

Automorphism groups and branched coverings of graphs

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In this lecture we give a short survey of the results about branched coverings of graphs. This notion was introduced independently by many authors. See, for example, paper [1] for one of the first expositions and paper [2] for the list of references. The branched covering of graphs are also known as harmonic maps or vertically holomorphic maps of graphs. The main idea of the present talk is to create a parallel between classical results on branched covering of Riemann surfaces and those for graphs. We introduce the notion of harmonic automorphism for graph and discuss the upper and lower bounds for the number of harmonic automorphisms acting on the graph of a prescribed genus. We give a few discrete versions of the Wiman, Oikawa and Arakawa theorems for graphs. We present also some statements of the Lefschetz fixed point theorem for graphs.

References

- [1] T. D. Parsons, T. Pisanski, P. Jackson, Dual imbeddings and wrapped quasi-coverings of graphs, *Discrete Mathematics*, Vol. 31, No. 1, 43–52 (1980).
- [2] B. Baker, S. Norine, Harmonic morphisms and hyperelliptic graphs, *Int. Math. Res. Notes*, Vol. 15, 2914–2955 (2009).