Semiregular factorisations of regular multigraphs

Anthony Hilton

An $(r, r + 1)$-factor of a graph G is a spanning subgraph which has the property that the degrees of all its vertices are either r or $r+1$. An $(r, r+1)$ factorisation of a graph G is a decomposition into edge-disjoint $(r, r + 1)$ factors. If the actual value of r is not specified, such a factorisation is called semiregular. Let $m(r)$ be the least integer such that each regular loopless multigraph of degree d with $d + 1 > m(r)$ has an $(r, r + 1)$-factorisation.

The problem of evaluating $m(r)$ was broached in the 1980's by various Japanese mathematicians, but it seems to be rather difficult. The corresponding questions for simple graphs (where no multiple edges or loops are allowed), or for pseudographs (where multiple edges and loops are allowed) have been completely resolved.

I shall show in this talk how some little known list colouring results can be used to provide a technique for obtaining fairly tight bounds on $m(r)$.