```
<!DOCTYPE html>
<!--
    $Id: 3DCubes.html 1.7 2017-01-19 16:57:46-05 Ron Exp $
    3DCubes.html is by Ron Charlton 2012-05-19.
    It is based on code in the book, "JavaScript: The Definitive Guide", 6th Ed.,
    by David Flanagan (O'Reilly), pp. 13-18. Book copyright 2011 David Flanagan,
    978-0-596-80552-4.  The 3DCubes code by Ron Charlton is in the public
    domain and may be used for any purpose.

    Last revised: 2014-12-13 (Made HTML5; checked with
    http://validator.w3.org/#validate_by_upload+with_options)
-->
<head>
<meta http-equiv="Content-Type" content="text/html;charset=utf-8" />
<meta name="author" content="Ron Charlton" />
<meta name="description" content="Three dimensional (3D) rotating cubes coded in JavaScript."  />
<title>3D Rotating Cubes</title>
<style  type="text/css">
#canvasID { background-color: black; }      /* canvas identification */
</style>
<script type="text/javascript">
"use strict"; // Use ECMAScript 5 strict mode in browsers that support it

var deg = 132;  // beginning angle of cubes' rotation
var degreesToRadians = (2 * Math.PI) / 360;
var rotate = false; // cubes aren't rotating initially
var step = 3;   // how many degrees to rotate cubes for each video frame
var t;          // timeout handle

// sine function that accepts degrees
function sinDeg(i) {
    return Math.sin(i * degreesToRadians);
}

// cosine function that accepts degrees
function cosDeg(i) {
    return Math.cos(i * degreesToRadians);
}


// rotate cubes by one video frame
var doVideoFrame = function() {
    var canvas = document.getElementById('canvasID'); // Get the canvas tag

    // Setting canvas width or height resets the canvas completely.  Don't try to twiddle them.
    canvas.width = canvas.width;  // Magic to clear and reset the canvas element

    // Get the "context" object for the canvas that defines the drawing API
    var context = canvas.getContext('2d'); // All drawing is done with this object
    var width = canvas.width, height = canvas.height; // Get canvas size

    // set the size and position of the cubes
    var R = height / 5;         // size of cubes
    var centerX = width / 2;    // center of cubes in the X direction
    var top = R;                // top    cube's top edge Y location
    var bottom = R * 3;         // bottom cube's top edge Y location

    // Change the cubes' angle by one video frame's worth, at a rate of ~15 RPM.
    // Initially the top cube rotates clockwise; the bottom one counterclockwise.
    deg -= step;
    if (deg < 45) {
        deg = 132;
    } else if (deg > 132) {
```

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        deg = 45;
    }

    // X offsets for cubes' faces
    var dX = R*3.0/4 * sinDeg(deg);
    var cX = R*3.0/4 * cosDeg(deg);

    // colors for the cubes' faces
    var blue1 = Math.floor(255 * (0.3+0.7*cosDeg(deg-30)));
    var blue2 = Math.floor(255 * (0.6+0.4*sinDeg(deg-30)));

    // draw the cubes
    context.fillStyle = 'rgb(0, 0, ' + blue1 + ')';
    context.fillRect(centerX-dX, top,    dX+cX, R); // top cube, left face
    context.fillRect(centerX-cX, bottom, dX+cX, R); // bottom cube, right face

    context.fillStyle = 'rgb(0, 0, ' + blue2 + ')';
    context.fillRect(centerX-dX, bottom, dX-cX, R); // bottom cube, left face
    context.fillRect(centerX+cX, top,    dX-cX, R); // top cube, right face
};


// Start after the document loads.
window.onload = function() {
    var canvas = document.getElementById('canvasID'); // Get the <canvas> tag
    canvas.width = canvas.width // required with Internet Explorer to see the error message below
    // Does this browser support graphics in a <canvas> element?
    if (canvas.getContext)  {
        Start();
    } else {
        document.write('<h2>Your browser does not support the canvas tag. Too bad.</h2>' );
    }
};


function Start() {
    if (!rotate) {
        t = setInterval('doVideoFrame()', 33)   // milliseconds (30 frames/second)
        rotate = true;
    }
};


function Stop() {
    rotate = false;
    clearInterval(t);
};


function SingleStep() {
    rotate = false;
    clearInterval(t);
    doVideoFrame();
};


function ReverseRotation() {
    step = -step;
}
```

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</script>
</head>
<body style="background-color: #eee1d1">
```

```
<noscript><h2>To view this page you must enable JavaScript in your web browser. </h2></noscript>
<a href="http://RonCharlton.org"><span style="font-size: x-large; color: blue;" >Home</span></a>
<div style="text-align: center">
<h1>3D Rotating Cubes</h1>
<canvas id="canvasID" width="400" height="400"></canvas>
</div>
<div style="text-align: center">
<button onclick="Stop();">Stop</button>
<button onclick="Start();">Start</button>
<button onclick="SingleStep();">Single Step</button>
<button onclick="ReverseRotation();">Reverse Rotation</button>
</div>
</body>
</html>
```