Mathematics > Combinatorics

Acyclic edge-coloring using entropy compression

Louis Esperet, Aline Parreau

(Submitted on 7 Jun 2012 (v1), last revised 27 Jul 2012 (this version, v2))

An edge-coloring of a graph G is acyclic if it is a proper edge-coloring of G and every cycle contains at least three colors. We prove that every graph with maximum degree Delta has an acyclic edge-coloring with at most 4 Delta colors, improving the previous bound of 9.62 Delta. Our bound results from the analysis of a very simple randomised procedure using the so-called entropy compression method. While this procedure might run in expected exponential time, we show that if we use (4+epsilon) Delta colors instead of 4 Delta colors, for some epsilon>0, the expected running time of the procedure is O(mn/epsilon Delta log Delta), where n and m are the number of vertices and edges of G. Such a randomised procedure running in expected polynomial time was only known to exist in the case where at least 16 Delta colors were available.

Our aim here is to make a pedagogic tutorial on how to use these ideas to analyse a broad range of graph coloring problems. As an application, we also show that every graph with maximum degree Delta has a star coloring with 2 sqrt{2} Delta^{3/2}+Delta colors.

Comments: 12 pages, algorithmic remarks have been added at the end
Subjects: **Combinatorics (math.CO)**
Cite as: **arXiv:1206.1535 [math.CO]**
(or **arXiv:1206.1535v2 [math.CO]** for this version)

Submission history

From: Louis Esperet [view email]
[v1] Thu, 7 Jun 2012 15:52:53 GMT (12kb)
[v2] Fri, 27 Jul 2012 12:45:49 GMT (14kb)

Which authors of this paper are endorsers?