

Operations on Patterns, Part 3: Concatenation

Concatenation is the adjoining (juxtaposition) of two patterns to form a larger one. There are two forms of pattern concatenation: horizontal, in which patterns are adjoining at their vertical edges, and vertical, in which patterns are adjoining at their horizontal edges.

We'll indicate horizontal and vertical concatenation by the symbols \mathbb{H} and \mathbb{I} , respectively.

In order for concatenation to be possible, the adjoining edges must be of the same length [1]:

for the horizontal concatenation of patterns P and Q , $\eta(P) = \eta(Q)$

for the vertical concatenation of patterns P and Q , $\omega(P) = \omega(Q)$

Figures 1 and 2 show examples of horizontal and vertical concatenation.

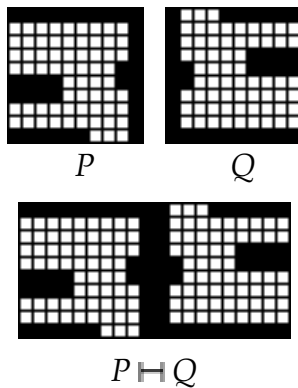


Figure 1. Horizontal Concatenation

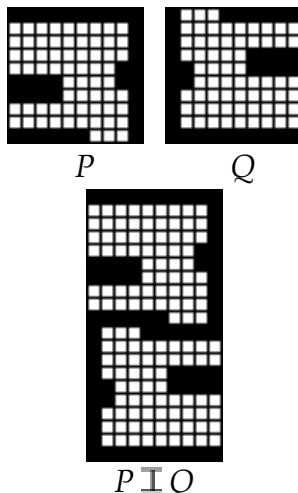


Figure 2. Vertical Concatenation

Duplicate Edges

A potential design problem arises when the adjoining edges in concatenation are the same, cell by cell. This produces a duplication at the boundary, which may be undesirable for aesthetic and structural reasons. Therefore, if the adjoining edges are the same, one edge is discarded. Figure 3 shows an example.

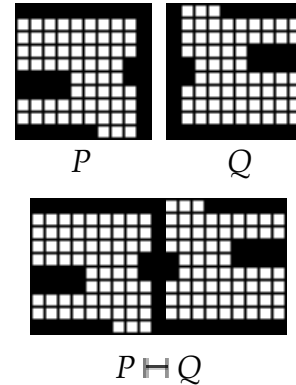


Figure 3. Concatenation with Duplicate Removal

Duplicate removal is automatic in concatenation of patterns. If duplicate removal is not desired, the operations \mathbb{H}_+ and \mathbb{I}_+ can be used.

Figure 4 shows an example of horizontal concatenation without duplicate removal.

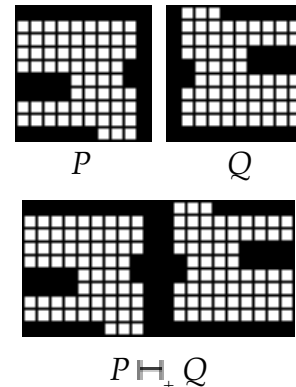


Figure 4 Concatenation without Duplicate Removal

Note: Duplicate edges are removed only at adjoining boundaries. Any other duplicate rows or columns are not affected.

Summary

- H horizontal concatenation
- I vertical concatenation
- H_+ horizontal concatenation
without duplicate removal
- I_+ vertical concatenation
without duplicate removal

Reference

1. Ralph E. Griswold, "Operations on Patterns, Part 1: Basic Notions", 2002:
http://www.cs.arizona.edu/patterns/weaving/webdocs/gre_pop1.pdf

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