

# The Four-Color Model, Exploring Inside the Box

**About Sheet 6.** The previous three explainers, together with your existing knowledge of how **S** and **P** work provide you with a solid grounding for all but *Section 4* of the [Bridges 2020 paper](#), 4. *Using the Four-Color Open Vertices Model.* *Section 4* deals with using the *6.FourColors* sheet in the **4ColorAetheometry Excel** file (that is also available there). This sheet allows users to add up to 40 (**x**, **y**) coordinates for each color. These vertices may be entered independently of one another, or they may use one another to create images such as the *Bridges 2020* image on the *Title* sheet of the *Excel* file in which the word **Bridges** is in **red**, with a reflection of that word in **gold** while **2020** is in **blue** and a reflection of **2020** in **green**. Additionally, one can explore variations on any one of the parameters holding the other two fixed (as was shown on a separate sheet in the file called *Bridges Handout*) using this sheet.

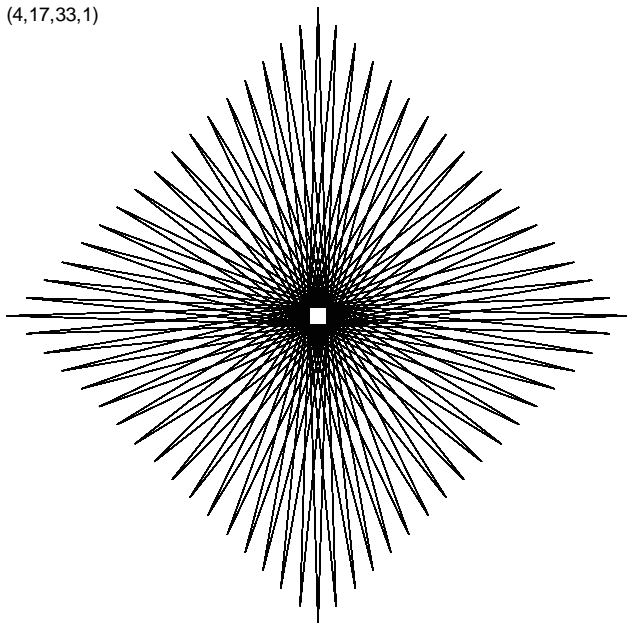
Users can create tessellations of a single image and that is how the *6.FourColors* sheet is set up upon opening the sheet. The use of this sheet for that purpose is discussed on pages 551-553 of the [Bridges paper](#) (which includes 4 four-color tessellations, horizontal, vertical, and rotational reflections) and it is best to simply refer readers to those pages.

Here, we choose to provide a couple of *explainers* that move in directions not discussed in the *Bridges* paper. This one explores variations on the [zero-jump model](#) and the next explores how to layer colors much like we did on the polygon to create initials (such as **ESA**, for example) or other layered images.

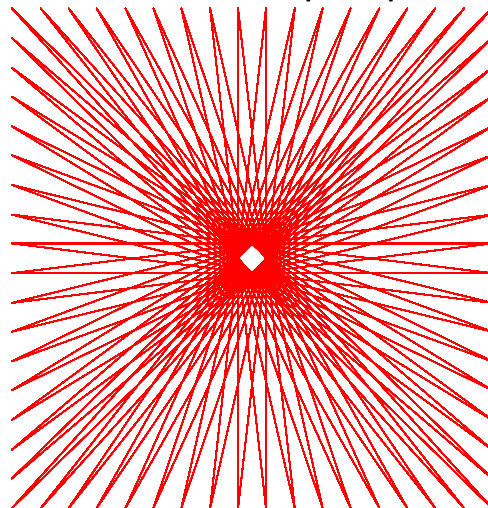
**Saving your work to a library.** You can always get back to a fresh copy of the file by opening up a new copy from the website. But what should you do when you have something you want to save? You have a couple of options. First you could simply click *File, Save As*, and then add a name to the end of the file so you will know what you have. Another option is to either add a new worksheet to the file or use the *Some4ColorShapes* sheet. You will note that the first image on that sheet saved A1:L58 but later images did not save the gray work area below the vertices. Just save what you need. You might also explore some of the images in the *8.SomeShapes* sheet which is from an earlier iteration of the file, referenced in the bibliography to the *Bridges* paper, and is single color.

**Square porcupines with varying zero jumps.** The porcupine polygon image at bottom left and the  $(V,S,P) = (4,17,33)$  at middle bottom differ by  $45^\circ$  and color. This simple image is the starting point for the explorations on the next page which are based on simply moving along the main diagonal inside the box once you get back to  $(0,0)$ . *The "data" for the upper right image is at lower right.* Note the last 5 rows of numbers in the **Red parent image**. Instead of stopping at  $(1,0)$  like the red image below, the point  $(0,0)$  is the 5<sup>th</sup> point. The 6<sup>th</sup> vertex moves inside along the main diagonal. As you can tell, there are 8 0.5s for vertices 6-9 (although 999s show for red after 6 meaning this vertex is not used). The "parent coordinate" is **x** for vertex 6 and all other 0.5s are linked to this value. If that changes, the other seven also change.

(n, S, P, J)  
(4,17,33,1)



These are both Porcupine Squares.



6	17	49
7	17	59
8	17	67
9	17	76

**V S P**

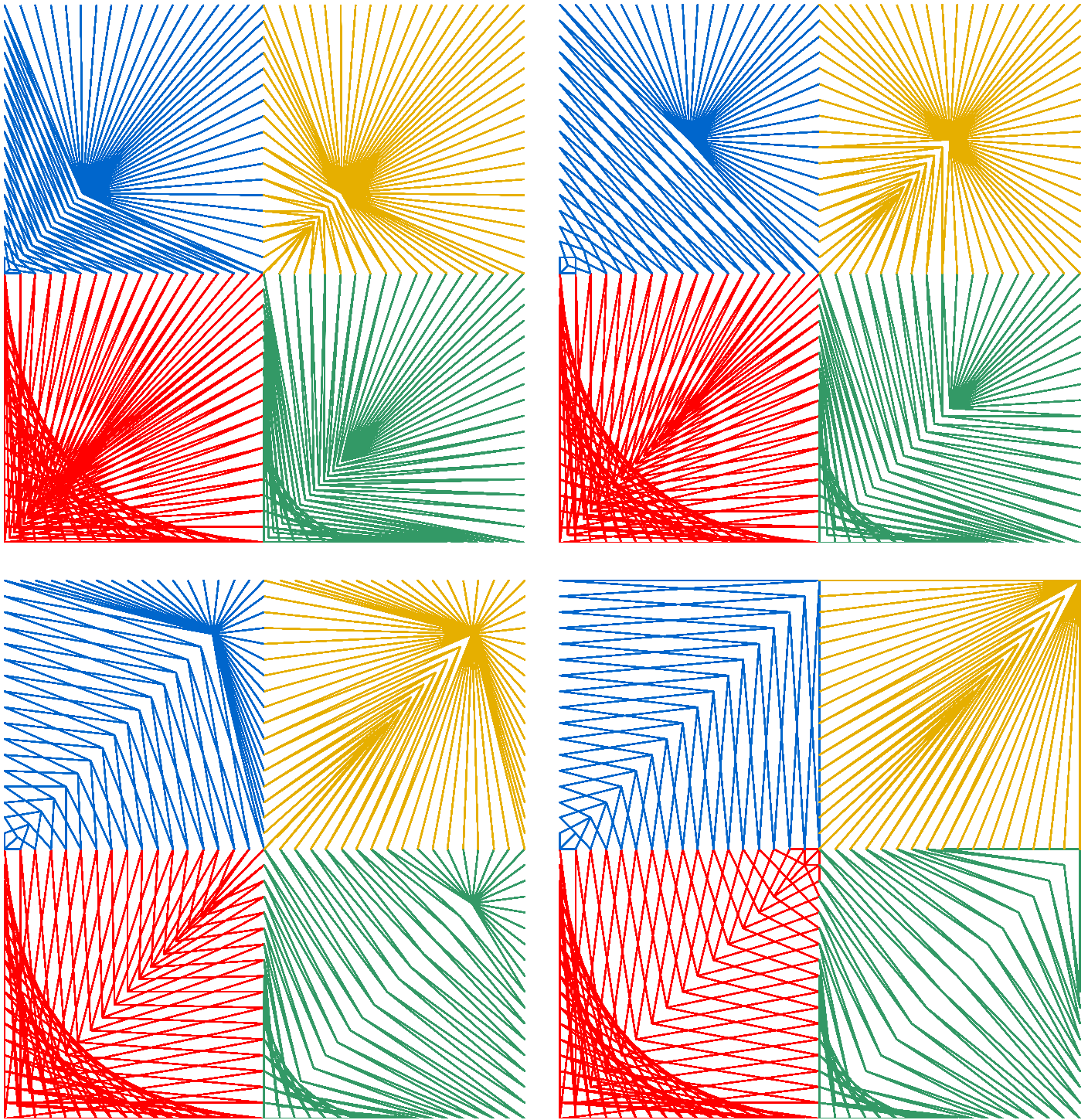
B50:B51 has red x,y

**Red Vertices**

	X	Y
1	0	0
2	0	1
3	1	1
4	1	0
5	0	0
6	0.5	0.5
999	0.5	0.5
999	0.5	0.5
999	0.5	0.5

This means that we get different images depending on how far along the diagonal we go into the box. We also get different images depending on how many times we use that vertex in a row (this as a zero jump). To tile here, set  $E6 = 1$ . **Red has no zero jumps; Green has 1 zero jump; Blue has 2 zero jumps; and Gold has 3 zero jumps.** Each  $P$  is adjusted so that the resulting image is a porcupine ( $P$  is closest to  $\text{INTEGR}(VS/2)$  with  $\text{SCF} = 1$ , e.g., red  $P = 50$  has  $\text{SCF} = 2$ ).

Each panel's vertex 6  $x$  value (and hence  $x$  for 7-9 and  $y$  for 6-9) is: Top Left, **0.3**; Right, **0.5**; Bottom Left, **0.8**; Right, **1**.



The images are different and instructive. The best starting point is the top right halfway image. **Red** has no zero jumps. **Green** has 1 zero jump so  $1/4^{\text{th}}$  of the lines (on VF from  $(1.5,1) - (2,1) - (2,0.5)$ ) are all single lines connecting to  $(0.5,0.5)$ . Half the lines are like this for blue (on VF from  $(0,2) - (1,2) - (1,1)$ ) since blue has 2 zero jumps. **Three-fourths** of the lines are like this for gold (on VF from  $(1,1.5) - (1,2) - (2,2) - (2,1) - (2,1.5)$ ) since gold has 3 zero jumps. These same statements hold true for other interior vertex point values; the only difference is where that interior point lies.