Graph parameters and graph polynomials: Definability and complexity

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Course given in Prague, 2014, in the DOC-COURSE series

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Graph polynomial project:
http://www.cs.technion.ac.il/~janos/RESEARCH/gp-homepage.html

Outline of the course

LECTURE 00: Second Order Logic (SOL) and its fragments (Background, not lectured)
LOGICS (14 slides)

LECTURE 01: Friday, Oct 10, 2014, 14:00-15:40, Prague Lecture 1,
A landscape of graph parameters and graph polynomials. Comparing graph parameters. Towards a general theory.
(90 minutes, 90 slides with skip-options)

LECTURE 02: Thursday, Oct 16, 2014, 12:20-14:00 Prague Lecture 2,
Why is the chromatic polynomial a polynomial? Where to graph polynomial occur naturally? Definability of graph properties and graph polynomials in fragment of Second Order Logic.
(90 minutes, ca. 99 slides with skip options)

LECTURE 03: Thursday, Oct 16, 2014, 14:30-16:00 Prague Lecture 3,
Connection matrices for graph parameters. When do connection matrices of graph parameters have finite rank? Connection matrices for graph parameters definable in fragments of Second Order Logic. The finite rank theorem. Using connections matrices to prove non-definability.
(90 minutes, ca. 55 slides with skip options)

Further links to the literature.

Further links

[arXiv] J.A. Makowsky's Graph Polynomial Go to **Homepage** at `http://www.cs.technion.ac.il/~janos/RESEARCH/gp-homepage.html`

[KMR 2013] J. A. Makowsky T. Kotek and E. V. Ravve, **A computational framework for the study of partition functions and graph polynomials**. In Proceedings of the 12th Asian Logic Conference ?11, pages 210?230, 2013. download at `http://www.cs.technion.ac.il/~janos/RESEARCH/alcpaper.pdf`

[GKM 2012] B. Godlin, E. Katz and J. A. Makowsky, **Graph Polynomials: From Recursive Definitions to Subset Expansion Formulas**. J. Log. Comput. 22(2): 237-265 (2012) download at `http://www.cs.technion.ac.il/~janos/RESEARCH/GodlinKatzMakowsky.pdf`

[M 2008] J.A. Makowsky, **From a Zoo to a Zoology: Towards a general theory of graph polynomials**, Theory of Computing Systems, 2008. download at `http://dx.doi.org/10.1007/s00224-007-9022-9`

More links

Further links, II

[arXiv] J.A. Makowsky's papers at `http://arxiv.org/find/all/1/au:+Makowsky/0/1/0/all/0/1?per_page=100` on **arXiv**.

[dblp] J.A. Makowsky's papers at `http://www.informatik.uni-trier.de/~ley/pers/hd/m/Makowsky:Johann_A=.html` on **DBLP**.

[google] J.A. Makowsky's papers at `http://scholar.google.co.il/citations?hl=en&user=ooNKL6UAAAAJ&pagesize=100&view_op=list_works` at **scholar.google**.

[Course notes] J.A. Makowsky's Course notes.

[PhD Theses] PhD Theses on graph polynomials (a selection)

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Further links: Course notes

Slides of courses on graph polynomials and related topics:

Technion 2005/6 Lecture notes of **Advanced Topics in Computer Science (238900)**

Technion 2009/10 Lecture notes of **Advanced Topics in Computer Science (236605)**

Vienna 2014 Lecture notes of **EMCL Lecture 2014: Graph polynomials**

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Further links: PhD Theses

PhD Theses on graph polynomials and related topics:

I. Averbuch PhD Thesis (Technion 2011): **Completeness and Universality Properties of Graph Invariants and Graph Polynomials**

T. Kotek PhD Thesis (Technion 2012): **Definability of combinatorial functions**

M. Trinks PhD Thesis (TU Freiberg 2012): **Graph Polynomials and Their Representations**

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