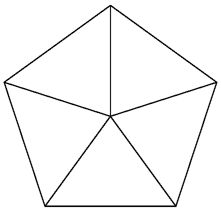
Variations on the String Art Model

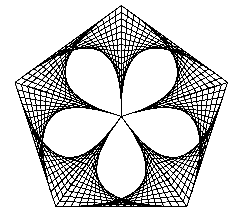
The String Art model laid out in prior chapters is based on four parameters, ***n***, ***S***, ***P***, and ***J***. The chapters to come create variations on those parameters in two main ways. One examines alternative formulations of jump structures and the other provides an alternative to remaining on a polygon.

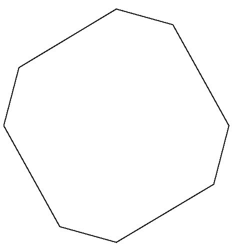
The model examined thus far is based on a *single jump structure* – how many vertices of the polygon are jumped over before the next line of the vertex frame, VF, is created. It is a single jump structure because the jump pattern is the same each time. The jump need not be 1, rather it is **constant**. Thus, an image with ***n*** = 5 and ***J*** = 1, the VF is 0-1-2-3-4-0, a pentagon, but if ***J*** = 2 ,the VF is 0-2-4-1-3-0, a pentagram.

We can alter the single jump structure in a couple of ways.

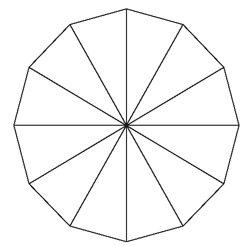


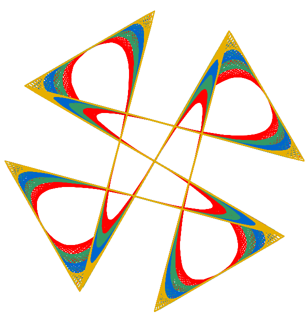
The simplest version is to set ***J*** = 1 but go into the center and out after each jump. The result is Centered-Point Flowers. Instead of a pentagon for ***n*** = 5, the VF is a pentagon with radiuses as seen to the left. When ***P*** < ***S*** one ends up with an ***n***-petal flower like at right based on ***n*** = 5, ***S*** = 17 and ***P*** = 16.



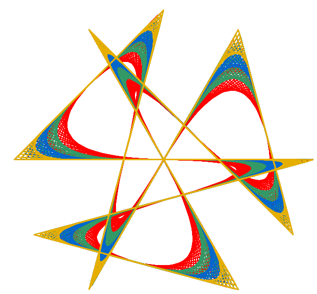


The other way to alter the VF is to have *Jump Sets*. The simplest way to explain this is with double jumps. Consider two possible double-jump versions on a 12-gon. The left is what happens when J_1 = 1 and J_2 = 2. The VF in this instance *alternates* 1 and 2 jumps: 0-1-3-4-6-7-9-10-0. The circuit is complete because the 2 jump is at the end of the jump set. The right shows the VF if J_1 = 1, J_2 = 6: 0-1-7-8-2-3-9-10-4-5-11-**0**-6-7-1-2-8-9-3-4-10-11-5-6-0. Notice that the circuit was not complete the first time 0 was an endpoint (in red above from 11 to **0**) because it was not at the end of the 2-jump set.

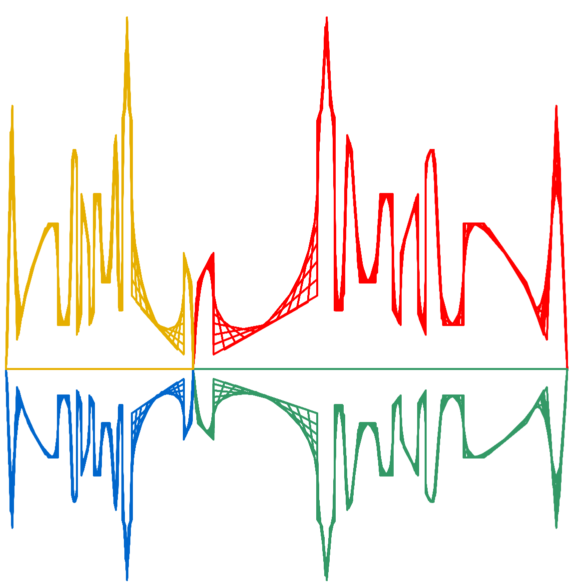




Subsequent jump extensions produce more elaborate vertex frames by allowing 3 or more jumps in a set. Three jump sets are shown using a file called Four-Color Clock Arithmetic. Both images have J_1 = 7, J_2 = 6. The left has J_3 = 2 (0-7-1-3-10-4-6-1-7-9-4-10-0 is the 12-line VF). Eight vertices were used but 4 were used twice in four 3-jump cycles. The right shows what happens when the third jump increases to J_3 = 3 (the 9-line VF is 0-7-1-4-11-5-8-3-9-0). Nine vertices are used once each in three 3-jump cycles. But J_3 = 4 (not shown) has 36 VF lines with each vertex used 3 times.



User determined vertices. The other alteration is to scrap ***n*** and ***J*** entirely and let users create their own vertices for their string art VF. This requires more work since the user is now in charge of where the vertices are located. But this also allows great flexibility to create your own image.



Here are two images from my ***Bridges 2020*** paper that are decidedly not part of a polygon.