HOMOGENEOUS COLORINGS OF GRAPHS

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A vertex k-colouring (not necessarily proper) of a graph G is called ℓ-homogeneous if the number of colours in the open neigbourhood of each vertex of G equals ℓ. Such a coloring can be viewed as a certain generalization of proper 2-coloring of bipartite graphs; for $k = \ell = 2$ (the generalized version), it is known as role R6-coloring (introduced by Everett and Borgatti [1] in the connection with social network research), and its existence is an NP-complete problem.

In our contribution, we explore basic properties (the existence, the number of used colours) of homogeneous colourings of graphs (both for proper and generalized version) in general as well as of graph some specific families, in particular planar graphs. We will also discuss related concept of facial ℓ-homogeneous colorings of plane graphs (defined by the requirement of the same number of ℓ colors that are present on each face; a particular kind of these colorings are polychromatic colorings, see [2]), and the ways how to approach homogeneous edge colorings.

References

[1] M.G. Everett, S. Borgatti *Role colouring a graph*, Math. Soc. Sci. 21 (1991), 183–188.

[2] N. Alon, R. Berke, K. Buchin, M. Buchin, P. Csorba, S.S. Shannigrahi, B. Speckmann, P.Zumstein *Polychromatic colorings of plane graphs*, in: Proceedings of the Twenty-Fourth Annual Symposium on Computational Geometry (SCG'08), College Park, MD, USA, 9–11 June 2008; ACM: New York, NY, USA (2008) 338–345.