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Computing Transparently: The Independent Sets in a Graph

Abstract for the Combinatorics Seminar 2009 October 20

I give a procedure for finding the independent sets in an undirected graph by xeroxing onto transparent plastic sheets.

Let an undirected graph having n vertices and m edges be given. A list of all the independent subsets of the set of vertices of the graph is constructed by using a xerox machine in a manner that requires the formation of only $n + m + 1$ successive transparencies. An accompanying list of the counts of the elements in each independent set is then constructed using only $O(n^2)$ additional transparencies. The list with counts provides a list of all maximum independent sets. This gives an $O(n^2)$ -step solution for the classical problem of finding the cardinality of a maximal independent set in a graph. The applicability of these procedures is limited, of course, by the increase in the information density on the transparencies when n is large.

My ultimate purpose here is to give hand tested 'ultra parallel' algorithmic procedures that may prove suitable for realization using future optical technologies.

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