

# Coding Physics

Physics is all about vectors, integrals, and functions:

$$\hat{r} = (x, y, z)$$

$$\int_a^b \{...\} dx$$

$$F(\hat{r}) = \sin(|r|)$$

Computer code is all about variables, loops, and functions:

*vec3 r = vec3(x, y, z);*

*for (int i = a; i <= b; i++) { ... }*

*float F (vec3 r) { return sin(length(r)); }*

A wave source can be modeled as a sine wave:

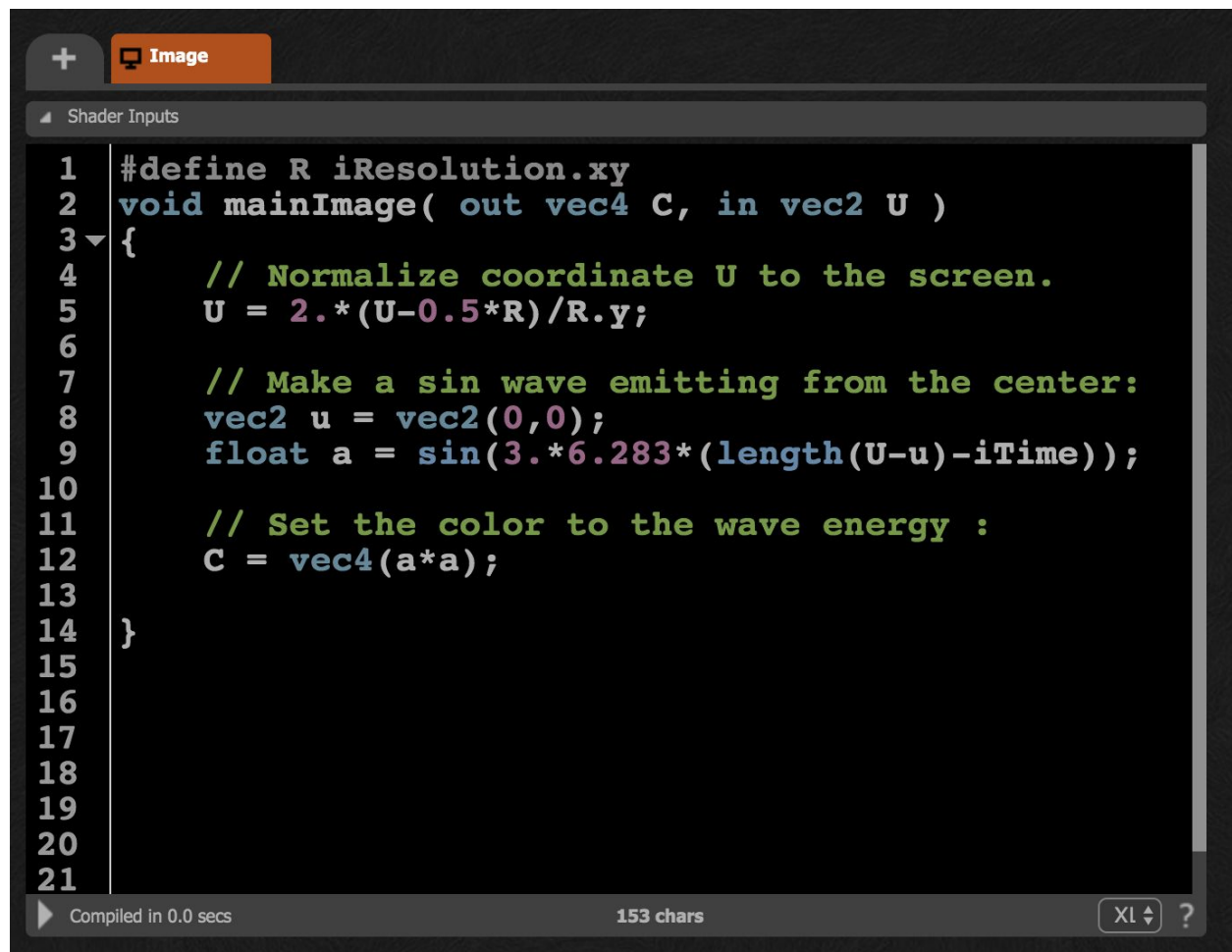
$$a = \sin(2\pi (|r| - t))$$

This is how one could code a visualization of a wave:

*C* is the color output

*U* is the coordinate input

*R* is defined as the resolution of the screen

A screenshot of a shader editor interface. At the top, there's a tab labeled 'Image' with a monitor icon. Below it, a 'Shader Inputs' panel is visible. The main area contains GLSL code for a fragment shader. The code defines a resolution variable 'R' as 'iResolution.xy', then defines a 'mainImage' function that takes an output vector 'C' and an input vector 'U'. Inside the function, it normalizes the coordinate 'U' to the screen, creates a center point 'u' at (0,0), calculates a sine wave value 'a' based on the distance from 'u' and time, and finally sets the color 'C' to the wave energy 'a\*a'. The code is numbered from 1 to 21 on the left. At the bottom, a status bar shows 'Compiled in 0.0 secs', '153 chars', and a zoom level of 'XL' with a help icon.

```
1  #define R iResolution.xy
2  void mainImage( out vec4 C, in vec2 U )
3  {
4      // Normalize coordinate U to the screen.
5      U = 2.*(U-0.5*R)/R.y;
6
7      // Make a sin wave emitting from the center:
8      vec2 u = vec2(0,0);
9      float a = sin(3.*6.283*(length(U-u)-iTime));
10
11     // Set the color to the wave energy :
12     C = vec4(a*a);
13
14 }
15
16
17
18
19
20
21
```

Compiled in 0.0 secs      153 chars      XL ?

Use all the information provided to **integrate** a vertical line of sources using a **for loop** to sum radial sine waves.

This will model a wave front passing through a single slit.

(Make sure that the space between sources is sufficiently small.)