Spiro Graphic Memories

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[Update] If you are looking for information on the Spirograph toy, click here.

In examining the PIC 32 C compiler in C32 Impressions, there was a pressing need for several programs to stand in as benchmarks. One of those programs was a graphics applet that drew images inspired by the old Spirograph toy. As requested by a reader, this posting takes a look at the story behind the pretty picture.

When I was a kid, one of my favorite toys was my Super Spirograph. This toy consisted of a number of gear toothed wheels, disks and inter-lockable shapes that when meshed together and driven by hand with a pen, would draw really cool pictures on paper. It was prone to having the little teeth slip, or the gears wobbling and ruining the picture, but I loved the toy all the same.

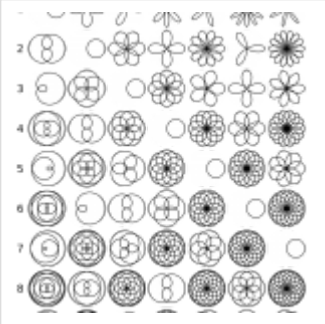
Years later in High School Math class, I was introduced to graphing trigonometric functions using polar coordinates. As difficult as it was to create those plots by hand (back then, fire was still a novelty so this was way before computers in the classroom) I still noted the similarity to the images created by my Spirograph.

A few years later in college, I was working as a research assistant at York University for Dr Keith Aldridge. I was given the task of writing device control software for a Calcomp pen plotter connected to an old Interdata 5/16 mini-computer. The purpose of this software was to help produce camera ready artwork for the graphs in the various papers and thesis of the post graduate

students. The scaling, data manipulation, and string processing were all done in FORTRAN. To test my routines, sample data was needed. Thinking back to my childhood toy, I wrote a program to generate data sets based on a simple model of the Spirograph. The results were quite striking and beautiful. Regrettably, those prints are long lost.

It turns out that my code was not really simulating a Spirograph toy, but instead was producing a set of plots closely related to a family of curves called Rose plots. The basic formula for a Rose plot is:

$$\text{For } \phi \text{ in } 0 \ldots 2D\pi : r = cos(\frac{N}{D}\phi)$$

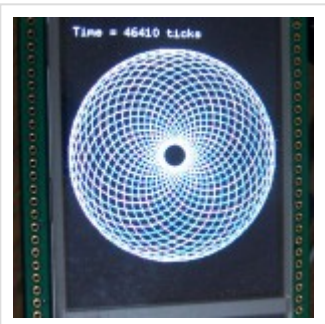


Rose plots for various values of N and D, are pictured to the left.

While Rose plots are pretty close, they are not quite what I came up with. Rose plots all pass through the center point. In a pen plotter that is not a good thing as the center of the page would become saturated with ink and tear. I needed a way to simulate the wider radius of the Spirograph drawing wheel. I did this by adding a unit circle to my polar plot data like this:

$$\text{For } \phi \text{ in } 0 \ldots 2D\pi : r = 1 + Acos(\frac{N}{D}\phi)$$

where A is typically 0.7. and N and D are relatively prime whole numbers.



So we come to the end. Just for the record, the benchmark sample used A=0.8, N=31 and D=30 to produce the figure on the left. Pretty, isn't it?

I hope you have enjoyed reading about this little trip down memory lane as much as I've had writing about it. As always, comments and suggestions are welcomed and encouraged.

Peter Camilleri (aka Squidly Jones)

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