Breaking Row and Column Symmetries in Matrix Models

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Abstract. We identify an important class of symmetries in constraint programming, arising from matrices of decision variables where rows and columns can be swapped. Whilst lexicographically ordering the rows (columns) breaks all the row (column) symmetries, lexicographically ordering both the rows and the columns fails to break all the compositions of the row and column symmetries. Nevertheless, our experimental results show that this is effective at dealing with these compositions of symmetries. We extend these results to cope with symmetries in any number of dimensions, with partial symmetries, and with symmetric values. Finally, we identify special cases where all compositions of the row and column symmetries can be eliminated by the addition of only a linear number of symmetry-breaking constraints.

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