Acyclic edge-colouring of planar graphs

Nathann Cohen[*]   Frédéric Havet[*]   Tobias Müller[†]

March 19, 2009

Abstract

A proper edge-colouring with the property that every cycle contains edges of at least three distinct colours is called an *acyclic edge-colouring*. The *acyclic chromatic index* of a graph *G*, denoted $\chi'_a(G)$ is the minimum *k* such that *G* admits an *acyclic edge-colouring* with *k* colours. We conjecture that if *G* is planar and $\Delta(G)$ is large enough then $\chi'_a(G) = \Delta(G)$. We settle this conjecture for planar graphs with girth at least 5 and outerplanar graphs. We also show that $\chi'_a(G) \leq \Delta(G) + 25$ for all planar *G*, which improves a previous result by Muthu et al.

---

[*]Projet Mascotte, I3S(CNRS, UNSA) and INRIA, 2004 route des lucioles, BP 93, 06902 Sophia-Antipolis Cedex, France. nathann.cohen@gmail.com ; fhavet@sophia.inria.fr

[†]School of Mathematical Sciences, Sackler Faculty of Exact Sciences, Tel Aviv University, Tel Aviv 69978, Israel. tobias@post.tau.ac.il