HÖGSKOLAN
I HALMSTAD

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Abstract:

Self-stabilizing TDMA Algorithms for Timeslot Assignment and Alignment in Wireless Ad-hoc Networks without External Reference

Time division multiple access (TDMA) is a method for sharing communication media. In wireless communications, TDMA algorithms often divide the radio time into timeslots of uniform size, \xi, and then combine them into frames of uniform size, \tau. We consider TDMA algorithms that allocate at least one timeslot in every frame to every node. Given a maximal node degree, \delta, and no access to external reference, we consider the problem of the existence of collision-free self-stabilizing TDMA algorithms that have constant communication delay of \tau.
We demonstrate that this problem has no solution when \tau <= max((2-\epsilon)\delta,\chi), where \epsilon>0, and \chi is the chromatic number for distance-2 vertex coloring. We observe the bound relevance to the bandwidth utilization when the network topology is a planar graph. As a complement to this lower bound, we focus on proving the existence of probabilistic collision-free self-stabilizing TDMA algorithms that have constant communication delay of \tau. We consider basic settings (no hardware support for collision detection and no prior clock synchronization), and the collision of concurrent transmissions from transmitters that are at most two hops apart. In the context of self-stabilizing systems that have no external reference, we are the first to study this problem (to the best of our knowledge).

Bio:

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Elad Michael Schiller received his M.Sc., and B.Sc. in Mathematics and Computer Science from Ben-Gurion University of the Negev, Israel and a Ph.D. in Computer Science from the same university (2006). His research excellence has been acknowledged by several highly competitive research fellowships from the Israeli government and the Swedish government. He is now an associate professor in the Department of Computer Science and Engineering at Chalmers University of Technology. Elad has published in top tier venues (including PODC, DISC, OPODIS, SPAA, SRDS, IEEE-TMC, IEEE-TPDS and Acta Inf.). He has co-authored more than 30 conference/journal papers. He served on the program committees for several international conferences, including SSS, DISC and AlgoSensors. His research interests include distributed computing, with special emphasis on self-stabilizing algorithms, wireless communications, and game theory.