

Marcin Stawiski

AGH University of Science and Technology

AXIOM OF CHOICE IN PROPER AND DISTINGUISHING COLOURINGS

Call a graph *locally finite* if all of its vertices have finite degree. We say that a vertex or an edge colouring of the graph G is *distinguishing* if the only automorphism of G which preserves the colouring is the identity. This concept was first studied by Babai [1] in 1977 and it is connected to his recent proof of the existence of quasipolynomial algorithm for the graph isomorphism problem [2]. Distinguishing colourings for infinite graphs were first studied by Imrich, Klavžar and Trofimov [4] in 2007.

We investigate the existence of distinguishing and proper colourings without the assumption of Axiom of Choice. For proper vertex colourings this was investigated by Galvin and Komjáth [3]. In particular, we are interested if there exists a colouring of a locally finite connected graph with at most countable number of colours.

References

- [1] L. Babai, *Asymmetric trees with two prescribed valences*, Acta Mathematica Academiae Scientiarum Hungaricae, 29, 1977, pp. 193–200.
- [2] L. Babai, *Graph isomorphism in quasipolynomial time*, arXiv:1512.03547.
- [3] F. Galvin, P. Komjáth, *Graph colorings and the axiom of choice*, Periodica Mathematica Hungarica, 22, 1991, pp. 71–75.
- [4] W. Imrich, S. Klavžar, V. Trofimov, *Distinguishing infinite graphs*, Electronic Journal of Combinatorics, 14(1), 2007, #R36.