

## Deming Decompositions of Graphs

M. Kayll, University of Montana &  
C. E. Larson\*, Virginia Commonwealth University

A König-Egervary (KE) graph is one where the matching number  $\nu$  of a graph plus the independence number of a graph  $\alpha$  equals the order  $n$  of the graph ( $\nu + \alpha = n$ ). These graphs are generalizations of bipartite graphs, can be identified efficiently, and  $\alpha$  can be computed efficiently. Deming (1979) characterized these graphs in terms of the non-existence of forbidden subgraphs, and sketched an algorithm for producing a maximum independent set and certificate for a KE graph or one of these forbidden subgraphs for a non-KE graph.

We extend Deming's algorithm to produce a decomposition of any graph with a perfect matching into subgraphs which are either almost KE (and where  $\alpha = \nu - 1$ ) and where the remaining subgraph is KE (and where  $\alpha = \nu$ ). Each of the subgraphs has a perfect matching. This algorithm can be naturally extended to graphs without a perfect matching.

Keywords: independent set, matching, graph decomposition, graph structure, KE graph.