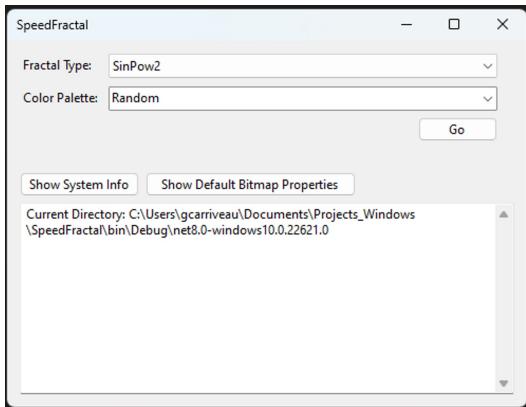


# SpeedFractal Manual

Sunday, August 11, 2024 3:00 PM

## SpeedFractal

SpeedFractal is a program that can be used to generate several unusual fractals and their Julia sets. There is also an algorithm included which modifies the Julia set results to make them look more interesting, sometimes showing what looks like a fractal overlaying many circles. This interesting effect, which I call the Carriveau algorithm, is achieved in part by taking the Sin of the minimum real or imaginary value of the Julia set.



### Part 1 - Getting Started

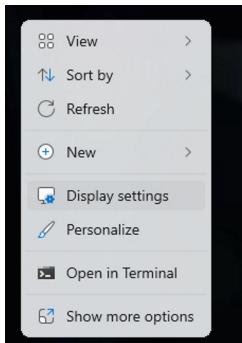
Select a Fractal Type and a Color Palette and press the "Go" button. Each fractal type corresponds to a different mathematical formula for calculating a fractal.

The "Show System Info" button will append your *Primary* screen's dimensions - (width and height).

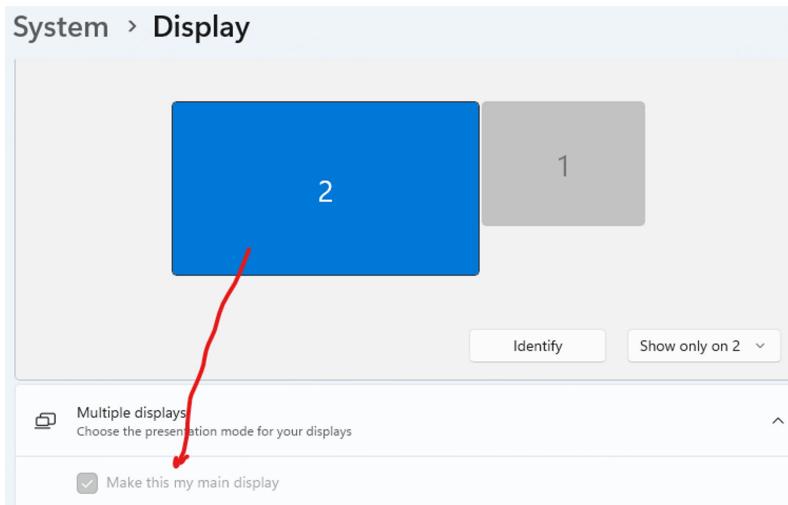
The fractals are generated full-screen so that screenshots of your fractals can be used as desktop background images.

If you are using a laptop computer and want to run SpeedFractal on an external display, make sure you set that display as the primary display.

You do this by right clicking your computer's desktop background and selecting "Display settings".

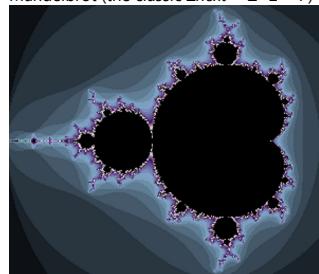


Select your external display and mark the checkbox  *Make this my main display*

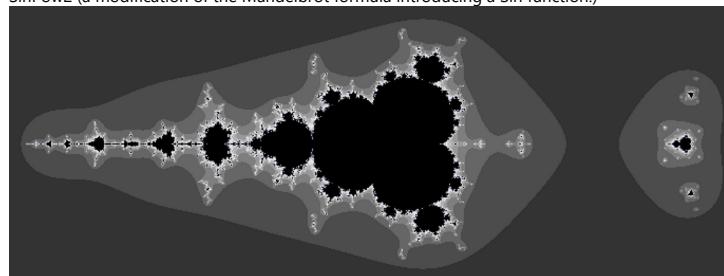


Here is what each of the fractals look like when generated.

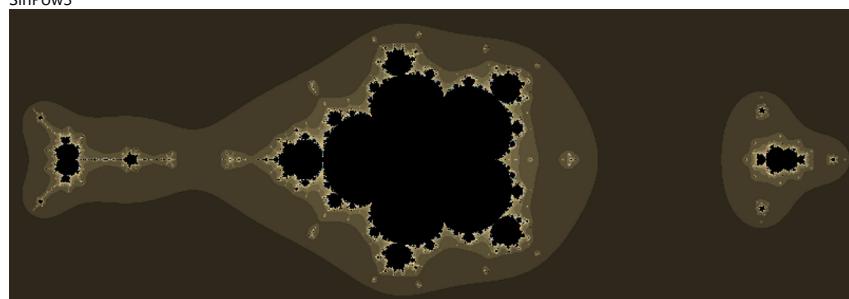
Mandelbrot (the classic  $Z_{next} = Z^2 + P$ )



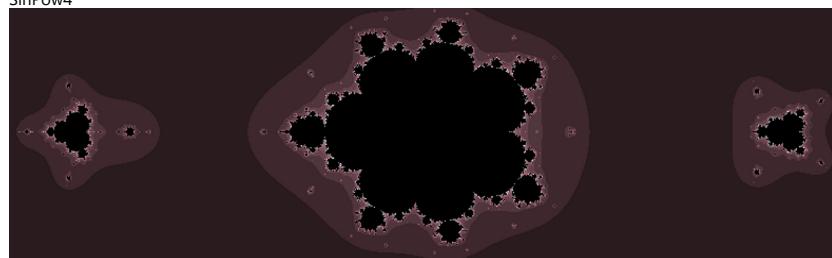
SinPow2 (a modification of the Mandelbrot formula introducing a Sin function.)



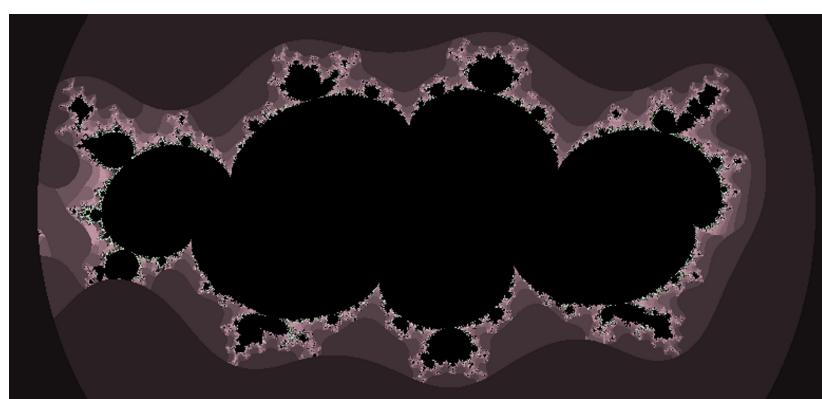
SinPow3



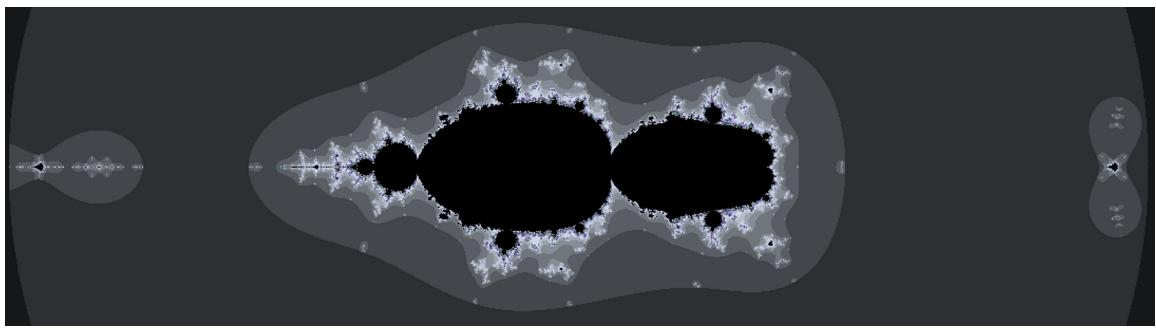
SinPow4



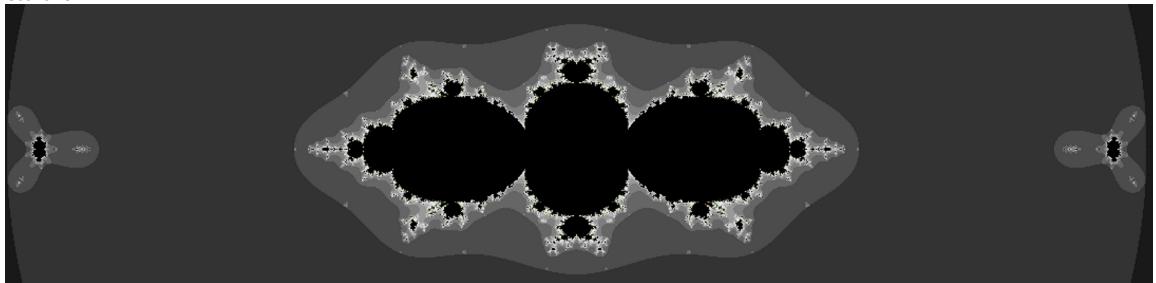
SinPow2Div1



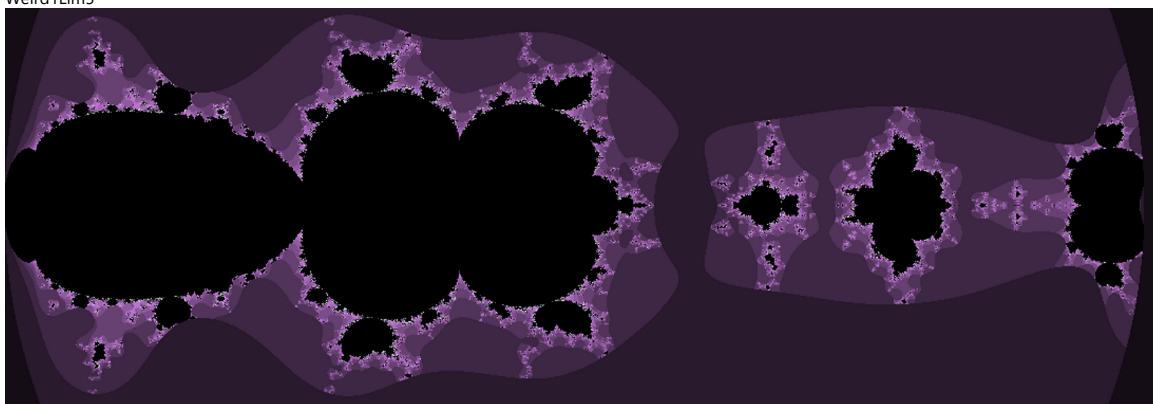
CosPow2



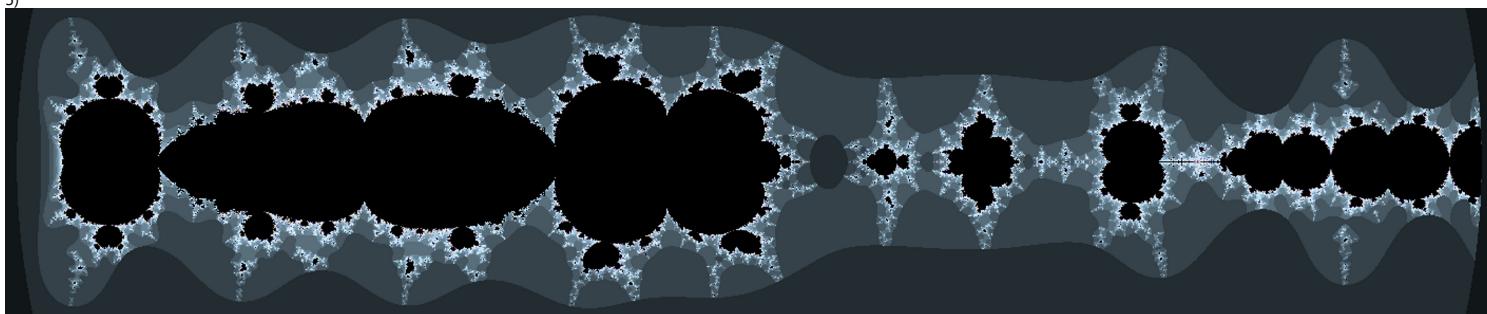
CosPow3



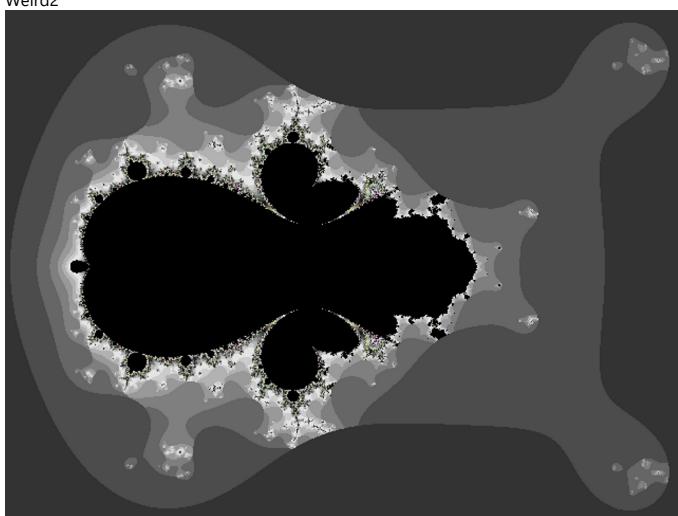
Weird1Lim5



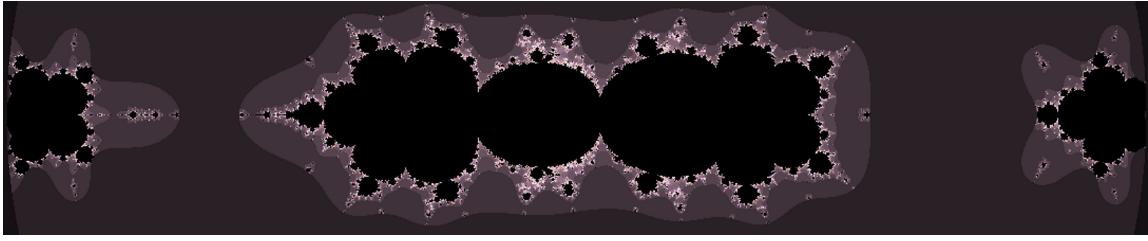
Weird1Lim9 (same formula as above, but setting the escape threshold to 9 instead of 5)



Weird2



### Weird3



#### Part 2 - How to Navigate

**Zoom in:** Click your **mouse** pointer on the center of the area of the fractal that you would like to see more closely.

**Zoom out:** Press the **E** key.

**Exit:** Pressing the **ESC** key will return to display the main fractal if you are viewing a Julia set or Carriaveau set. If you are viewing the main fractal, it will close the display and return to the main SpeedFractal criteria form.

**Scrolling:** Scroll UP/DOWN/LEFT/RIGHT by using the **arrow keys**.

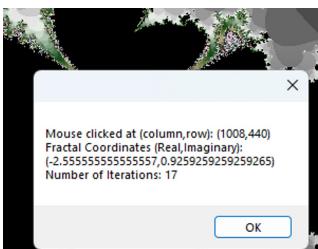
**Random Color Palette:** Press the **R** key to show the fractal using a new randomly selected set of colors.

**View the Julia Set:** You can view the Julia set corresponding to a point on the main fractal with a **SHIFT-Click** of the mouse.

**View the Carriveau Set:** You can view the Carriveau set corresponding to a point on the main fractal with an **ALT-Click** of the mouse. The Carriveau set is a modification of the Julia set of at a selected point.

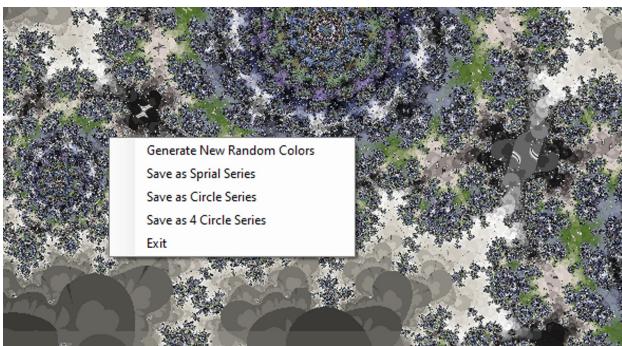
**Smooth Edges:** Press the **S** key (*may require more than one press*) to apply a home rolled smoothing algorithm that smooths the edges of areas with different colors.

**Show Pixel Info:** Using the mouse, **CTRL-Click** on a pixel of the fractal to show a dialog window with information including the screen (x,y) coordinates, corresponding (real,imaginary) fractal coordinates, and the number of iterations performed before reaching the escape threshold.



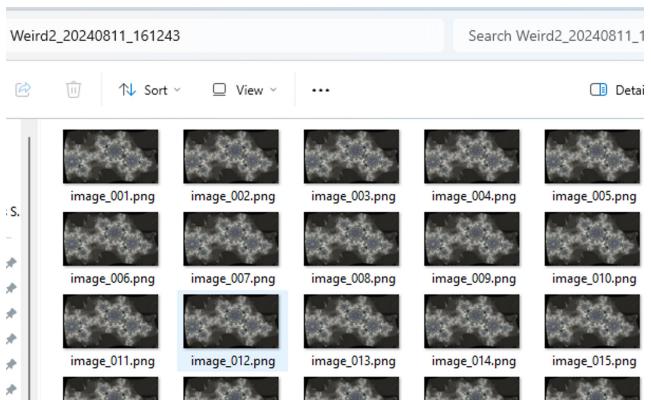
#### Part 3 - The Fractal Display Form Context Menu

To display the context menu, **RIGHT-Click** anywhere on the fractal.



The context menu **Save as...** options allow you to export a series of **720 PNG files** of Julia sets or Carriveau sets following a path around a spiral, circle, or 4 circles centered around the last place you clicked on the main fractal. The radius of the 360 degree spiral or circle depends upon the average difference, in fractal space, between two pixels on the main fractal and two pixels on the Julia or Carriveau set. These distances correspond to the current zoom level.

A new subfolder is created in the folder where you are executing the SpeedFractal.exe program. It is named after the fractal algorithm and the date and time that the export was started. A series of image files will be generated under this folder named image\_001.png through image\_720.png.



Important Note: As of this writing, there is currently no notification when the generation of the image files is complete.

If you opened File Explorer before running the fractal, you can ALT-TAB to switch from the fractal display form to the File Explorer form so that you can look and see whether SpeedFractal is still generating images under the new folder that was created.

To **CANCEL** the export at any time, press the **C** key while viewing the fractal display form.

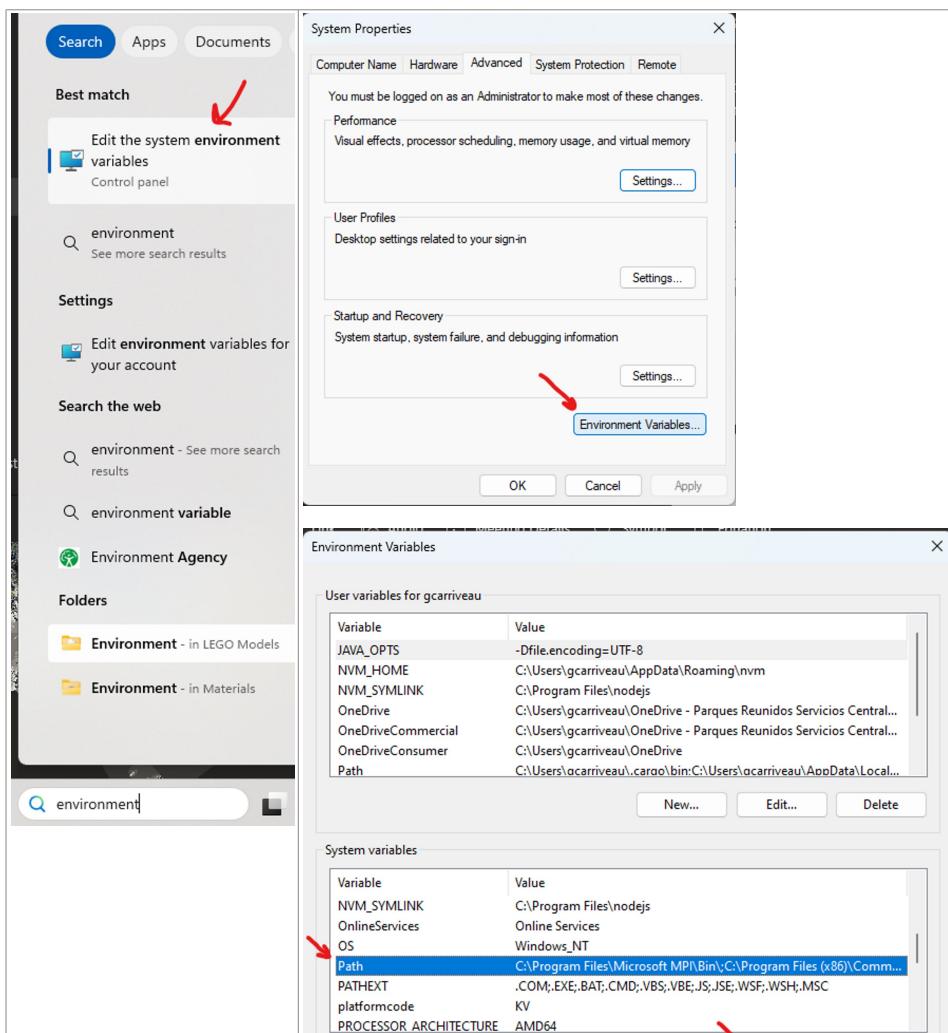
#### Part 4 - How to make a Movie

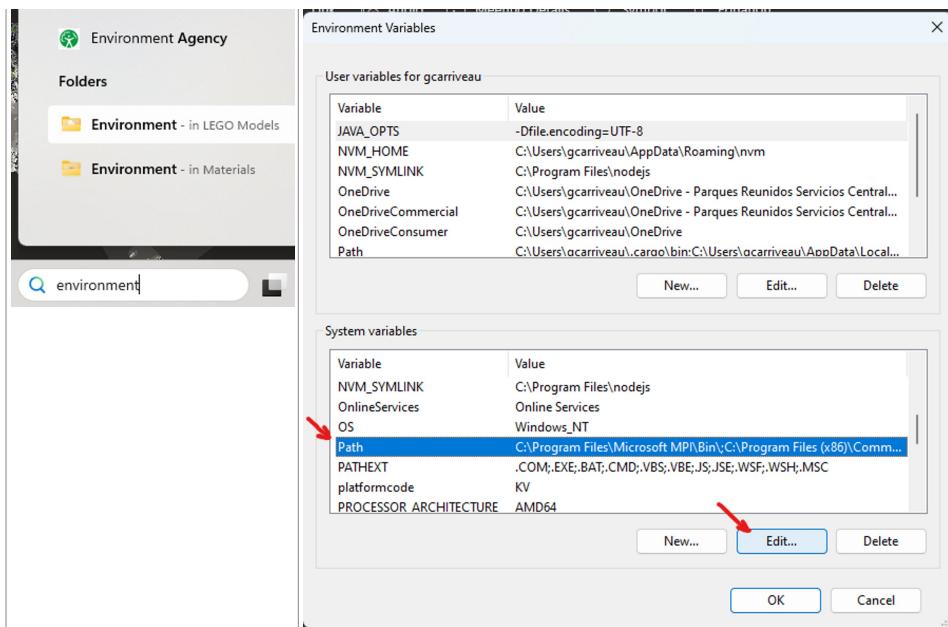
I use **ffmpeg** to create video sequences from the 720 .png image files.

You can obtain a Windows binary build of ffmpeg.exe from links found on [ffmpeg.org](https://www.gyan.dev/ffmpeg/builds/). One place where a Windows 64-bit version of the ffmpeg.exe command line program can be downloaded is at <https://www.gyan.dev/ffmpeg/builds/>

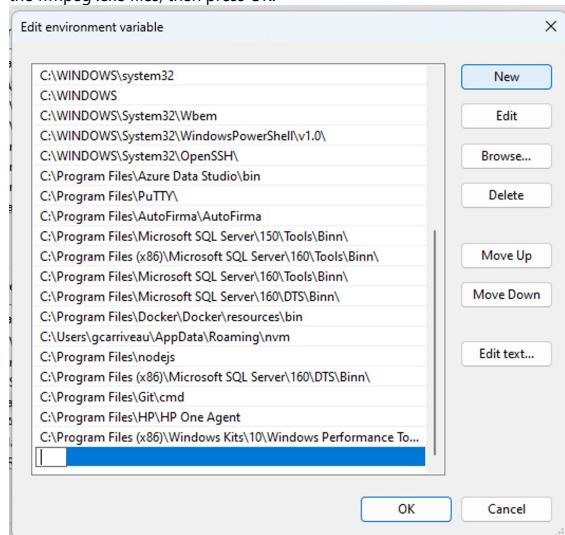
After downloading the **.7z** file and unzipping the files of the build using **7-zip**, place the contents of the **/bin** folder in a folder which is added to your PATH Windows system environment variable. For example, the **C:\Windows\** folder.

If you decided to save the ffmpeg.exe files to a different folder, you can add the path to that folder to the PATH system environment variable as follows:





Press the "New" button and enter the path C:\...<etc.> to the folder where you put the ffmpeg.exe files, then press OK.



Now that you have that done, you can execute the ffmpeg command from any folder.

Open the folder where your fractal images were exported in a Powershell or Command line terminal.

To compile the PNG files into a relatively small, but low quality .avi movie file you can use this command:

```
ffmpeg -framerate 10 -i 'image_1_%03d.png' out.avi
```

For better quality, but bigger .webm movie file you can use this command.  
(Increasing crf decreases video size):

```
ffmpeg -framerate = 10 -i 'image_%03d.png' -c:v libvpx-vp9 -crf 15 -b:v 0 out.webm
```

Documentation can be found here:

<https://ffmpeg.org/ffmpeg-all.html#image2-1>

I've uploaded a number of interesting video sequences to YouTube. To find them, you can google the term "Calcmaster Fractal".