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NOTE ON THE GAME COLOURING NUMBER OF POWERS OF GRAPHS

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Abstract

We generalize the methods of Esperet and Zhu [6] providing an upper bound for the game colouring number of squares of graphs to obtain upper bounds for the game colouring number of m-th powers of graphs, $m \geq 3$, which rely on the maximum degree and the game colouring number of the underlying graph. Furthermore, we improve these bounds in case the underlying graph is a forest.

Keywords: game colouring number, marking game, graph power, game chromatic number, forest.

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References

[1] G. Agnarsson and M.M. Halldórsson, *Coloring powers of planar graphs*, SIAM J. Discrete Math. **16** (2003) 651–662.
doi:10.1137/S0895480100367950

[2] T. Bartnicki, J. Grytczuk, H.A. Kierstead and X. Zhu, *The map-coloring game*, Amer. Math. Monthly **114** (2007) 793–803.

[3] H.L. Bodlaender, *On the complexity of some coloring games*, Internat. J. Found. Comput. Sci. **2** (1991) 133–147.

[4] T. Dinski and X. Zhu, *A bound for the game chromatic number of graphs*, Discrete Math. **196** (1999) 109–115.
doi:10.1016/S0012-365X(98)00197-6

[5] P. Erdős and A. Hajnal, *On chromatic number of graphs and set-systems*, Acta Math. Acad. Sci. Hungar. **17** (1966) 61–99.
doi:10.1007/BF02020444

[6] L. Esperet and X. Zhu, *Game colouring of the square of graphs*, Discrete Math. **309** (2009) 4514–4521.
doi:10.1016/j.disc.2009.02.014

[7] U. Faigle, U. Kern, H. Kierstead and W.T. Trotter, *On the game chromatic number of some classes of graphs*, Ars Combin. **35** (1993) 143–150.

[8] M. Gardner, *Mathematical games*, Scientific American **244(4)** (1981) 18–26.

[9] H.A. Kierstead, *A simple competitive graph coloring algorithm*, J. Combin. Theory Ser. B **78** (2000) 57–68.
doi:10.1006/jctb.1999.1927

[10] H.A. Kierstead and W.T. Trotter, *Planar graph coloring with an uncooperative partner*, J. Graph Theory **18** (1994) 569–584.
doi:10.1002/jgt.3190180605

[11] A. Theuser, Die spielchromatische Zahl der Potenz eines Graphen, Diploma Thesis (FernUniversität in Hagen, 2014), in German.

[12] J. Wu and X. Zhu, *Lower bounds for the game colouring number of partial k-trees and planar graphs*, Discrete Math. **308** (2008) 2637–2642.
doi:10.1016/j.disc.2007.05.023

[13] D. Yang, *Coloring games on squares of graphs*, Discrete Math. **312** (2012) 1400–1406.
doi:10.1016/j.disc.2012.01.004

[14] X. Zhu, *The game coloring number of planar graphs*, J. Combin. Theory Ser. B **75** (1999) 245–258.
doi:10.1006/jctb.1998.1878

[15] X. Zhu, *The game coloring number of pseudo partial k-trees*, Discrete Math. **215** (2000) 245–262.
doi:10.1016/S0012-365X(99)00237-X

[16] X. Zhu, *Refined activation strategy for the marking game*, J. Combin. Theory Ser. B **98** (2008) 1–18.
doi:10.1016/j.jctb.2007.04.004

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