

3-colourability and forbidden subgraphs

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We call G an H -free graph, if G does not contain H as an induced subgraph. In a class of *bull*-free graphs, i.e. graphs which does not contain as an induced subgraph a triangle with two additional edges attached to its two vertices, the 3-colourability problem remains NP-complete. However, in the class of graphs defined by two forbidden subgraphs, *bull* and one of stars $S(1, 1, 2)$ or $S(1, 2, 2)$, it is possible to find a polynomial algorithm that resolves 3-colourability. Such an algorithm returns a colouring if the given graph is 3-colourable, or a certain subgraph which is obviously non-3-colourable, otherwise.

In this talk we present such algorithms for $(\textit{bull}, S(1, 1, 2))$ -free and $(\textit{bull}, S(1, 2, 2))$ -free graphs. The main tool used is the characterisation of perfect graphs given by the Strong Perfect Graph Theorem.

References

- [1] B. Randerath, I. Schiermeyer: Polynomial χ -binding functions and forbidden induced subgraphs: a survey, *Graphs Combin.* 35 (2019), 1–31.
- [2] N. Hodur, M. Piłśniak, M. Prorok, I. Schiermeyer: On 3-colourability of (\textit{bull}, H) -free graphs, arXiv:2404.12515, 2024.

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