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The braid rook monoid

Let W be a finite monoid and $\ell: W \rightarrow \mathbb{N}$ be a map. One can consider the monoid B defined by the presentation

$$\langle \underline{w} \in \underline{W} \mid \underline{ww'} = \underline{w'w} \text{ when } \ell(ww') = \ell(w) + \ell(w') \rangle$$

where \underline{W} is a formal copy of W . If W is the permutation group on n elements and ℓ is its standard length function, one obtains the monoid of positive braids on n strands. Here I consider the case where W is the rook monoid, which a natural generalization of the permutation group.