**Die canvas-Uhr**

Wir „bauen“ uns eine **Analoguhr** mit HTML **canvas**.

**Part I - Create the Canvas**

The clock needs an **HTML container**. Create an **HTML canvas**:

**HTML code:**

<!DOCTYPE html>

<html>

 <body>

 <canvas id="canvas" width="400" height="400"

 style="background-color:#333">

 </canvas>

 <script>

 var canvas = document.getElementById("canvas");

 var ctx = canvas.getContext("2d");

 var radius = canvas.height / 2;

 ctx.translate(radius, radius);

 radius = radius \* 0.90

 drawClock();

 **function drawClock()**

 {

 ctx.arc(0, 0, radius, 0 , 2 \* Math.PI);

 ctx.fillStyle = "white";

 ctx.fill();

 }

 </script>

 </body>

</html>

**Ich erkläre den Code:**

Add an HTML **<canvas>** element to your page:

<canvas id="canvas" width="400" height="400" style="background-color:#333"></canvas>

Create a canvas object (**var canvas**) from the HTML canvas element:

var canvas = document.getElementById("canvas");

Create a **2d drawing object** (**var ctx**) for the **canvas** object:

var ctx = canvas.getContext("2d");

Calculate the clock **radius**, using the **height** of the **canvas**:

var radius = canvas.height / 2;

Using the **canvas height** to calculate the clock **radius**, makes the clock work for all canvas sizes.

Remap the **(0,0)** position (of the drawing object) to the center of the canvas:

ctx.translate(radius, radius);

Reduce the clock **radius** (to **90%**) to draw the clock well inside the canvas:

radius = radius \* 0.90;

Create a function to draw the clock:

**function drawClock()**

{

 ctx.arc(0, 0, radius, 0 , 2 \* Math.PI);

 ctx.fillStyle = "white";

 ctx.fill();

}

**Part II - Draw a Clock Face**

The clock needs a clock face. Create a JavaScript function to draw a clock face:

**JavaScript:**

**function drawClock()**

{

 **drawFace(ctx, radius);**

}

**function drawFace(ctx, radius)**

{

 var grad;

 ctx.beginPath();

 ctx.arc(0, 0, radius, 0, 2 \* Math.PI);

 ctx.fillStyle = 'white';

 ctx.fill();

 grad = ctx.createRadialGradient(0, 0 ,radius \* 0.95, 0, 0, radius \* 1.05);

 grad.addColorStop(0, '#333');

 grad.addColorStop(0.5, 'white');

 grad.addColorStop(1, '#333');

 ctx.strokeStyle = grad;

 ctx.lineWidth = radius \* 0.1;

 ctx.stroke();

 ctx.beginPath();

 ctx.arc(0, 0, radius \* 0.1, 0, 2 \* Math.PI);

 ctx.fillStyle = '#333';

 ctx.fill();

}

**Ich erkläre den Code:**

Create a **drawFace()** function for **drawing the clock face**:

**function drawClock()**

{

 **drawFace(ctx, radius);**
}

**function drawFace(ctx, radius)**

{

}

Draw the **white circle**:

ctx.beginPath();

ctx.arc(0, 0, radius, 0, 2 \* Math.PI);

ctx.fillStyle = 'white';

ctx.fill();

Create a **radial gradient** (**95%** and **105%** of original clock radius):

grad = ctx.createRadialGradient(0, 0, radius \* 0.95, 0, 0, radius \* 1.05);

Create **3 color stops**, corresponding with the inner, middle, and outer edge of the arc:

grad.addColorStop(0, '#333');

grad.addColorStop(0.5, 'white');

grad.addColorStop(1, '#333');

The color stops create a **3D** effect.

Define the gradient as the **stroke style** of the drawing object:

ctx.strokeStyle = grad;

Define the **line width** of the drawing object (**10%** of radius):

ctx.lineWidth = radius \* 0.1;

Draw the **circle**:

ctx.stroke();

Draw the **clock center**:

ctx.beginPath();

ctx.arc(0, 0, radius \* 0.1, 0, 2 \* Math.PI);

ctx.fillStyle = '#333';

ctx.fill();

**Part III - Draw Clock Numbers**

The clock needs **numbers**. Create a JavaScript **function to draw clock numbers**:

**JavaScript:**

**function drawClock()**

{

 drawFace(ctx, radius);

 **drawNumbers(ctx, radius);**

}

**function drawNumbers(ctx, radius)**

{

 var ang;

 var num;

 ctx.font = radius \* 0.15 + "px arial";

 ctx.textBaseline = "middle";

 ctx.textAlign = "center";

 for (num = 1;num < 13;num++)

 {

 ang = num \* Math.PI / 6;

 ctx.rotate(ang);

 ctx.translate(0, -radius \* 0.85);

 ctx.rotate(-ang);

 ctx.fillText(num.toString(), 0, 0);

 ctx.rotate(ang);

 ctx.translate(0, radius \* 0.85);

 ctx.rotate(-ang);

 }

}

**Ich erkläre das Beispiel:**

Set the font size (of the drawing object) to 15% of the radius:

ctx.font = radius \* 0.15 + "px arial";

Set the text alignment to the middle and the center of the print position:

ctx.textBaseline = "middle";

ctx.textAlign = "center";

Calculate the print position (for 12 numbers) to 85% of the radius, rotated (PI/6) for each number:

for (num = 1;num < 13;num++)

{

 ang = num \* Math.PI / 6;

 ctx.rotate(ang);

 ctx.translate(0, -radius \* 0.85);

 ctx.rotate(-ang);

 ctx.fillText(num.toString(), 0, 0);

 ctx.rotate(ang);

 ctx.translate(0, radius \* 0.85);

 ctx.rotate(-ang);

}

**Part IV - Draw Clock Hands**

Die Uhr benötigt Zeiger. Erstelle eine **JavaScript Funktion** zum **Zeichnen von Zeigern**.

**JavaScript:**

**function drawClock()**

{

 drawFace(ctx, radius);

 drawNumbers(ctx, radius);

 **drawTime(ctx, radius);**

}

**function drawTime(ctx, radius)**

{

 var now = new Date();

 var hour = now.getHours();

 var minute = now.getMinutes();

 var second = now.getSeconds();

 **// hour**

 hour = hour % 12;

 hour = (hour \* Math.PI / 6) +

 (minute \* Math.PI / ( 6 \* 60)) +

 (second \* Math.PI / (360 \* 60));

 drawHand(ctx, hour, radius\*0.5, radius \* 0.07);

 **// minute**

 minute = (minute \* Math.PI / 30) +

 (second \* Math.PI / (30 \* 60));

 drawHand(ctx, minute, radius \* 0.8, radius \* 0.07);

 **// second**

 second = (second\*Math.PI / 30);

 drawHand(ctx, second, radius \* 0.9, radius \* 0.02);

}

**function drawHand(ctx, pos, length, width)**

{

 ctx.beginPath();

 ctx.lineWidth = width;

 ctx.lineCap = "round";

 ctx.moveTo(0,0);

 ctx.rotate(pos);

 ctx.lineTo(0, -length);

 ctx.stroke();

 ctx.rotate(-pos);

}

**Ich erkläre das Beispiel:**

Use **Date** to get **hour**, **minute**, **second**:

var now = new Date();
var hour = now.getHours();
var minute = now.getMinutes();
var second = now.getSeconds();

Calculate the **angle** of the **hour** hand, and draw it a **length** (**50%** of **radius**),

and a **width** (**7%** of **radius**):

hour = hour%12;
hour = (hour\*Math.PI/6)+(minute\*Math.PI/(6\*60))+(second\*Math.PI/(360\*60));
drawHand(ctx, hour, radius\*0.5, radius\*0.07);

Use the same technique for minutes and seconds.

The **drawHand()** routine does not need an explanation. It just draws a line with a given length and width.

**Part V - Start the Clock**

To start the clock, call the **drawClock** function at intervals:



**JavaScript:**

var canvas = document.getElementById("canvas");
var ctx = canvas.getContext("2d");

var radius = canvas.height / 2;

ctx.translate(radius, radius);

radius = radius \* 0.90

**// drawClock();**

setInterval(drawClock, 1000);

**Ich erkläre das Beispiel:**

The only thing you have to do (to start the clock) is to call the **drawClock** function at **intervals**.

Substitute:

drawClock();

With:

setInterval(drawClock, 1000);

The interval is in milliseconds. drawClock will be called for each 1000 milliseconds.

**Der komplette Code:**

<!DOCTYPE html>

<html>

 <body>

 <canvas id="canvas" width="400" height="400" style="background-color:#333"></canvas>

 <script>

 var canvas = document.getElementById("canvas");

 var ctx = canvas.getContext("2d");

 var radius = canvas.height / 2;

 ctx.translate(radius, radius);

 radius = radius \* 0.90

 setInterval(drawClock, 1000);

 **function drawClock()**

 {

 drawFace(ctx, radius);

 drawNumbers(ctx, radius);

 drawTime(ctx, radius);

 }

 **function drawFace(ctx, radius)**

 {

 var grad;

 ctx.beginPath();

 ctx.arc(0, 0, radius, 0, 2\*Math.PI);

 ctx.fillStyle = 'white';

 ctx.fill();

 grad = ctx.createRadialGradient(0,0,radius\*0.95, 0,0,radius\*1.05);

 grad.addColorStop(0, '#333');

 grad.addColorStop(0.5, 'white');

 grad.addColorStop(1, '#333');

 ctx.strokeStyle = grad;

 ctx.lineWidth = radius\*0.1;

 ctx.stroke();

 ctx.beginPath();

 ctx.arc(0, 0, radius\*0.1, 0, 2\*Math.PI);

 ctx.fillStyle = '#333';

 ctx.fill();

 }

 **function drawNumbers(ctx, radius)**

 {

 var ang;

 var num;

 ctx.font = radius \* 0.15 + "px arial";

 ctx.textBaseline = "middle";

 ctx.textAlign = "center";

 for (num = 1;num < 13;num++)

 {

 ang = num \* Math.PI / 6;

 ctx.rotate(ang);

 ctx.translate(0, -radius \* 0.85);

 ctx.rotate(-ang);

 ctx.fillText(num.toString(), 0, 0);

 ctx.rotate(ang);

 ctx.translate(0, radius \* 0.85);

 ctx.rotate(-ang);

 }

 }

 **function drawTime(ctx, radius)**

 {

 var now = new Date();

 var hour = now.getHours();

 var minute = now.getMinutes();

 var second = now.getSeconds();



 **// hour**

 Hour = hour % 12;

 hour = (hour \* Math.PI / 6) +

 (minute \* Math.PI / ( 6 \* 60)) +

 (second \* Math.PI / (360 \* 60));

 drawHand(ctx, hour, radius \* 0.5, radius \* 0.07);

 **// minute**

 minute=(minute \* Math.PI / 30) + (second\*Math.PI / (30 \* 60));

 drawHand(ctx, minute, radius \* 0.8, radius \* 0.07);

 **// second**

 second=(second\*Math.PI / 30);

 drawHand(ctx, second, radius \* 0.9, radius \* 0.02);

 }

 **function drawHand(ctx, pos, length, width)**

 {

 ctx.beginPath();

 ctx.lineWidth = width;

 ctx.lineCap = "round";

 ctx.moveTo(0,0);

 ctx.rotate(pos);

 ctx.lineTo(0, -length);

 ctx.stroke();

 ctx.rotate(-pos);

 }

 </script>

 </body>

</html>