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Geru: Optimising Data Gathering in Resource-constrained Networks

http://www.hiit.fi/ada/geru

The *Geru* project conducts fundamental algorithmic research on data gathering in wireless sensor networks. Our focus is on computationally efficient methods, computational complexity, and mathematically provable bounds of optimality.

The research project is funded by the Academy of Finland during the years 2007–2009. The project constitutes a continuation of the work undertaken in the Academy of Finland project Networking and Architecture in Proactive Systems (NAPS, 2003–2005).

Researchers

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Publications

[1] P. Floréen, P. Kaski, J. Suomela. A distributed approximation scheme for sleep scheduling in sensor networks. *Proc. SECON 2007*.

[2] J. Suomela. Approximability of identifying codes and locating-dominating codes. *Information Processing Letters* 103:28–33, 2007.

[3] P. Floréen, P. Kaski, T. Musto, J. Suomela. Local approximation algorithms for scheduling problems in sensor networks. *Proc. Algosensors 2007*.

[4] P. Kaski, A. Penttinen, J. Suomela. Coordinating concurrent transmissions: A constant-factor approximation of maximum-weight independent set in local conflict graphs. *Proc. AdHoc-NOW 2007*.

[5] P. Floréen, P. Kaski, T. Musto, J. Suomela. Approximating max-min linear programs with local algorithms. *Proc. IPDPS 2008*.

[6] P. Floréen, M. Hassinen, P. Kaski, J. Suomela. Tight local approximation results for max-min linear programs. *Proc. Algosensors 2008*.

[7] V. Polishchuk, J. Suomela. Optimal backlog in the plane. *Proc. Algosensors 2008*.

[8] A. Efrat, S.P. Fekete, P.R. Gaddehosur, J.S.B. Mitchell, V. Polishchuk, J. Suomela. Improved approximation algorithms for relay placement. *Proc. ESA 2008*.

[9] P. Kaski, A. Penttinen, J. Suomela. Coordinating concurrent transmissions: A constant-factor approximation of maximum-weight independent set in local conflict graphs. *Ad Hoc & Sensor Wireless Networks* 6:239–263, 2008.

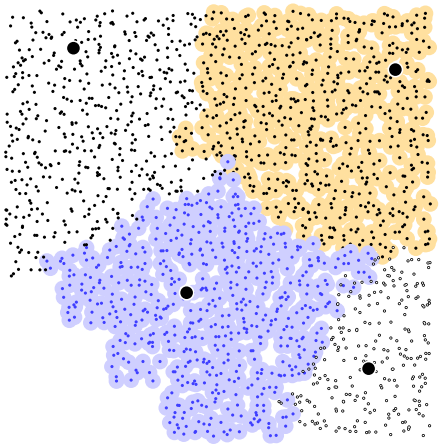
[10] V. Polishchuk, J. Suomela. A simple local 3-approximation algorithm for vertex cover. *Information Processing Letters* 109:642–645, 2009.

[11] P. Floréen, J. Kaasinen, P. Kaski, J. Suomela. An optimal local approximation algorithm for max-min linear programs. *Proc. SPAA 2009*.

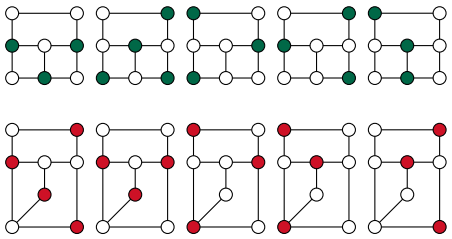
[12] M. Åstrand, P. Floréen, V. Polishchuk, J. Rybicki, J. Suomela, J. Uitto. A local 2-approximation algorithm for the vertex cover problem. *Proc. DISC 2009*.

[13] P. Floréen, P. Kaski, V. Polishchuk, J. Suomela. Almost stable matchings by truncating the Gale–Shapley algorithm. *Algorithmica*, to appear.

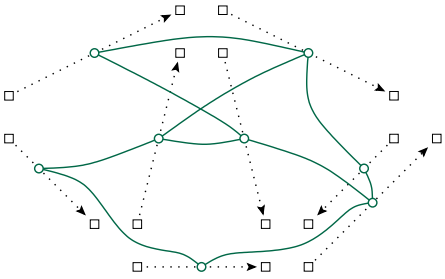
[14] C. Lenzen, J. Suomela, R. Wattenhofer. Local algorithms: self-stabilization on speed. *Proc. SSS 2009*.



Given a suitable set of anchor nodes (large dots), a sensor network can perform sleep scheduling near-optimally by using a *local approximation algorithm* where each sensor needs information from its local neighbourhood only [1].



A *sleep schedule* consists of dominating sets and associated time periods; an *activity schedule* consists of independent sets and associated time periods [3].



A wireless networks and a *local conflict graph*. In local conflict graphs, maximum-weight independent set can be approximated within a constant factor but there is no PTAS [4, 9].