

# Arc-distinguishing of orientations of graphs

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A distinguishing index of a graph is the minimum number of colours in an edge colouring such that the identity is the only automorphism that preserves the colouring. The study of the distinguishing index was started by Kalinowski and Piłśniak [2] and since then, there have been a number of results on the subject. In particular, the optimal bounds for the distinguishing index have been found for the classes of traceable or claw-free graphs. Recently, the variant of the problem for digraphs has attracted some interest. A distinguishing index of a digraph is the minimum number of colours in an arc colouring that is preserved only by the identity. In particular, results for symmetric digraphs have been obtained [3].

Meslem and Sopena [4] started a study of determining the minimum and maximum value of distinguishing index among all possible orientations of a given graph  $G$ . We continue this direction of investigation. However, we take a different approach to the problem and consider the relation between the distinguishing index of the orientations of  $G$  and the distinguishing index of  $G$ . In the talk, we present sharp results for trees, unbalanced bipartite graphs, traceable graphs and claw-free graphs. With this, we extend the results of Meslem and Sopena to some wider classes of graphs and answer a question posed by them about the class of complete bipartite graphs.

## References

- [1] A. Gorzkowska, J. Kwaśny, Arc-distinguishing of orientations of graphs, arXiv:2402.16169.
- [2] R. Kalinowski, M. Piłśniak, Distinguishing graphs by edge-colourings, European J. Combin. 45 (2015) 124–131.
- [3] R. Kalinowski, M. Piłśniak, M. Prorok, Distinguishing arc-colourings of symmetric digraphs, Art Discrete Appl. Math. 6 (2023) P2.04.
- [4] K. Meslem, E. Sopena, Distinguishing numbers and distinguishing indices of oriented graphs, Discrete Appl. Math., 285 (2020) 330–342.

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