Texturing the 3D Cube in WebGL

We continue with the interactive cube example and add a texture to the cube.

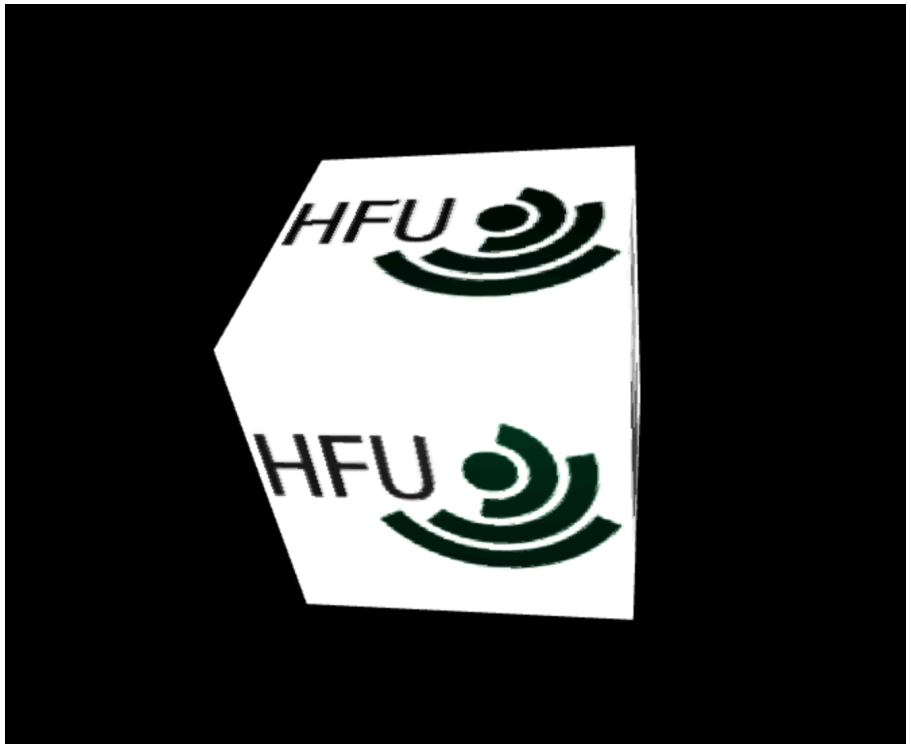
Explanation

👀 means that the code is already in the repository and you just need to look at it.
📋 means you can copy-paste the code and it should work.
📝 means that you need to create a new file
⭕ indicates that you need to do more than just copy-paste the code.
❌ indicates that you need to replace the old code with something new.

In any case you need to understand what you are doing.

Geometry

We now need texture coordinates to map the texture onto the cube.



Texture coordinates on the cube

👀 The new cube class from `utils.zip` contains a method that defines the texture coordinates.

```
generateTexcoords() {
    const texcoords = [];
    // front face
    let numFaces = 6; // Each face has 4 vertices
    for (let i = 0; i < numFaces; i++) {
        texcoords.push(...[0, 0]);
        texcoords.push(...[0, 1]);
        texcoords.push(...[1, 1]);
        texcoords.push(...[1, 0]);
    }
    return texcoords;
}
```

Get texture coordinates to the vertex shader

📋 We update the vertex shader code and add the textures as attribute and as output.

```
in vec2 aTexcoord;
// a varying to pass the texture coordinates to the fragment shader
out vec2 vTexcoord;

void main() {
    ...
    // Pass the texcoord to the fragment shader.
    vTexcoord = aTexcoord;
}
```

Retrieve the texture coordinates in the fragment shader

📋 We need to retrieve the texture coordinates in the fragment shader.

```
in vec2 vTexcoord;
uniform sampler2D uTexture;
void main() {
    ...
    // Sample the texture using the texture coordinates
    outColor = texture(uTexture, vTexcoord);
}
```

Connect the texture coordinates to the vertex shader

📋 In the script we read the texture coordinates into a buffer:

```
const texcoordBuffer = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, texcoordBuffer);
gl.bufferData(gl.ARRAY_BUFFER, new Float32Array(cube.texcoords), gl.STATIC_DRAW);
```

⭕ Use `connectShaderAttributes` to connect this buffer to the vertex shader.

Create a texture

⭕ Insert these code lines at the right positions.

```
// Create a texture.
let texture = gl.createTexture();
gl.bindTexture(gl.TEXTURE_2D, texture);

// Fill the texture with a 1x1 blue pixel.
gl.texImage2D(gl.TEXTURE_2D, 0, gl.RGBA, 1, 1, 0, gl.RGBA, gl.UNSIGNED_BYTE,
    new Uint8Array([0, 0, 255, 255]));

// Asynchronously load an image
let image = new Image();
image.src = "./resources/logo-hfu.png";
image.addEventListener('load', function () {
    // Now that the image has loaded, copy it to the texture.
    gl.bindTexture(gl.TEXTURE_2D, texture);
    gl.texImage2D(gl.TEXTURE_2D, 0, gl.RGBA, gl.RGBA, gl.UNSIGNED_BYTE, image);
    gl.generateMipmap(gl.TEXTURE_2D);
});
```

Result: Textured Cube

You should be able to see a textured cube and also change the texture by loading a different image.