height: close path: ☐

grid size: snap grid: ☒ show grid: ☒

RESET PATH

Selected point

POINT TYPE

☐ L ☒ Q ☐ C ☐ A

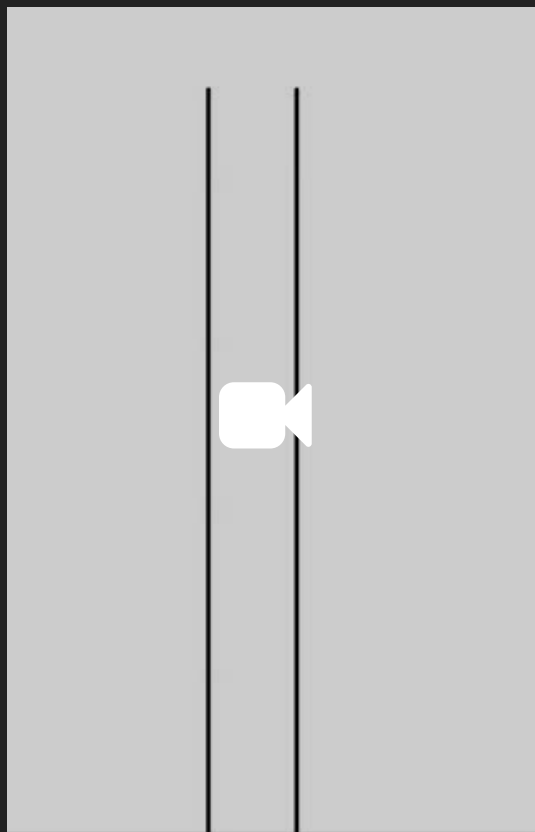
POINT X POSITION

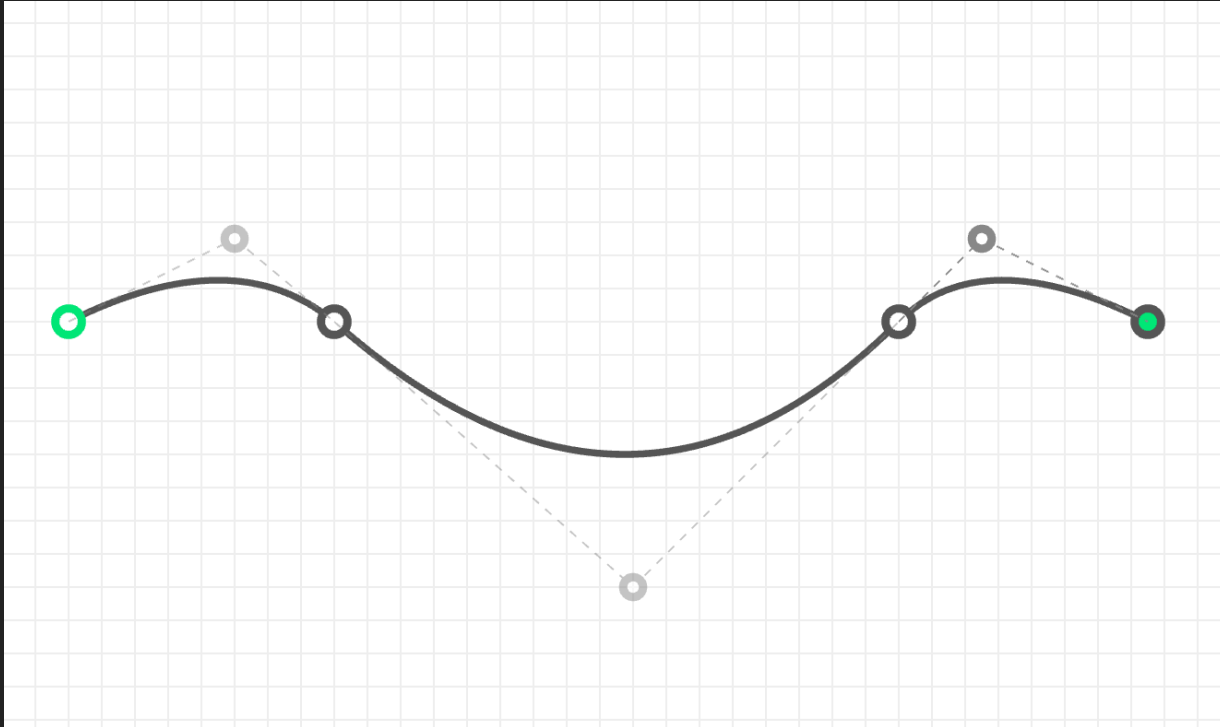
POINT Y POSITION

CONTROL POINT X POSITION

CONTROL POINT Y POSITION

M 100 100 Q 150 150 200 200 Q 250 250 300 300 Q
350 350 400 400 C 450 450 500 500 550 550 C 600 600
650 650 700 700 A 50 50 0 1 1 700 700





M two points x,y
Q two points for the bezier handle x,y ,
two points x,y

Plot the points

M xcoord ycoord L xcoord ycoord

```
function plotter(points, startX) {
  var pathArr = [],
      pathpoints = [];
  for (i = 0; i <= inc; i++) {
    pathpoints.push(points + ((i * (points*2)) + points));
    pathArr.push(` ${startX} ${pathpoints[i]} `);
  }
  return pathArr;
}

rope1.setAttribute("d", `M ${plotter(50, start1)} ` .join(" L" ) );
```


SVG can Distort

Distortion Filters

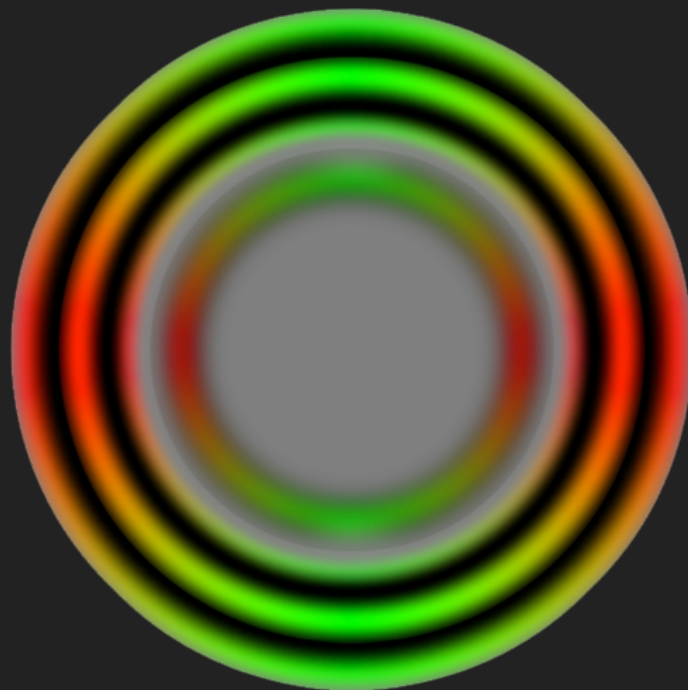
codrops buttons

```
<filter id="turb">
  <feTurbulence id="turbwave" type="fractalNoise" baseFrequency="0"
    numOctaves="2" result="turbulence_3" data-filterId="3" />
  <feDisplacementMap xChannelSelector="R" yChannelSelector="G"
    in="SourceGraphic" in2="turbulence_3" scale="40" />
</filter>
```

Set the filter on a timer

```
function addFilter() {  
    var all = document.getElementById("all");  
    all.setAttribute("filter", "url(#turb)");  
};  
  
(function addFilterTimed() {  
    window.setTimeout(addFilter, 5000);  
})();
```

Pool



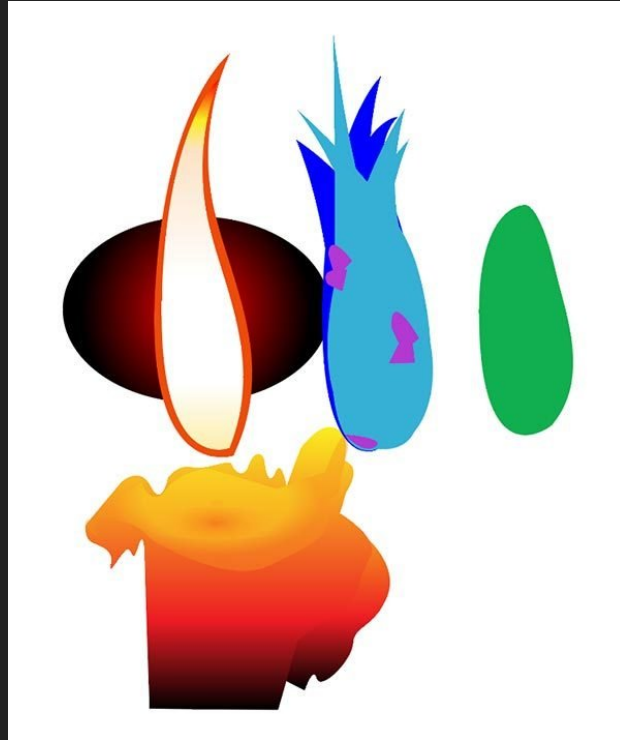
Animate the filter

```
let turb = document.querySelectorAll('#filter-ripple-2 feImage')[0],
    feD = document.querySelectorAll('#filter-ripple-2 feDisplacementMap')[0];

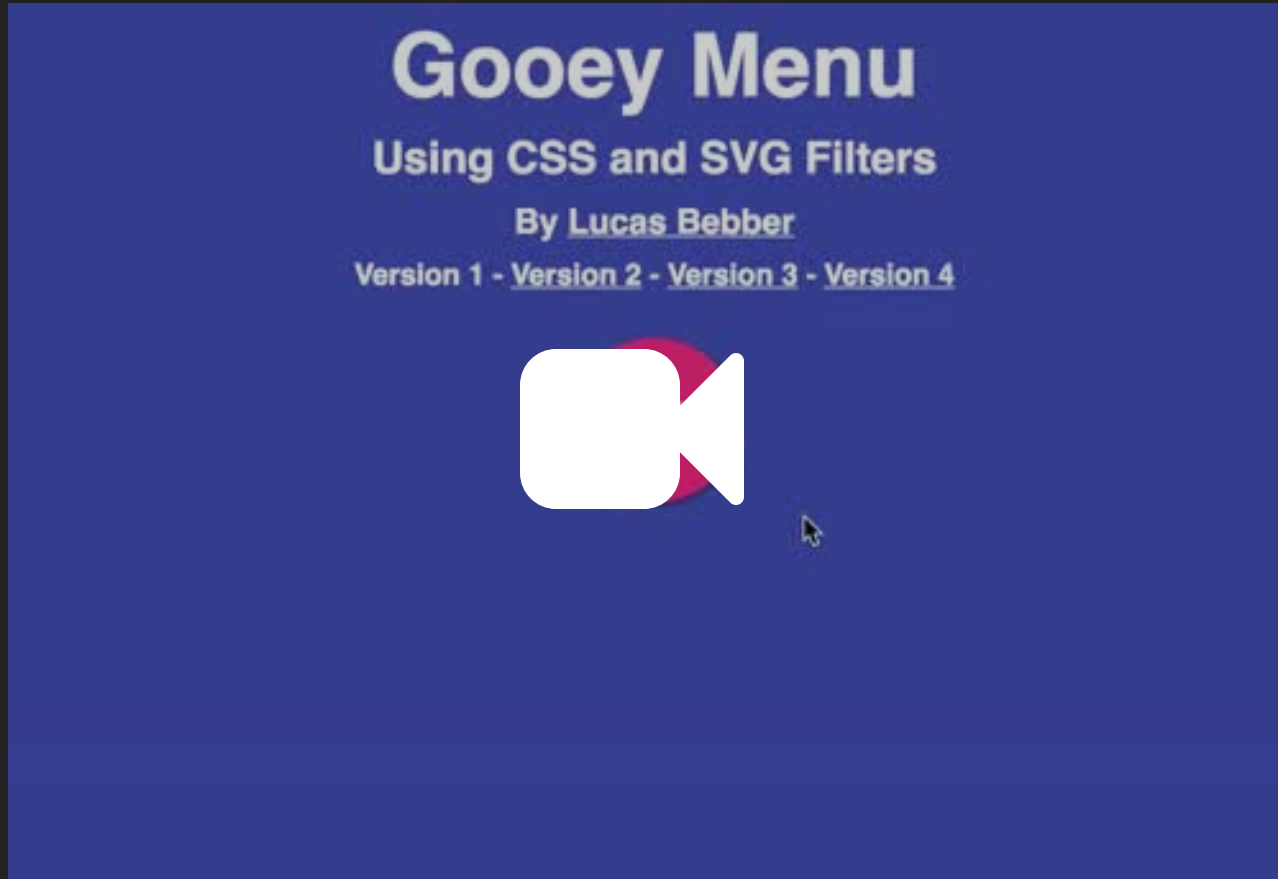
function sceneOne() {
  var tl = new TimelineMax();

  tl.add('begin');
  ...
  tl.fromTo(feD, 8, {
    attr: {
      scale: 30
    }
  }, {
    attr: {
      scale: 0,
      transformOrigin: '50% 50%'
    }
  }, 'begin+=0.4');
}
```


This pen.



This [pen](#) by [Lucas Bebber](#) (go follow him!)



```
MorphSVGPlugin.convertToPath("ellipse");

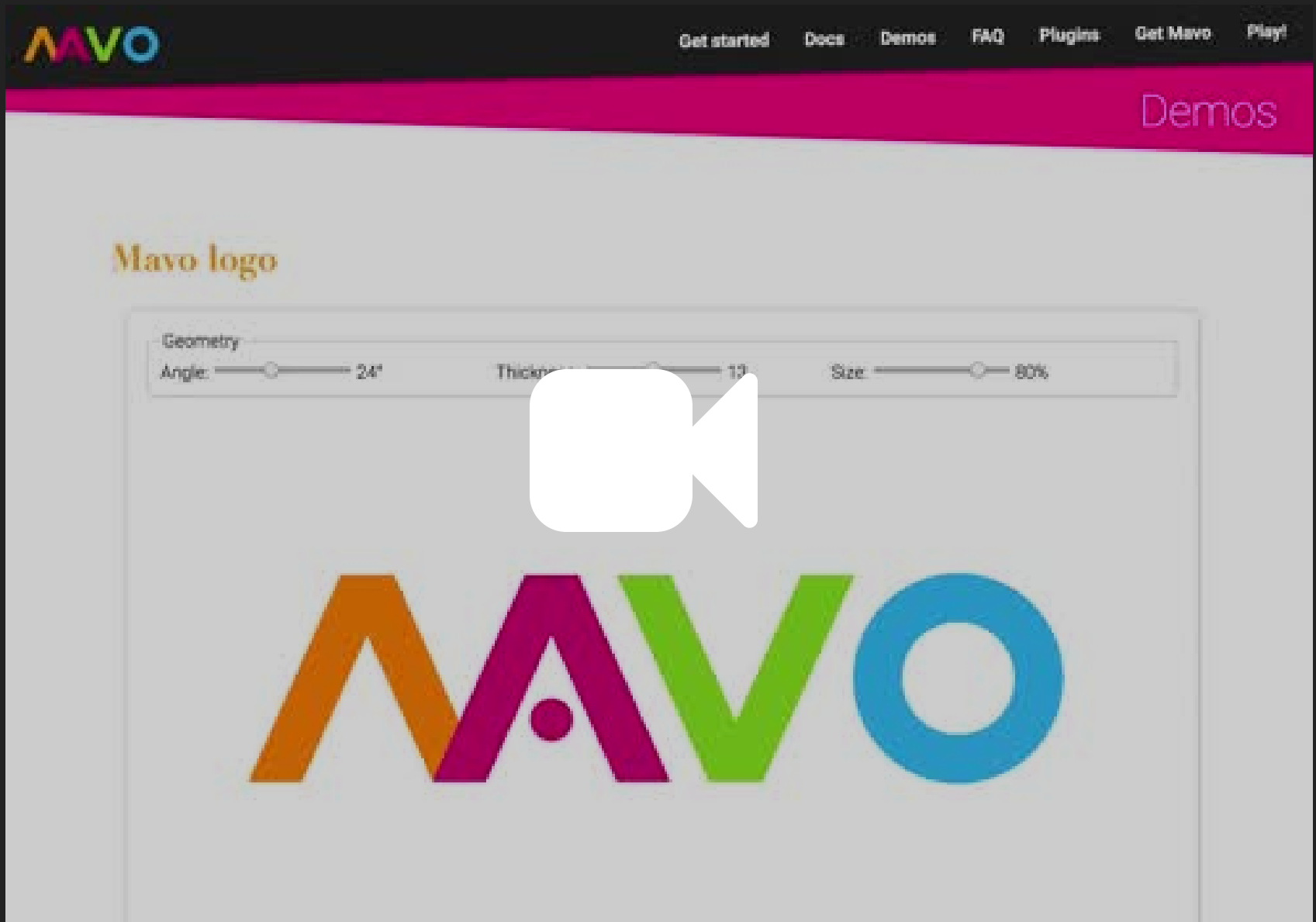
function flame() {
    var tl = new TimelineMax();

    tl.add("begin");
    tl.fromTo(blurNode, 2.5, {
        attr: {
            stdDeviation: 9
        }
    }, {
        attr: {
            stdDeviation: 3
        }
    }, "begin");
    var num = 9;
    for (var i = 1; i <= num; i++) {
        tl.to(fStable, 1, {
            morphSVG: {
                shape: "#f" + i
            },
            opacity: ((Math.random() * 0.7) + 0.7),
            ease: Linear.easeNone
        }, "begin+=" + i);
    }
}
```

This pen.

SVG can do on-the-fly
logo adjustment

Mavo, by Lea Verou (you should go follow her,
and the project)



SVG can increase KPIs

Revisiting old approaches

Responsive animated Infographic



Rethinking Information Presentation article

Conversion

(one source example, **The Whole Brain Group**)

- increased traffic to their website by over **400%**
- lead increase by almost **4500%**
- the number of new visitors to their site to almost **78%**

All posts older than **2 years**.

What Happened?

Problems

- Not responsive- tipping point: **Tim Kadlec**
- Not updated to current context
- ^ Especially design

This pen.

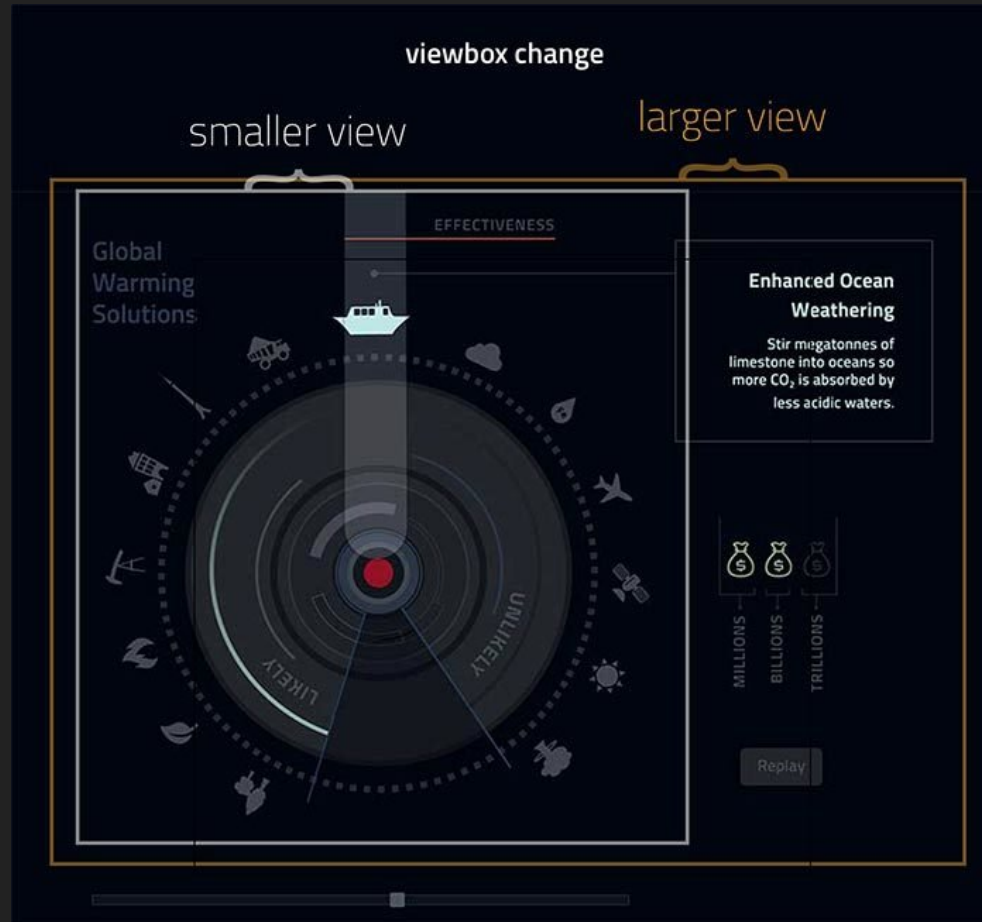
Land Management

- Plant trees & plants to absorb more CO₂, reduce tropical deforestation.



Responsive:

Change the viewbox in JavaScript like we did before:



Responsive:

```
/* media query example element, mobile first */  
@media (max-width: 825px) {  
  container {  
    width: 100%;  
  }  
}  
@media (min-width: 826px) {  
  .container {  
    width: 825px;  
  }  
}
```

You already know this!

SVG can draw itself

The dash's offset is an animatable property!



This pen



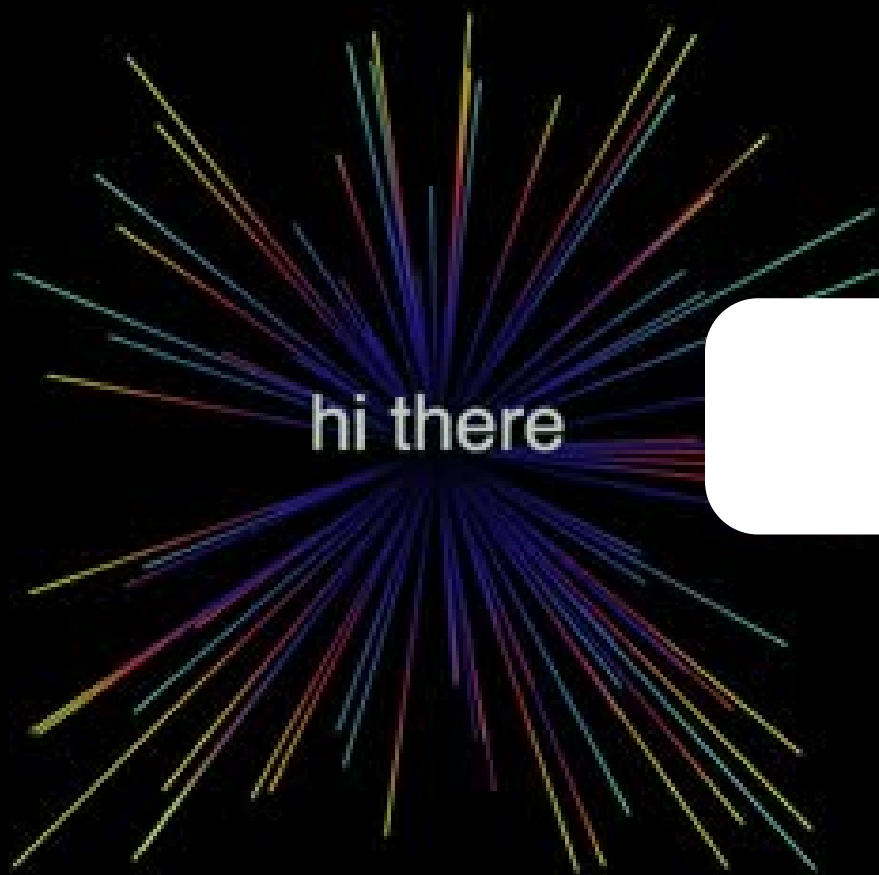
This [pen](#) by [Chris Gannon](#) (go follow him!)



You can interact with an SVG

Interaction

```
var radius = balloon.getAttribute("r");
var cySet = balloon.getAttribute("cy");
balloon.setAttribute('r', parseInt(radius) + 10);
balloon.setAttribute('cy', parseInt(cySet) - 10);
if (parseInt(radius) > 125) {
    ion.sound.play("balloon-pop3");
    var balloonTl = new TimelineMax();
    balloonTl.add("pop");
    balloonTl.to("#balloon", 0.05, {
        scale: 5,
        opacity: 0,
        transformOrigin: "50% 50%",
        ease: Circ.easeOut
    }, "pop");
    ...
    setTimeout(function(){
        balloon.setAttribute("r", "45");
        balloon.setAttribute("cy", "233.5");
    }, 200);
}
```



UPDATE THE TEXT:



CREATE CIRCLES:

CREATE LINES:

ANIMATION:

CHANGE TEXT COLOR:

FILL COLOR:



STROKE COLOR:



TEXT SIZE:

```
<div class="formarea">
  <h3>Create Circles:</h3>
  <button @click="createSmCircles">Make small circles</button>
  <button @click="createBigCircles">Make big circles</button>
</div>
```

```
createBigCircles() {
  const svgNS = this.$refs.figure.namespaceURI;
  this.$refs.patterngroup.innerHTML = '';

  for (let i = 0; i < this.numLines/2; i++) {
    let circ = document.createElementNS(svgNS, 'circle');
    this.append(this.$refs.patterngroup, circ);
    this.setAttributes(circ, {
      'cx': this.size/2,
      'cy': this.size/2,
      'r': this.totesRando(this.size/2, 0),
      'fill': 'none',
      'stroke': this.gradients2[this.totesRando(1, 0)],
      'stroke-width': 1
    });
  }
},
```



```
<div class="formarea">
  <h3>Animation:</h3>
  <button @click="animation">Play Animation</button>
  <button @click="pauseAnim">Stop Animation</button>
</div>
```

```
animation() {
  let tl = new TimelineMax()

  tl.add('begin')
  tl.to('line', 2, {
    rotation: 360,
    repeat: -1,
    transformOrigin: '50% 50%',
    ease: Sine.easeOut
  }, 'begin')
  ...

  return tl;
},
pauseAnim() {
  var tl = TimelineLite.exportRoot();
  tl.pause(0);
},
```

This pen.



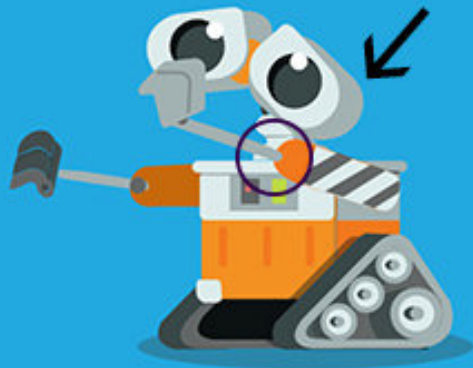
HTML (Vue Component)

```
<div id="app" @mousemove="coordinates">
```

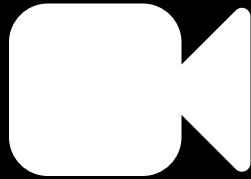
JavaScript

```
coordinates(e) {  
  ...  
  this.startArms.progress(1 - (e.clientX / walleCoords)).pause();  
}
```

SVG can be clipped and
masked



This pen.



```
<svg class="svg" viewBox="0 0 500 500">
  <defs>
    <mask
      id="mask"
      maskunits="userSpaceOnUse"
      maskcontentunits="userSpaceOnUse">
      <image
        xlink:href="https://s3-us-west-2.amazonaws.com/s.cdpn.io/28963/giphy"
        width="100%"
        height="100%" />
    </mask>

    ...

    <rect width="100%" height="100%" fill="url(#checker)" mask="url(#mask)" />
  </svg>
```

This pen by Yoksel (go follow her!)



This **reference pen** by Yoksel

CSS and SVG Masks



CSS clip

Specification

CSS

```
.item {  
  position: absolute;  
  clip: rect(10px, 190px, 190px, 10px);  
}
```



CSS clip-path

Specification

CSS

```
.item {  
  clip-path: circle(100px, 100px, 100px);  
  clip-path: circle(100px at center);  
}
```

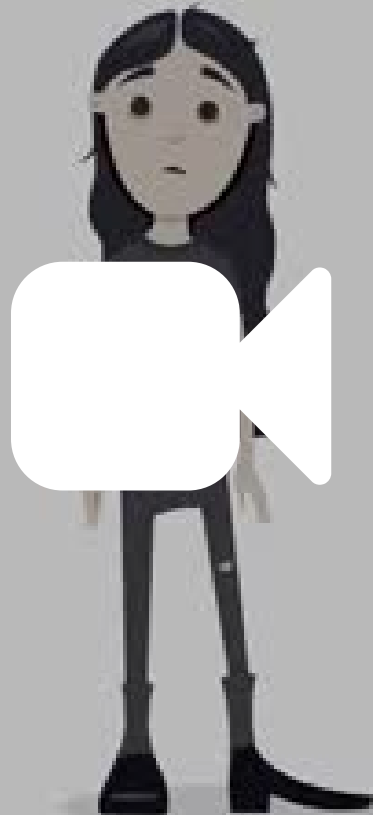
Syntax for circle ~~was changed~~, to radial gradient syntax



My **CSS-Tricks article** on the differences

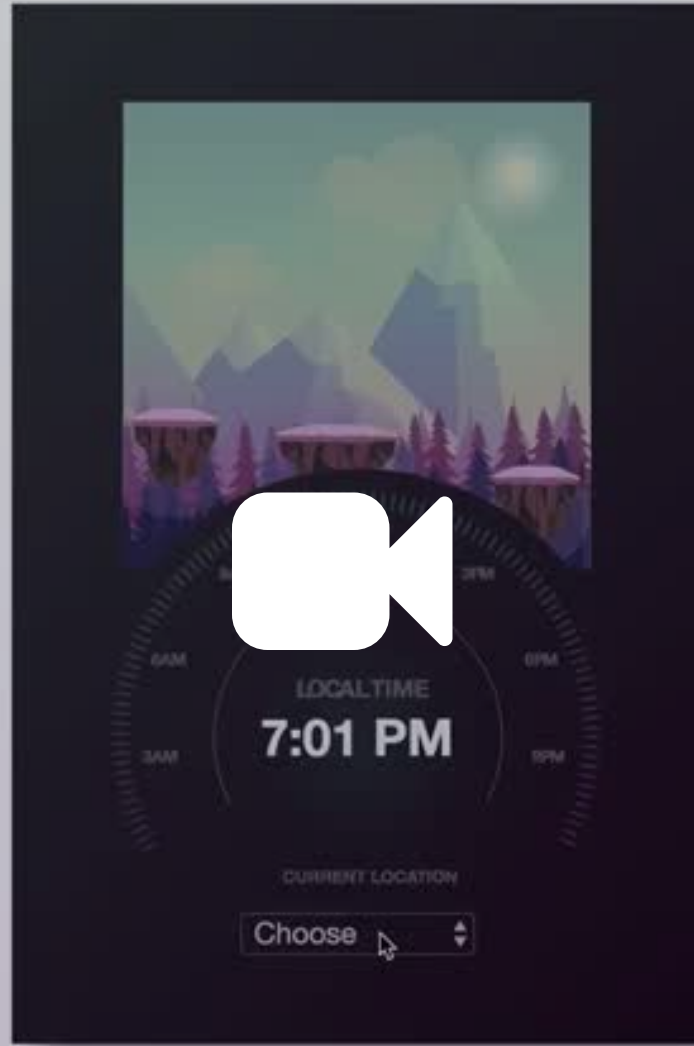
edit mem SWC

This pen by Noel Delgado



SVG can signify something changing

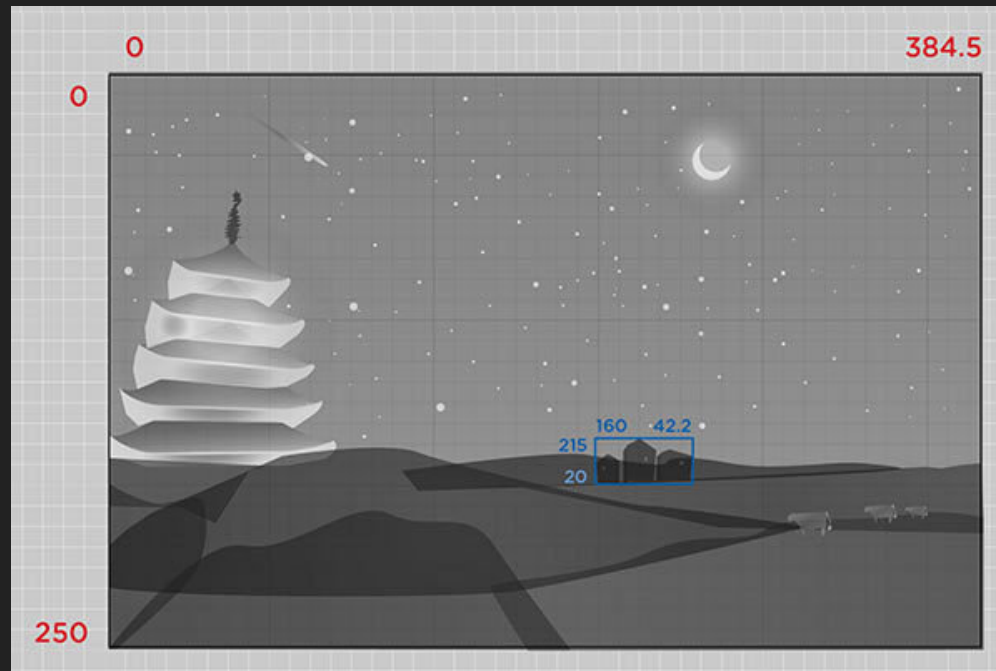
This **pen** with Vue.js



Side note: get rid of big libraries

```
methods: {  
  //this formats the hour info without a library  
  getCurrentHour(zone) {  
    let newhr = new Date().toLocaleTimeString('en', {  
      hour: '2-digit',  
      minute: '2-digit',  
      hour12: true,  
      timeZone: zone  
    })  
    return newhr  
  },  
  ...  
}
```

You can use an SVG's
viewBox like a camera



get bbox();

```
▼ SVGRect ⓘ  
  height: 19.600006103515625  
  width: 42.199981689453125  
  x: 215.10000610351562  
  y: 160  
  ► __proto__: SVGRect
```

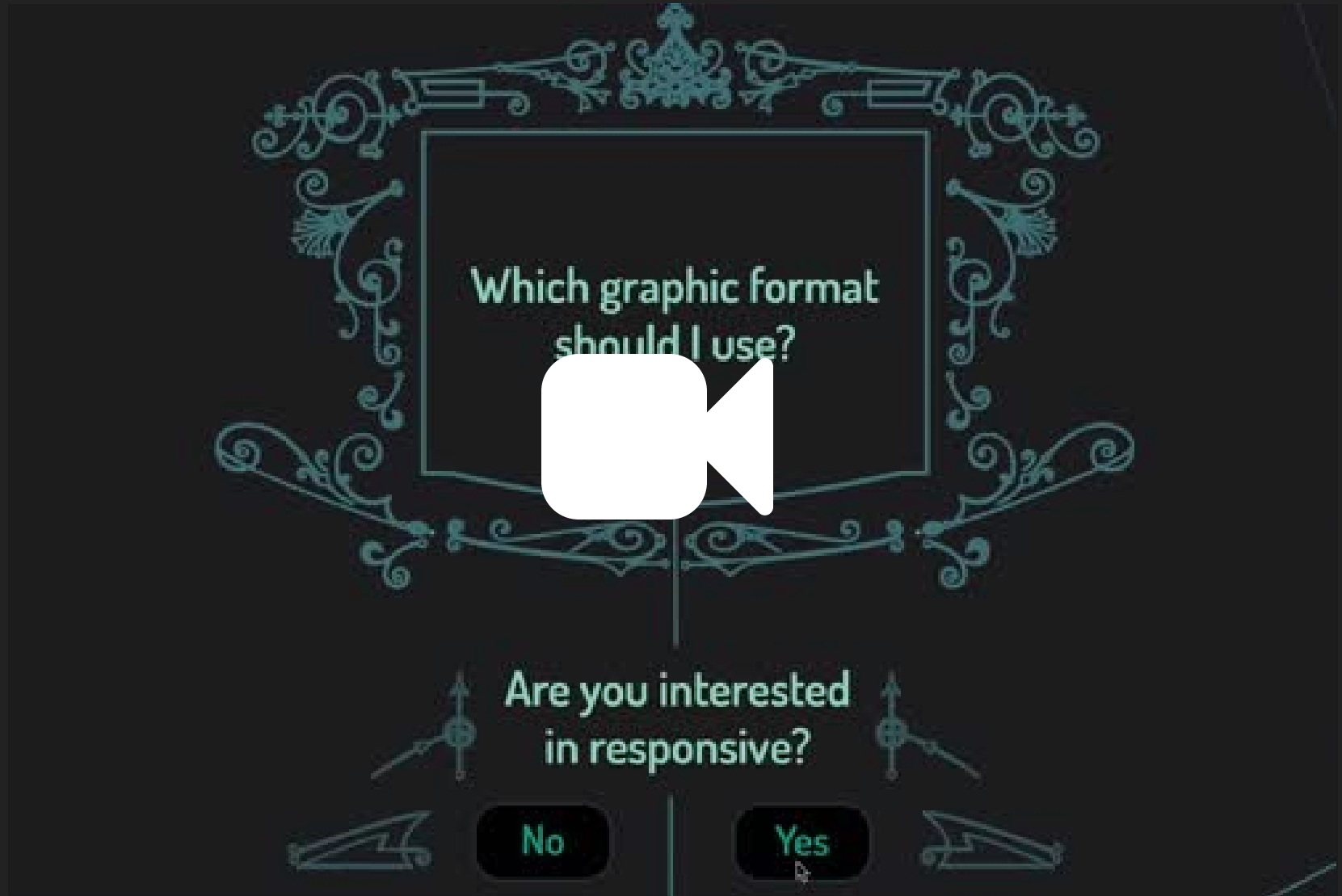

This pen.

Crime Statistics



FLOW CHART

This pen.



This pen by Andrey Sorokin



SVG can make a GAME

This pen.

How did we use SVG?

Three ways:

- Directly inline in the HTML, for loops
- Background images, for things like taco
- Inline in React


```

const App = React.createClass({
  getInitialState: function() {
    return {
      score: 500,
      startTime: 0,
      finalScore: 0
    };
  },

  _startGame: function(setGameToStart) {
    this.setState({ isPlaying: setGameToStart,
      score: 500,
      startTime: Date.now()
    });
  },

  _updateScore: function(scoreDelta) {
    let score = Math.min(Math.max(0, this.state.score + scoreDelta), 1270);
    this.setState({ score: score });
    if (score === 0 || score === 1270) {
      this.setState({ isPlaying: false,
        finalScore: 10000 - Math.round((Date.now() - this.state.s
      )
    }
  },
  ...

  render() {
    return (
      <div>
        ...
        <HeartMeter score={this.state.score}/>
        ...
      </div>
    )
  }
});

```

```
const HeartMeter = React.createClass({
  render() {
    return (
      <div>
        <svg className="heartmeter" xmlns="http://www.w3.org/2000/svg" width="200" height="100">
          <path d="M174.8 197.7c0 109.3-89 197.8-198.8 197.8a198.6 198.6 0 0 1 198.8 198.8" />
          <path d="M159.8 127c-18.3 0-34.1 14.8-41.4 30.3-7.3-15.5-23.1-30.3-41.4 30.3" />
          <rect x="68.2" y="140.8" width={this.props.score} height="101.55" fill="red" />
        </svg>
      </div>
    )
  }
});
```

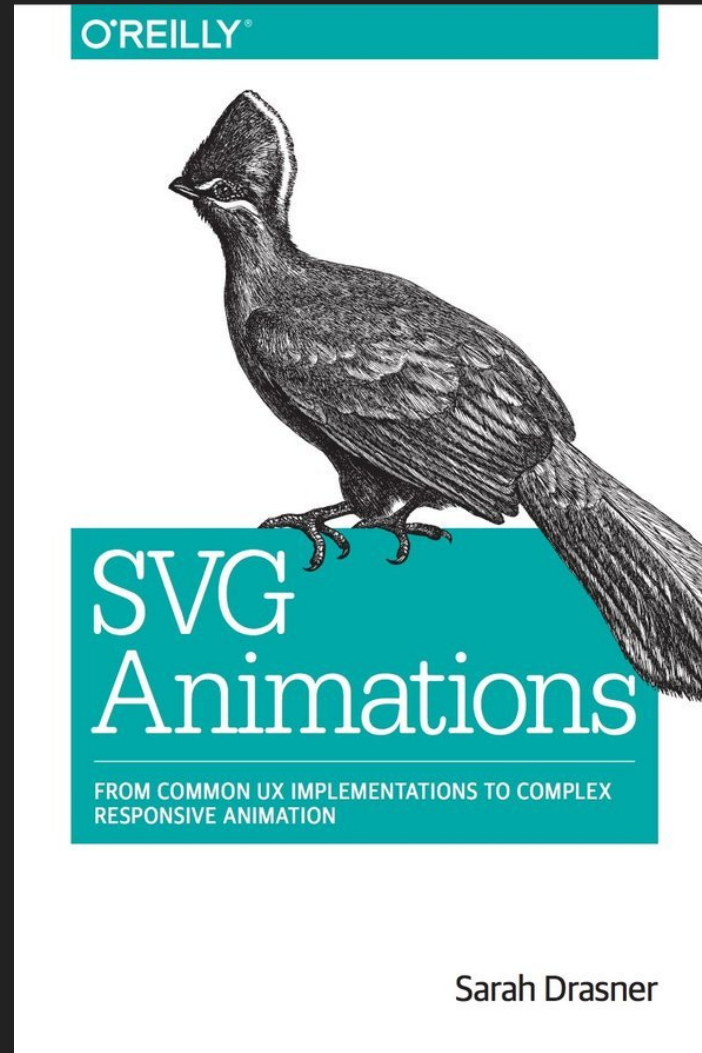

Request Animation Frame

```
(function getCoords() {  
  let tCoords = tC1.getBoundingClientRect(),  
      txCoords = txC1.getBoundingClientRect(),  
      mCoords = mC1.getBoundingClientRect(),  
      elCoords = ele1.getBoundingClientRect();  
  
  function intersectRect(a, b) {  
    return Math.max(a.left, b.left + 40) < Math.min(a.right, b.right - 40) &&  
           Math.max(a.top, b.top + 40) < Math.min(a.bottom, b.bottom - 40);  
  }  
  
  // can't do if/else because sometimes they both come out at once  
  // and one of them will be ignored  
  if (intersectRect(tCoords, elCoords)) {  
    getHitTestIncrease();  
  }  
  if (intersectRect(txCoords, elCoords)) {  
    getHitTestDecrease();  
  }  
  if (intersectRect(mCoords, elCoords)) {  
    getHitTestMargarita();  
  }  
  
  requestAnimationFrame(getCoords);  
})();
```

All this, and we didn't even
get to data vis!

O'Reilly Book

SVG Animation





Web Animation Workshops

with Val Head

Thank you!

@sarah_edo on twitter