Comenius University Bratislava
Faculty of Mathematics, Physics and Informatics

THESIS ASSIGNMENT

Name and Surname:	Bc. Lukáš Gáborik
Study programme:	Computer Science (Single degree study, master II. deg., full time form)
Field of Study:	Computer Science
Type of Thesis:	Diploma Thesis
Language of Thesis:	English
Secondary language:	Slovak

Title: New approaches to nowhere-zero flow problems

Annotation: This work builds on the results of the bachelor thesis of the same author. The newly introduced notion of multidimensional Manhattan and Chebyshev flows still leaves some possibilities for further research like finding lower bounds on flow numbers. One of the main results of the mentioned bachelor thesis is the introduction of the conjecture asserting that each bridgeless graph admits a (1,2)-circulation decomposition, that is a 2-circulation and a 4-circulation such that whenever the 2-circulation is zero on any edge, the 4-circulations can not attain 0, +1 or -1. This offers wide possibilities of exploration including various generalisations where further requirements are posed on the flow values.

Aim:
1. Prove nontrivial lower bounds on 2-dimensional Chebyshev flow number of a graph.
2. Explore possible ways of proving the conjecture that each bridgeless graph admits a (1, 2)-circulation decomposition, and other related conjectures. Prove this conjecture for some infinite families of snarks, eventually for some snarks that are far from being colourable (e.g. with oddness 2, perfect matching index 4, …)
3. Research other generalisation of flows potentially useful in the context of the abovementioned conjecture.

Supervisor:	Mgr. Jozef Rajník, PhD.
Department:	FMFI.KI - Department of Computer Science
Head of department:	prof. RNDr. Martin Škoviera, PhD.
Assigned:	21.11.2024
Approved:	05.12.2024

prof. RNDr. Rastislav Kráľovič, PhD.
Guarantor of Study Programme

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Student

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Supervisor