On avoiding and completing colorings

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av filosofie doktorsexamen framläggs till offentligt försvar i MA121, MIT-huset, fredagen den 24 maj, kl 10:15. Avhandlingen kommer att förvaras på engelska.

Fakultetsopponent: Professor, Kimmo Eriksson, Mälardalens högskola, Sverige.

Department of Mathematics and Mathematical Statistics
Title
On avoiding and completing colorings.

Abstract
All of my papers are related to the problem of avoiding and completing an edge precoloring of a graph. In more detail, given a graph $G$ and a partial proper edge precoloring $\varphi$ of $G$ and a list assignment $L$ for every non-colored edge of $G$, can we extend $\varphi$ to a proper edge coloring of $G$ which avoids $L$?

In Paper I, $G$ is the $d$-dimensional hypercube graph $Q_d$, a partial proper edge precoloring $\varphi$ and a list assignment $L$ must satisfy certain sparsity conditions. Paper II still deals with the hypercube graph $Q_d$, but the list assignment $L$ for every edge of $Q_d$ is an empty set and $\varphi$ must be a partial proper edge precoloring of at most $d - 1$ edges. In Paper III, $G$ is a $(d, s)$-edge colorable graph, that is $G$ has a proper $d$-edge coloring, where every edge is contained in at least $s - 1$ 2-colored 4-cycles, $L$ must satisfy certain sparsity conditions and we do not have a partial proper edge precoloring $\varphi$ on edges of $G$. The problem in Paper III is also considered in Paper IV and Paper V, but here $G$ can be seen as the complete 3-uniform 3-partite hypergraph $K_{n,n,n}^3$, where $n$ is a power of two in paper IV and $n$ is an even number in paper V.

Keywords
Graph coloring, precoloring, list assignment.

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