# Fractals

The second minor project is the generation of a fractal following the chaos game and algorithm describe in the research paper "The Fractal Flame Algorithm" From Scott Draves and Erik Reckase.

First, we have a set of linear or no linear function which applies a simple transformation on a point. For each function, we defined also six parameters $a_x$, $b_x$, $c_x$ and $a_y$, $b_y$, $c_y$ and a probability value. Then, the following algorithm is executed:

```
float x,y;
x=y=0;
For each n iterations (number of vertices)
      Select randomly a function (with probability)
      x= xa_x+ yb_x+ c_x
      y= xa_y+ yb_y+ c_y
      Call Function no linear on (x,y)
      Draw a pixel in x,y
```

In this project, we have two functions "spherical" with different parameter; the probability of execution of each function is the same. The spherical function is described by this relation.

$$\begin{cases} x = \dfrac{x}{x^2+y^2} \\ y = \dfrac{y}{x^2+y^2} \end{cases} and\; x^2+y^2 \neq 0$$

The two functions have two colours, the green and the red, the hue value is interpolated for each draw thanks to a representation of the colours in HSL space.  It is possible to use a palette to modify this interpolation and give a different result.

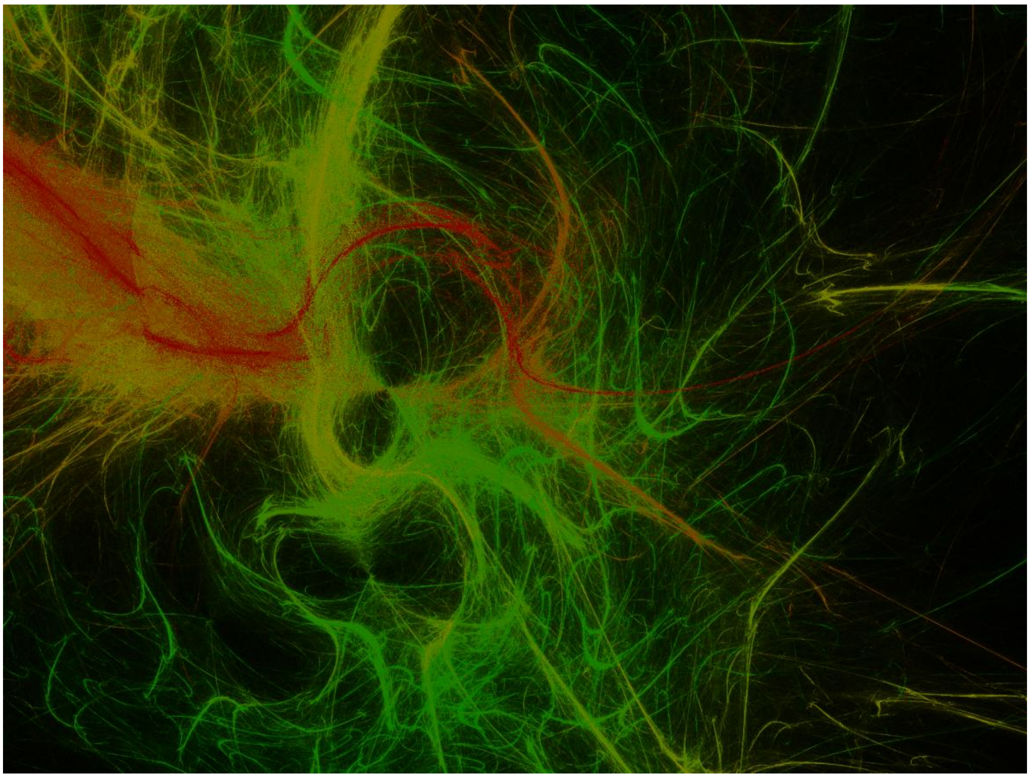

**Figure 1: Fractal without palette**

**Figure 2: Fractal with a defined palette**

It is interesting to see that it is always possible to generate the triangle of Sierpinski with a particular set of functions, The linear parameter are set to ignore this transformation (x=x and y=y) :

$$\begin{cases} x = \dfrac{x}{2} \\ y = \dfrac{y}{2} \end{cases} \qquad \begin{cases} x = \dfrac{x+1}{2} \\ y = \dfrac{y}{2} \end{cases} \qquad \begin{cases} x = \dfrac{x}{2} \\ y = \dfrac{y+1}{2} \end{cases}$$

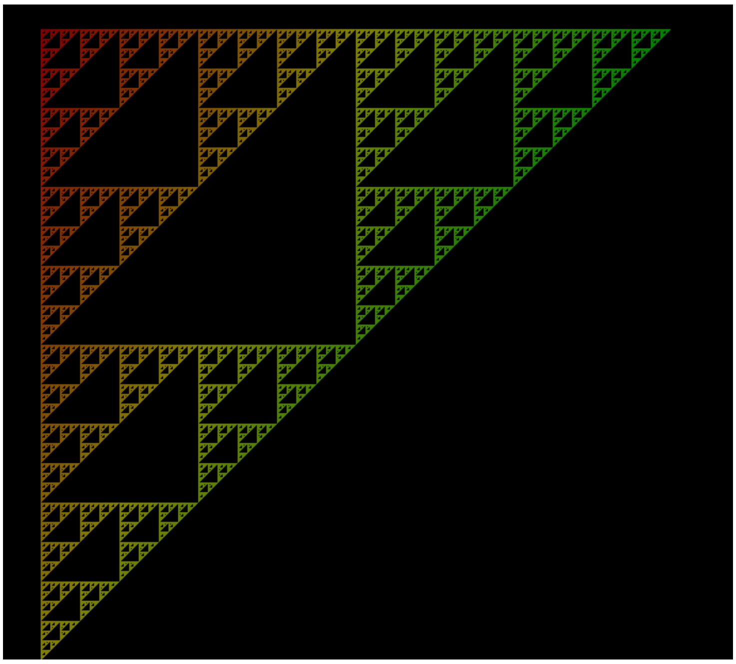

Figure 3: Triangle of Sierpinski

The animation of the fractal is done modifying randomly values of the six linear parameters, each frame is saved into a BMP file and a video is created from this list of images (see "**Animated Fractal.avi**").