Stripes, Part 1: Introduction

Stripes are everywhere; in nature, fabrics, flags, traffic warnings, advertisements, logos, uniforms, vehicles, balloons, bar codes — you name it. By their nature, brightly color stripes command attention, whether to a barricade or an advertisement.

Stripes are simple, easy to produce, and do not take artistic ability to render (although design does).

This is the first in a series of articles concerned with the characterization, construction, and manipulation of patterns consisting of stripes.

First a few definitions of terms used in these articles. A stripe has two properties, color and width. A stripe pattern is a sequence of stripes. A stripe design has the additional property of orientation: horizontal, vertical or diagonal at various angles.

Stripe patterns can be characterized by two parallel sequences, one for colors and the other for widths.

Colors

A convenient and compact way to represent colors is with characters. The labels can be mnemonic, but the actual color associated with a character is a separate consideration.

For the purpose of illustration, suppose some basic colors labels are

r	red
b	blue
g	green
k	black
w	white

Widths

Widths are dimensionless and relative. A width of 4 could be 4 millimeters, 4 threads, 4 yards, … . In any event, a width of 8 is twice the width of 4, and so on.

In the context of weaving, it nevertheless is convenient to think of widths as thread counts, realizing that all widths in a stripe pattern can be multiplied by 2, for example, and still represent the same *pattern*.

Stripe Pattern Representations

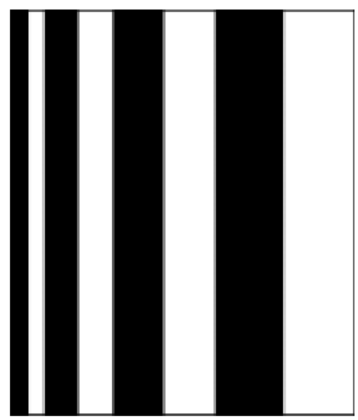
Parallel Sequences

One way to characterize stripe patterns is by two parallel sequences, one for colors and the other for widths.

For example, the sequences

b	w	b	w	b	w	b	w
1	1	2	2	3	3	4	4

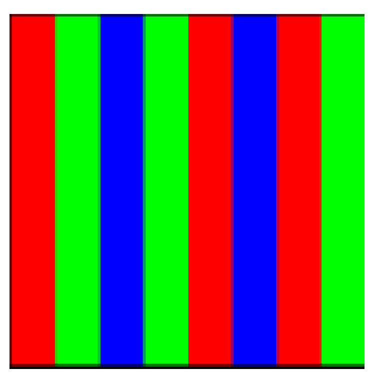
produce this stripe pattern



and the sequences

r	g	b	g	r	b	r	g
3	3	3	3	3	3	3	3

produce this stripe pattern



If the same color appears more than once in succession in a color sequence, the sequences can be reduced to ones in which no color appears more than once in succession by summing the widths for the repeated colors.

For example, the sequences

b	w	b	b	b	w	w	w
1	1	2	2	3	3	4	4

have the *reduced form*

b	w	b	w
1	1	7	11

In what follows, stripe sequences are reduced in this fashion.

Pair Sequences

An alternative way to represent stripe patterns is as sequences of color/width pairs. For example, the parallel sequence representation

b	w	b	w	b	w	b	w
1	1	2	2	3	3	4	4

has the color/width sequence representation

b 1 w 1 b 2 w 2 b 3 w 3 b 4 w 4

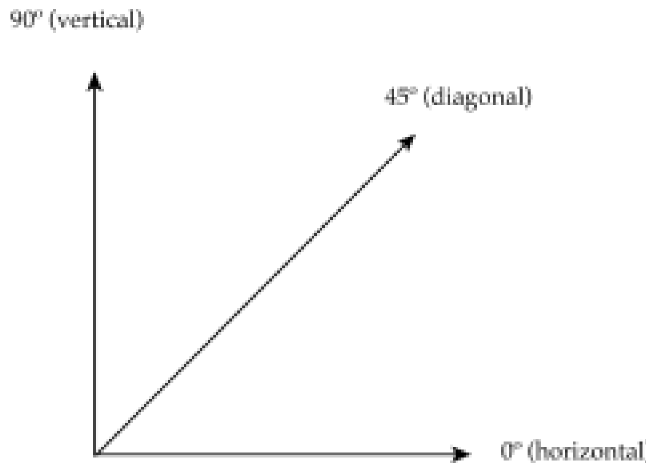
Choice of a Representation

The parallel sequence and pair sequence representations are, of course, equivalent. Which one to use depends mostly on the operations to be performed.

For example, if the colors are to be reversed and the widths to be left unchanged, the parallel sequence representation is more natural. On the other hand, if the *stripes* are to be reversed, the pair sequence representation is more natural.

Stripe Designs

Another property of stripes is their orientation: horizontal, vertical (as above), and diagonal at various angles. Although the orientation of woven stripes is limited by structural concerns and color weavability [1], the general situation is shown in this diagram:



All angles between 0° and 90° are diagonal, with 45° being regular twills (as drafted).

Vertical and horizontal stripe designs repeat naturally regardless of their. For 45° diagonal twills, the width and length must be the same to repeat properly. For other diagonals, the issue of repeats is more complicated and will be covered in a subsequent article.

The next article in this series will look more closely at the representation of stripe patterns.

Reference

1. *Weavable Color Patterns*, Ralph E. Griswold, 2004:
http://www.cs.arizona.edu/patterns/weaving/webdocs/gre_cwev.pdf

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