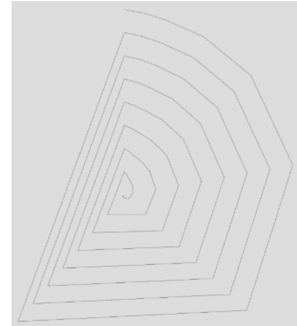
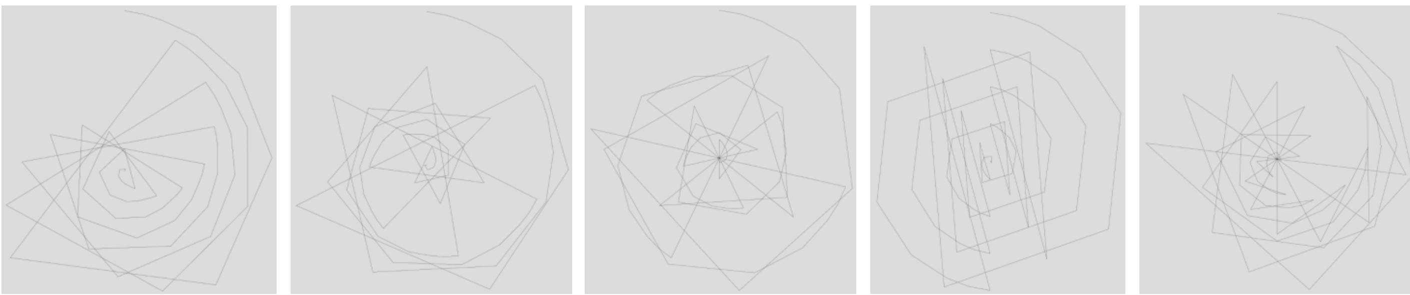
Fibonacci Jumps create Nautilus Shells



The Fibonacci sequence produce spiral images so it is not surprising that in the context of a model that produces spirals in any event, if you use the Fibonacci sequence as jumps you end up with spirals. One obtains the sequence by starting with 1, 1 then to get the next number in the sequence, you add the previous two numbers. We examined string art images involving Fibonacci jump sets in E18.4.3, E20.13 and E20.14. Here we focus attention on how a Fibonacci jump set can create giant spirals that are reminiscent of nautilus shells. We focus on the first 8 Fibonacci numbers as a jump set of (1, 1, 2, 3, 5, 8, 13, 21). The sum of jumps is 54 so that we would have an *almost polygon* with Fibonacci sides by setting ***n*** = 54, shown at upper right with 8 iterations since ***r*** = 64.

Comparisons to simple swirls. To obtain an image that resembles a nautilus shell, simply start from 54 and decrease ***n***. Many of the ***n*** smaller than 54 produce images that appear to be a clockwise giant spiral. At one level, this is how we created a clockwise swirl from an almost polygon. (The same does not go for increasing ***n*** to get a counter-clockwise giant spiral as we will see below.) From left to right we have n = 51, 47, 42, 36, and 26.



There would be more lines if ***r*** > 64 but a small number was used in order to focus in on individual lines. Notice that the middle image and the far right image have a number of lines that pass through the center. The partial diameters in the middle image are based on the jump of 21 which is half of ***n*** = 42 and the partial diameters in the right image are based on the jump of 13 which is half of ***n*** = 26. The second from right, ***n*** = 36 image has seemingly parallel lines, “almost” 180° rotational symmetry and two sets of sharp Vs. The lines are not parallel, and the rotational symmetry is not exact because each endpoint is a different distance from the center, see here for additional discussion. The sharp Vs are the visual consequence of the last two jumps which sum to 34, two less than ***n*** in this instance so each V looks like a *cracked-open* line. The almost rotational symmetry is because 1.5·36 = 54 so the first jump set ends after one and a half times around the parent polygon at the vertex 18 radius. The second jump set ends at the vertex 0 radius, and so on.

Reverse Fibonacci. Things are different because the clockwise direction is baked into the Fibonacci jump set. Two versions are shown: the top shows Fibonacci, the bottom reverses the jump set order. Both increase ***r*** = 200 for ***n*** = 55 to 59. Notice that the spiral in the top row fades relative to the one bottom row which are paired except for jump set order.