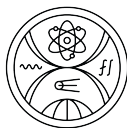


New approaches to nowhere-zero flow problems

Master thesis

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21st January 2025

Nowhere-zero k -flows

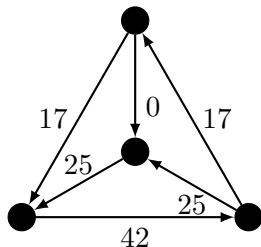


Figure: 43-flow

- ▶ assignment of values $0, 1, 2, \dots, k - 1$ to edges
- ▶ Kirchhoff's law in vertices

Nowhere-zero k -flows

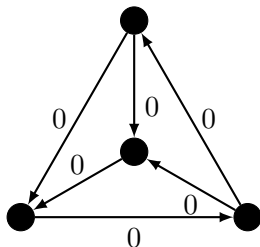


Figure: 1-flow

- ▶ assignment of values $0, 1, 2, \dots, k - 1$ to edges
- ▶ Kirchoff's law in vertices
- ▶ this allowing trivial cases
- ▶ restrict zero flow values

Nowhere-zero k -flows

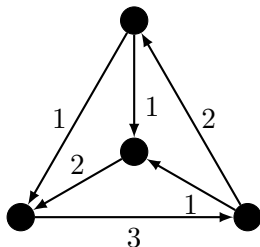


Figure: NZ 4-flow, $\Phi(K_4) = 4$

- ▶ assignment of values $0, 1, 2, \dots, k - 1$ to edges
- ▶ Kirchoff's law in vertices
- ▶ this allowing trivial cases
- ▶ restrict zero flow values
- ▶ graph with NZ k -flow has also a NZ $(k + 1)$ -flow
- ▶ rate of graph complexity
- ▶ flow number $\Phi(\Gamma)$ – minimum