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Critical groups of covering, voltage and signed graphs. (English) Zbl 1281.05072
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Summary: Graph coverings are known to induce surjections of their critical groups. Here we describe the kernels of these morphisms in terms of data parametrizing the covering. Regular coverings are parametrized by voltage graphs, and the above kernel can be identified with a naturally defined voltage graph critical group. For double covers, the voltage graph is a signed graph, and the theory takes a particularly pleasant form, leading also to a theory of double covers of signed graphs.

MSC:

05C22 Signed and weighted graphs

Cited in 4 Documents

Keywords:

covering; signed; voltage; critical; sandpile group; crown; functorial; morphism

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References:

- [1] Abdollahi, A., Determinants of adjacency matrices of graphs, *Trans. Combin.*, 1, 9-16, (2012) · [Zbl 1272.05107](#)
- [2] Bacher, R.; de la Harpe, P.; Nagnibeda, T., The lattice of integral cuts and lattice of integral flows of a finite graph, *Bull. Soc. Math. France*, 125, 167-198, (1997) · [Zbl 0891.05062](#)
- [3] Bai, H., On the critical group of the n -cube, *Linear Algebra Appl.*, 369, 251-261, (2003) · [Zbl 1023.05096](#)
- [4] Baker, M.; Norine, S., Riemann-rosch and Abel-Jacobi theory on a finite graph, *Adv. Math.*, 215, 766-788, (2007) · [Zbl 1124.05049](#)
- [5] Baker, M.; Norine, S., Harmonic morphisms and hyperelliptic graphs, *Int. Math. Res. Not. IMRN*, 2914-2955, (2009) · [Zbl 1178.05031](#)
- [6] Berget, A., Critical groups of graphs with reflective symmetry · [Zbl 1284.05121](#)
- [7] Berget, A.; Manion, A.; Maxwell, M.; Potechin, A.; Reiner, V., The critical group of a line graph, *Ann. Combin.*, 16, 449-488, (2012) · [Zbl 1256.05095](#)
- [8] Berman, K. A., Bicycles and spanning trees, *SIAM J. Algebr. Discrete Methods*, 7, 1-12, (1986) · [Zbl 0588.05016](#)
- [9] Biggs, N., Algebraic potential theory on graphs, *Bull. Lond. Math. Soc.*, 29, 641-682, (1997)
- [10] Godsil, C.; Royle, G., (Algebraic Graph Theory, Graduate Texts in Mathematics, vol. 207, (2001), Springer-Verlag New York) · [Zbl 0968.05002](#)
- [11] Gross, J. L.; Tucker, T. W., Generating all graph coverings by permutation voltage assignments, *Discrete Math.*, 18, 273-283, (1977) · [Zbl 0375.55001](#)
- [12] Jacobson, B.; Niedermaier, A.; Reiner, V., Critical groups for complete multipartite graphs and Cartesian products of complete graphs, *J. Graph Theory*, 44, 231-250, (2003) · [Zbl 1031.05064](#)
- [13] Lorenzini, D., A finite group attached to the Laplacian of a graph, *Discrete Math.*, 91, 277-282, (1991) · [Zbl 0755.05079](#)
- [14] J. Machacek, The critical group of a line graph: the bipartite case, Bachelors Thesis, U. Minnesota, 2011. See www.math.umn.edu/~reiner/HonorsTheses/Machacek.pdf
- [15] Perkinson, D.; Perlman, J.; Wilmes, J., Primer for the algebraic geometry of sandpiles · [Zbl 1320.05060](#)
- [16] D. Treumann, Functoriality of Critical Groups, Bachelors Thesis, U. Minnesota, 2002. See www.math.umn.edu/~reiner/HonorsTheses/Treumann.pdf
- [17] Tseng, D., Graph coverings and critical groups of signed graphs and voltage graphs, univ. of minnesota REU report, (2012), See www.math.umn.edu/~reiner/REU/Tseng2012.pdf
- [18] Urakawa, H., A discrete analogue of the harmonic morphism and Green kernel comparison theorems, *Glasg. Math. J.*, 42, 319-334, (2000) · [Zbl 1002.05049](#)
- [19] Waller, D. A., Double covers of graphs, *Bull. Aust. Math. Soc.*, 14, 233-248, (1976) · [Zbl 0318.05113](#)
- [20] Zaslavsky, T., Signed graphs, *Discrete Appl. Math.*, 5, 248-74, (1983), (Erratum) · [Zbl 0503.05060](#)

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