Using the time to set up the frame rate of the animation

PRINCIPLE: EVEN IF THE MAINLOOP IS CALLED 60 TIMES PER SECOND, IGNORE SOME FRAMES IN ORDER TO REACH THE DESIRED FRAME RATE

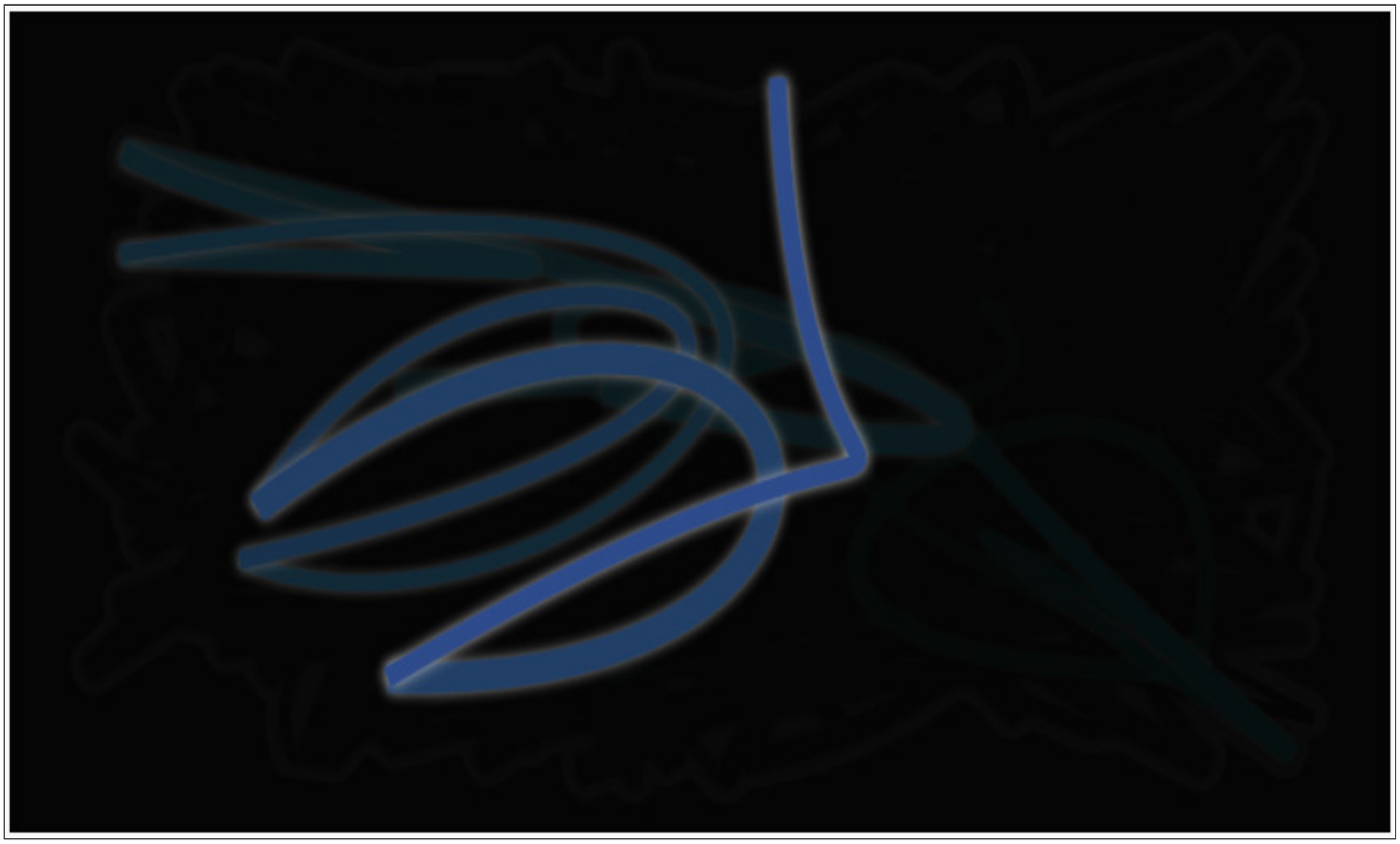
It is also possible to set the frame rate using time based animation: we can set a global variable that corresponds to the desired frame rate and compare the elapsed time between two executions of the animation loop:

- If the time elapsed is too short for the target frame rate: do nothing,
- If the time elapsed is superior to the delay that corresponds to the frame rate: draw the frame and reset this time to zero.

Here is the an online example at JSBin.

Try to change the parameter value of the call to:

```
      setFrameRateInFramesPerSecond(5); // try other values!
```



Source code of the example:

```
<!DOCTYPE html>
<html lang="en">
 <head>
 <meta charset=utf-8 />
 <title>Set framerate using a high resolution timer</title>
 </head>
 <body>
 <p>This example measures and sums deltas of time between
consecutive frames of animation. It includes
a <code>setFrameRateInFramesPerSecond</code> function you can use
to reduce the number of frames per second of the main animation.
</p>

 <canvas id="myCanvas" width="700" height="350">
 </canvas>
 <script>
   var canvas = document.querySelector("#myCanvas");
   var ctx = canvas.getContext("2d");
   var width = canvas.width, height = canvas.height;
   var lastX = width * Math.random();
   var lastY = height * Math.random();
```

```
    var hue = 0;

    // Michel Buffa: set the target frame rate. TRY TO CHANGE THIS VALUE AND SEE
    // THE RESULT. Try 2 frames/s, 10 frames/s, 60 frames/s Normally there
    // should be a limit of 60 frames/s in the browser's implementations.
    setFrameRateInFramesPerSecond(60);

  // for time based animation. DelayInMS corresponds to the target framerate
  var now, delta, delayInMS, totalTimeSinceLastRedraw = 0;

  // High resolution timer
  var then = performance.now();

  // start the animation
  requestAnimationFrame(mainloop);

  function setFrameRateInFramesPerSecond(frameRate) {
    delayInMs = 1000 / frameRate;
  }

  // each function that is going to be run as an animation should end by
  // asking again for a new frame of animation
  function mainloop(time) {
    // Here we will only redraw something if the time we want between frames has
    // elapsed
    // Measure time with high resolution timer
    now = time;

    // How long between the current frame and the previous one?
    delta = now - then;
    // TRY TO UNCOMMENT THIS LINE AND LOOK AT THE CONSOLE
    // console.log("delay = " + delayInMs + " delta = " + delta + " total time = " +
    // totalTimeSinceLastRedraw);

    // If the total time since the last redraw is > delay corresponding to the wanted
    // framerate, then redraw, else add the delta time between the
```

```
    last call to line()
        // by requestAnimFrame to the total time..
        if (totalTimeSinceLastRedraw > delayInMs) {
            // if the time between the last frame and now is > delay
    then we
            // clear the canvas and redraw

            ctx.save();

            // Trick to make a blur effect: instead of clearing the
    canvas
            // we draw a rectangle with a transparent color. Changing
    the 0.1
            // for a smaller value will increase the blur...
            ctx.fillStyle = "rgba(0,0,0,0.1)";
            ctx.fillRect(0, 0, width, height);

            ctx.translate(width / 2, height / 2);
            ctx.scale(0.9, 0.9);
            ctx.translate(-width / 2, -height / 2);

            ctx.beginPath();
            ctx.lineWidth = 5 + Math.random() * 10;
            ctx.moveTo(lastX, lastY);
            lastX = width * Math.random();
            lastY = height * Math.random();

            ctx.bezierCurveTo(width * Math.random(),
                              height * Math.random(),
                              width * Math.random(),
                              height * Math.random(),
                              lastX, lastY);

            hue = hue + 10 * Math.random();
            ctx.strokeStyle = "hsl(" + hue + ", 50%, 50%)";
            ctx.shadowColor = "white";
            ctx.shadowBlur = 10;
            ctx.stroke();

            ctx.restore();

            // reset the total time since last redraw
            totalTimeSinceLastRedraw = 0;
        } else {
```

```
        // sum the total time since last redraw
        totalTimeSinceLastRedraw += delta;
    }

    // Store time
    then = now;

    // request new frame
    requestAnimationFrame(mainloop);
  }
 </script>
 </body>
</html>
```

SAME TECHNIQUE WITH THE BOUNCING RECTANGLE + SEE HOW WE CAN BOTH SET THE SPEED AND FRAME RATE USING A HIGH RESOLUTION TIME

Here is a modified version on JSBin of the example with the rectangle that also uses this technique. In this version you can change both the speed in pixels/s and the frame rate.

Source code:

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset=utf-8 />
<title>Bouncing rectangle with high resolution timer and
adjustable frame rate</title>
 <script>
   var canvas, ctx;
   var width, height;
   var x, y, incX; // incX is the distance from the previously
drawn rectangle
                   // to the new one
   var speedX; // speedX is the target speed of the rectangle in
pixels/s

   // for time based animation, DelayInMS corresponds to the
target frame rate
   var now, delta, delayInMS, totalTimeSinceLastRedraw=0;
   // High resolution timer
   var then = performance.now();
   // Michel Buffa: set the target frame rate. TRY TO CHANGE THIS
```

```
VALUE AND SEE
19.    // THE RESULT. Try 2 frames/s, 10 frames/s, 60, 100 frames/s
Normally there
       // should be a limit of 60 frames/s in the browser's
implementations, but you can
       // try higher values
       setFrameRateInFramesPerSecond(25);
       function setFrameRateInFramesPerSecond(framerate) {
         delayInMs = 1000 / framerate;
       }
       // Called after the DOM is ready (page loaded)
       function init() {
30.      // init the different variables
         canvas = document.querySelector("#mycanvas");
         ctx = canvas.getContext('2d');
         width = canvas.width;
         height = canvas.height;
         x=10; y = 10;
         // Target speed in pixels/second, try with high values, 1000,
2000...
         speedX = 2000;
40.      // Start animation
         requestAnimationFrame(animationLoop)
       }
       function animationLoop(time) {
         // Measure time with high resolution timer
         now = time;

         // How long between the current frame and the previous one?
         delta = now - then;
         if(totalTimeSinceLastRedraw > delayInMs) {
           // Compute the displacement in x (in pixels) in function of
the time elapsed
           // since the last draw and
           // in function of the wanted speed. This time, instead of
delta we
           // use totalTimeSinceLastRedraw as we're not always drawing
at
           // each execution of mainloop

 incX = calcDistanceToMove(totalTimeSinceLastRedraw, speedX);
           // an animation involves: 1) clear canvas and 2) draw
shapes,
           // 3) move shapes, 4) recall the loop with
```

```
requestAnimationFrame
       // clear canvas
       ctx.clearRect(0, 0, width, height);
       ctx.strokeRect(x, y, 10, 10);
       // move rectangle
       x += incX;
69.
      // check collision on left or right
      if((x+10 >= width) || (x <= 0)) {
        // cancel move + inverse speed
        x -= incX;
        speedX = -speedX;
      }
      // reset the total time since last redraw
      totalTimeSinceLastRedraw = delta;
   } else {
79.   // sum the total time since last redraw
     totalTimeSinceLastRedraw += delta;
   }
   // Store time
   then = now;

   // animate.
87.  requestAnimationFrame(animationLoop);
 }
 var calcDistanceToMove = function(delta, speed) {
    return (speed * delta) / 1000;
 }
93.
 </script>
</head>
<body onload="init();">
 <canvas id="mycanvas" width="200" height="50" style="border: 2px solid
black"></canvas>
</body>
</html>
```

USING SETINTERVAL?

It's always possible to use some functions called by `setInterval(function, interval)` if you do not need an accurate scheduling.

For animating a monster at 60 frames/s but having his eyes blink every second, you would use a

mainloop with `requestAnimationFrame` and target a 60 frames/s animation, but you would also have a call to `setInterval(changeEyeColor, 1000);` and the changeEyeColor function will update every second a global variable `eyeColor` that will be taken into account in the `drawMonster` function, called 60 times/s from the mainloop.