GRAPHICS SYSTEMS AND INTERACTION

Lesson 1

Abstract

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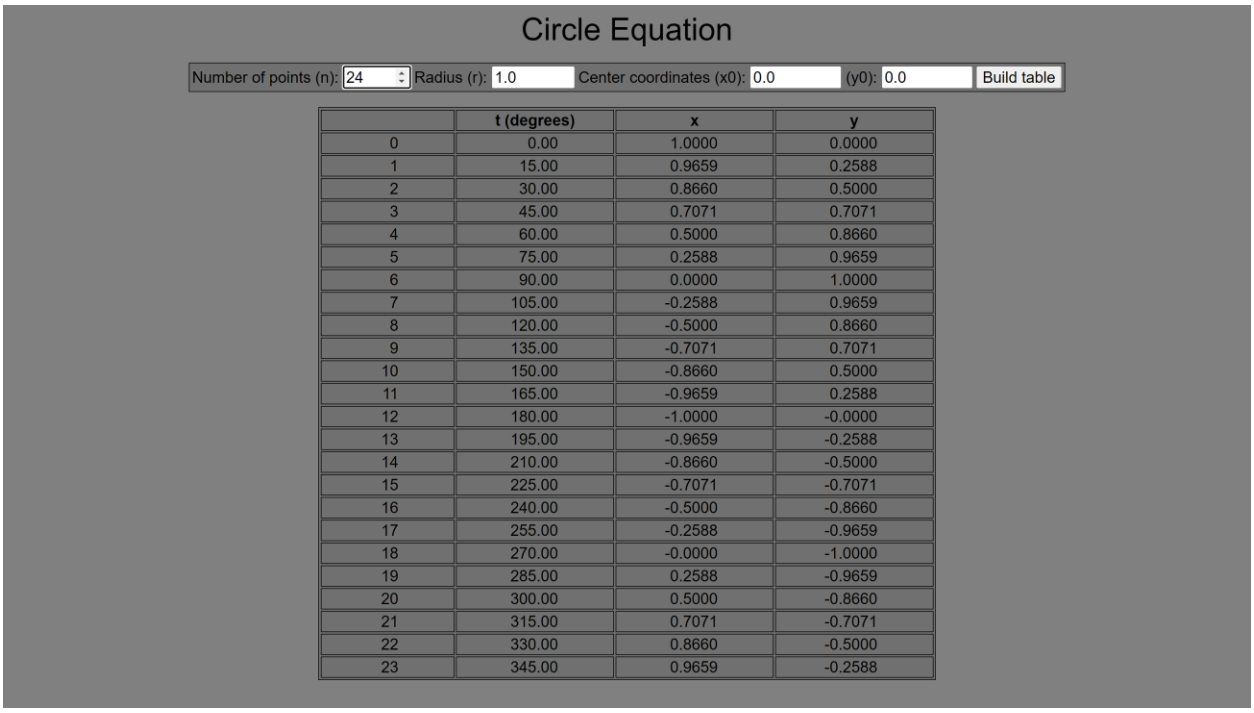
Project “Circle Equation”

The aim of this project is to create a small HTML [1] / CSS [2] / JavaScript [3] program that lets you exercise the parametric form of the circle equation (Figure 1).



	t (degrees)	x	y
0	0.00	1.0000	0.0000
1	15.00	0.9659	0.2588
2	30.00	0.8660	0.5000
3	45.00	0.7071	0.7071
4	60.00	0.5000	0.8660
5	75.00	0.2588	0.9659
6	90.00	0.0000	1.0000
7	105.00	-0.2588	0.9659
8	120.00	-0.5000	0.8660
9	135.00	-0.7071	0.7071
10	150.00	-0.8660	0.5000
11	165.00	-0.9659	0.2588
12	180.00	-1.0000	-0.0000
13	195.00	-0.9659	-0.2588
14	210.00	-0.8660	-0.5000
15	225.00	-0.7071	-0.7071
16	240.00	-0.5000	-0.8660
17	255.00	-0.2588	-0.9659
18	270.00	-0.0000	-1.0000
19	285.00	0.2588	-0.9659
20	300.00	0.5000	-0.8660
21	315.00	0.7071	-0.7071
22	330.00	0.8660	-0.5000
23	345.00	0.9659	-0.2588

Figure 1 – Project “Circle Equation”

Download the folder “Circle_Equation_template”. The project is composed by one single file:

- “Circle_Equation_template.html”

Two tables are to be displayed: the data input table and the results output table.

The data input table has already been created and allows the user to choose the following parameters:

- The desired number of points equally distributed along a circle (n)
- The circle’s radius (r)
- The circle’s center coordinates (x_0 and y_0)

The results output table, to be populated when the user clicks the button “Build table” or presses the “Enter” key, comprises four columns and lists the following figures:

- The order number of each point (0, 1, 2, etc.)
- The corresponding angle in degrees (t)
- The point’s coordinates (x and y)

Your assignment is to set and validate circle parameters and create the results output table.

To-do #1 – Set and validate circle parameters *r*, x_0 and y_0

Open the file "Circle_Equation_template.html" and look for comment "To-do #1". Follow the example of setting and validating parameter *n*.

To-do #2 – Set the values of the starting angle and angle increment (in radians)

Look for comment "To-do #2" and follow the instructions.

To-do #3 – Set the for () loop parameters

Look for comment "To-do #3" and follow the instructions.

To-do #4 – Compute the values of point coordinates *x* and *y*

Use the parametric form of the circle equation to compute the points coordinates (Figure 2 and Equation 1) [4].

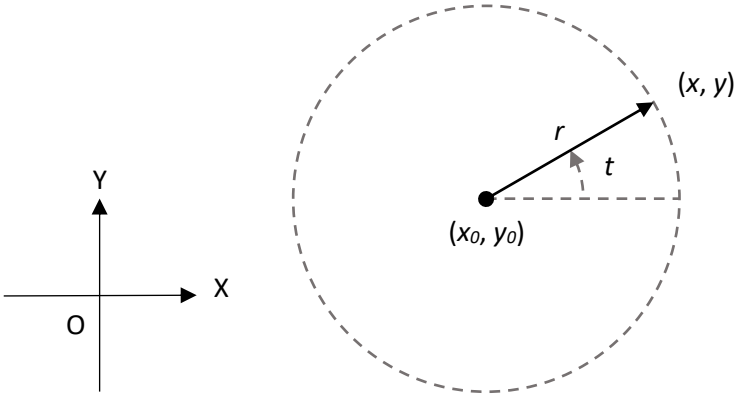


Figure 2 – A generic circle

$$\begin{cases} x = r * \cos(t) + x_0 \\ y = r * \sin(t) + y_0 \end{cases}$$

Equation 1 – Parametric form of the circle equation

Where:

- (*x*, *y*) are the point coordinates
- (x_0, y_0) are the center coordinates
- *r* is the radius
- *t* is a parametric variable in the range $0.0 \leq t < 2.0 * \pi$ (pi)

Don't forget that angles must be expressed in radians (180.0 degrees = π radians).

Look for comment "To-do #4" and follow the instructions.

To-do #5 – Add the value of *i* to the newly created cell contents

Look for comment "To-do #5" and follow the instructions.

To-do #6 – Add the value of *angle* (in degrees) to the newly created cell contents

Look for comment "To-do #6" and follow the instructions.

To-do #7 – Add the value of point coordinate *x* to the newly created cell contents

Look for comment “To-do #7” and follow the instructions.

To-do #8 – Add the value of point coordinate *y* to the newly created cell contents

Look for comment “To-do #8” and follow the instructions.

To-do #9 – Update the value of *angle*

Look for comment “To-do #9” and follow the instructions.

Installation and tests

To install Three.js [5] and Lodash [6] open the presentation file "Installation.pdf" and follow the instructions. When testing the installation you should see:

- A textured spinning cube (Figure 3)

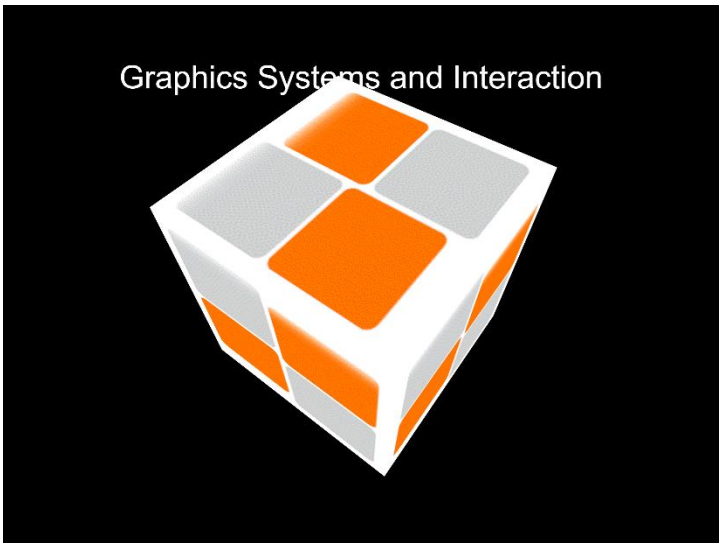


Figure 3 – Test "Cube"

- A video-textured spinning cube with audio (Figure 4)

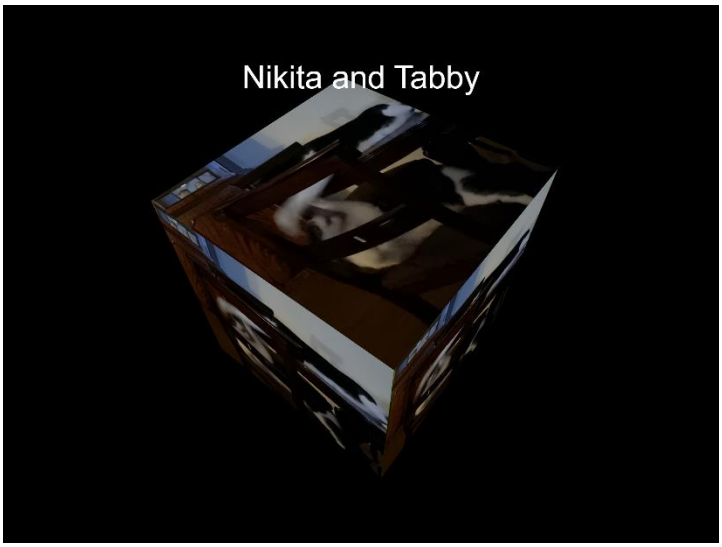


Figure 4 – Test "Cube – NT"

Creating a scene

Carefully read this section [7] of the manual. It gives you a brief introduction to Three.js.

References

[1] Wikipedia, "HTML," [Online]. Available: https://en.wikipedia.org/wiki/HTML. [Accessed 05 August 2021].

[2] Wikipedia, "CSS," [Online]. Available: https://en.wikipedia.org/wiki/CSS. [Accessed 05 August 2021].

[3] Wikipedia, "JavaScript," [Online]. Available: https://en.wikipedia.org/wiki/JavaScript. [Accessed 05 August 2021].

[4] Wikipedia, "Circle," [Online]. Available: https://en.wikipedia.org/wiki/Circle. [Accessed 25 July 2021].

[5] Three.js, "Three.js – JavaScript 3D Libray," [Online]. Available: https://threejs.org. [Accessed 25 July 2021].

[6] Lodash, "Lodash," [Online]. Available: https://lodash.com/. [Accessed 02 03 2024].

[7] Three.js, "Creating a scene," [Online]. Available: https://threejs.org/docs/index.html#manual/en/introduction/Creating-a-scene. [Accessed 25 July 2021].