Designing with L-Systems, Part 9: Devious Interpretation

The first article in this series showed some images derived from L-Systems [1]. The second article showed how interpretation of L-System characters is used to create such images [2].

The images produced by L-Systems in this manner have proved immensely popular and have motivated both recreational activity and serious research. In fact, if you explore the Web looking for L-Systems, you might get the impressing that this is all L-Systems are about.

The work that has been done to produce images using L-Systems has resulted in a large number of such L-Systems that are readily available.

The question posed here is: Can these L-Systems be used for anything other than producing the images for which they were designed? More specifically, do they have inherent design properties that can be used for other purposes such as weave design?

A techno-geek marketroid would call this "repurposing". "Devious interpretation" is less misleading, if a bit fanciful.

It is problematical, until actually tried, to derive interesting weave designs from L-Systems designed to draw fanciful plants and fractals. There is, however, an underlying fact that suggests some promise. L-Systems by their nature produce elaborate, evolving patterns that can be of great subtlety and complexity. L-Systems designed for producing images inherently contain harmonies and attractive relationships.

One approach to using such L-systems for weave design is to construct t-sequences by interpreting drawing characters in an appropriate way.

For drawing images, the L-System characters are interpreted in the following way:

F   move forward a specified length, drawing a line

f   move forward a specified length, without drawing a line

+   turn right a specified number of degrees

−   turn left a specified number of degrees

[save the current position and direction

]   restore the previously saved position and direction

The conceptual basis for creating t-sequences is as follows: The sequence starts (arbitrarily) with 1. Subsequent terms are based on the current term and a value. The value is 1 prior to the interpretation of each character. The sign of the value, + (up) or − (down), starts as + and may change during interpretation. When the sign is +, t values are positive, while when the sign is −, values are negative.

The interpretation of characters is as follows:

F   append a new term whose value is the current term plus the current value.

f   increase or decrease the current value by 1, depending on the sign, but do not add a term

+   set the sign to +

−   set the sign to −

[ignored

]   ignored

The symbols [and], which have use in two-dimensional drawing to save the current "state" and later restore it, do not apply to the linear structure of a t-sequence.

The Appendix shows some weaves produced from L-Systems using this interpretation and with the intended image along side. The t-sequences are mirror for symmetry. All are treadled as drawn in with twill tie-ups.
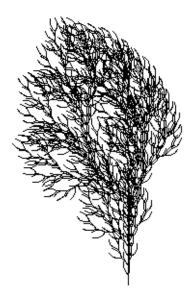
It should not be surprising that there is no evident connection between the images and the weaves.

References

1. *Designing with L-Systems, Part 1: String Rewriting Systems*, Ralph E. Griswold, 2004:
   http:www.cs.arizona.edu/patterns/weaving/webdocs/gre_ls01.pdf

2. *Designing with L-Systems, Part 2: A Side Trip to Graphicss*, Ralph E. Griswold, 2004:
   http:www.cs.arizona.edu/patterns/weaving/webdocs/gre_ls02.pdf

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Appendix — Gallery