Sequence Covering Arrays and Linear Extensions
(Extended Abstract)

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Covering subsequences by sets of permutations arises in numerous applications. Given a set of permutations that cover a specific set of subsequences, it is of interest not just to know how few permutations can be used, but also to find a set of size equal to or close to the minimum. These permutation construction problems have proved to be computationally challenging; few explicit constructions have been found for small sets of permutations of intermediate length, mostly arising from greedy algorithms. A different strategy is developed here. Starting with a set that covers the specific subsequences required, we determine local changes that can be made in the permutations without losing the required coverage. By selecting these local changes (using linear extensions) so as to make one or more permutations less ‘important’ for coverage, the method attempts to make a permutation redundant so that it can be removed and the set size reduced. A post-optimization method to do this is developed, and preliminary results on sequence covering arrays show that it is surprisingly effective.