SEMINARIUM
MATEMATYKA DYSKRETNA

wtorek, 28 października 2014 r. godz. 12.45, s. 304 A3-A4

COMPLETE ORIENTED COLOURINGS AND THE ORIENTED ACHROMATIC NUMBER

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A *complete colouring* of an undirected graph G is a proper vertex colouring of G such that for every pair of colours there is at least one edge in G whose endpoints are coloured with this pair of colours. The *achromatic number* $\psi(G)$ of G is the greatest number of colours in a complete colouring of G.

The achromatic number of a graph can be equivalently defined in terms of complete homomorphisms. A *homomorphism* of a graph G to a graph H is a mapping h from $V(G)$ to $V(H)$ such that $h(u)h(v)$ is an edge in H whenever uv is an edge in G. The *homomorphic image* $h(G)$ of G under h is the subgraph of H given by $V(h(G)) = h(V(G))$ and $xy \in E(h(G))$ if and only if there exists an edge $uv \in E(G)$ such that $h(u) = x$ and $h(v) = y$. A homomorphism h of G to H is *complete* if and only if $h(G) = H$.

A proper vertex k-colouring of G can thus be viewed as a homomorphism of G to K_k, the complete graph of order k, and a complete k-colouring of G as a complete homomorphism of G to K_k. Moreover, the ordinary chromatic number $\chi(G)$ of G corresponds to the smallest k for which there exists a complete homomorphism of G to K_k, while the achromatic number $\psi(G)$ of G corresponds to the greatest such k.

In this talk, we introduce the notions of complete colourings, complete homomorphisms and achromatic numbers of *oriented graphs*, that is antisymmetric digraphs.

We will present a few results on this new topic together with some open problems.