Operations on Patterns, Part 1: Basic Notions

In this series of articles, we'll discuss various operations that can be performed on drawdown patterns – idealized interlacement patterns — to produce other interesting, and useful drawdowns. In the last article, we'll extend the discussion to include "color drawdowns".

We'll represent drawdowns as grids of cells. Black cells indicate where the warp is on top and white cells where the weft is on top. Figure 1 shows an example.

Figure 1. A Drawdown Pattern

Cells in lines across the pattern from top to bottom are called columns, while cells in lines from left to right are called rows. We'll use the word lines for both in situations in which orientation is not important. See Figure 2.

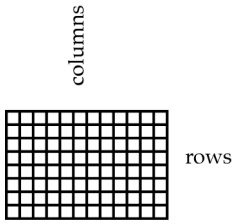

Figure 2. Columns and Rows

A variety of operations can be performed on such patterns. They can be changed by geometrical transformations, such as rotation. Two patterns can be concatenated (adjoined) to forma larger pattern. A portion of a pattern can be replaced by another pattern. The rows and columns can be rearranged. And a pattern can be turned over to show its back side, as in the back of a woven fabric.

In subsequent articles, we'll explore each of these topics in some detail.

Notation

We'll use uppercase italic letters, like P, Q, and R, to name patterns so that we can refer to different patterns easily.

Some operations on patterns require integer values. We'll name these with lowercase italic letters, such as i, j, and k.

Various symbols will be introduced in subsequent articles to stand for operations on patterns.

Pattern Properties

Two properties of patterns are important in many operations:

- width, the number of columns; the width of a pattern P is denoted by $\omega(P)$
- height, the number of rows; the height of a pattern P is denoted by $\eta(P)$

Sometimes it is useful to know the total number of cells in a pattern. The number of cells in a pattern P is denoted by $\sigma(P)$. $\sigma(P) = \omega(P) \times \eta(P)$. Figure 3 illustrates these properties.

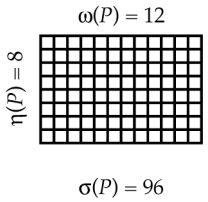

Figure 3. Pattern Dimensions

Another property of a pattern that is important is the number of different colors it has. For a pattern P, the number of colors is denoted by $\kappa(P)$. For drawdowns, $\kappa(P) = 2$ (drawdowns in which all cells are black or all cells are white do not correspond to interlacement patterns and are not permitted).

For "color drawdowns" (patterns in which the colors of the warp and weft threads are shown), $\kappa(P)$ may be greater than 2. Figure 4 shows a 6-color pattern.

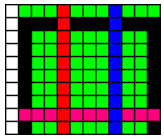

Figure 4. $\kappa(P) = 6$

April 23, 2002; last modified December 6, 2002

Summary

$\omega(P)$	width
$\eta(P)$	height
$\sigma(P)$	number of cells
$\kappa(P)$	number of colors

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