Implicit Hitting Set Problems and Multi-genome Alignment

Richard M. Karp

University of California at Berkeley and
International Computer Science Institute

Let U be a finite set and S a family of subsets of U. Define a hitting set as a subset of U that intersects every element of S. The optimal hitting set problem is: given a positive weight for each element of U, find a hitting set of minimum total weight. This problem is equivalent to the classic weighted set cover problem.We consider the optimal hitting set problem in the case where the set system S is not explicitly given, but there is an oracle that will supply members of S satisfying certain conditions; for example, we might ask the oracle for a minimum-cardinality set in S that is disjoint from a given set Q. The problems of finding a minimum feedback arc set or minimum feedback vertex set in a digraph are examples of implicit hitting set problems. Our interest is in the number of oracle queries required to find an optimal hitting set. After presenting some generic algorithms for this problem we focus on our computational experience with an implicit hitting set problem related to multi-genome alignment in genomics. This is joint work with Erick Moreno Centeno.

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