

## Linear representation of relational operations

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By slicing the graph of an  $n$ -ary relation along lines defined by all combinations of  $n - 1$  domain elements, we obtain a matrix with  $n$  columns and (in general) infinitely many rows. Components of this matrix are subsets of the domain, and the row indices are  $(n - 1)$ -place vectors of domain elements. We show how the cylindrical algebra operations of substitution, diagonalization and cylindrification can be defined as matrix operations, in particular, as multiplication of the relations matrix representation by distinct matrices corresponding to the various cylindrical operators. Conjunction, disjunction and complementation of relational expressions are also shown to have matrix counterparts.