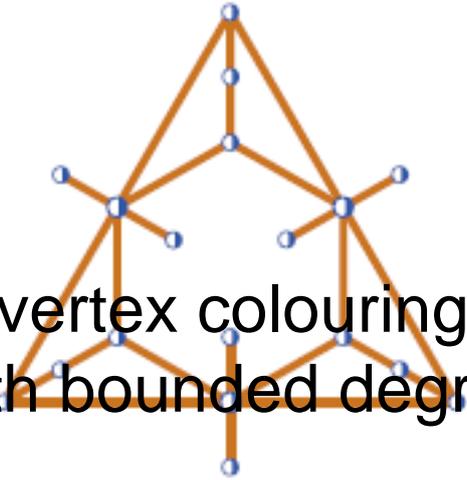


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On acyclic vertex colourings of graphs with bounded degree



Content :

A k -colouring of a graph G is a mapping c from the set of vertices of G to the set $\{1, \dots, k\}$ of colours. We can also regard a k -colouring of G as a partition of the set $V(G)$ into colour classes V_1, \dots, V_k such that each V_i is the set of vertices with colour i . In many situations it is desired that the particular set V_i has some particular property. Let P_1, \dots, P_k be the hereditary properties. A k -colouring of a graph G is called a (P_1, \dots, P_k) -colouring of G if for $1 \leq i \leq k$ the subgraph induced in G by the colour class V_i belongs to P_i . Such a colouring is called an acyclic (P_1, \dots, P_k) -colouring if for every two distinct colours i and j the subgraph formed by the edges whose endpoints have colours i and j is acyclic. In other words, every 2-coloured cycle in G contains at least one monochromatic edge. An acyclic (P_1, \dots, P_k) -colouring is called an acyclic k -colouring if for $1 \leq i \leq k$ the property P_i is the set of all edgeless graphs. The minimum k such that G has an acyclic k -colouring is called the acyclic chromatic number of G , denoted by $\chi_a(G)$. An acyclic (P_1, \dots, P_k) -colouring such that for $1 \leq i \leq k$ the property P_i is the set of graphs with degree at most d is called d -improper acyclic colouring. The d -improper acyclic chromatic number $\chi_a^d(G)$ is the smallest k for which there exists a d -improper acyclic colouring of G with k colours. We deal with the acyclic (P_1, \dots, P_k) -colouring of graphs with bounded degree. We study the complexity of the problem of recognizing graphs with the acyclic (P_1, P_2) -colouring for some hereditary properties P_1, P_2 . We determine the upper bound for acyclic chromatic number and d -improper acyclic chromatic number of graphs with bounded degree.

Primary authors : SIDOROWICZ, Elżbieta (University of Zielona Góra)

Co-authors :

Presenter : SIDOROWICZ, Elżbieta (University of Zielona Góra)

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