Distributed Algorithm for Node Localization in Wireless Ad-Hoc Networks

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5-minutes-4-slides LISHA presentention

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Getting inside

- The problem: “node localization”
- The solution: ~~computational geometry~~

  Reducing to an optimization problem [Biswas and Ye 2004]

$$F(x_1, \ldots, x_n) = \sum_{(i,j)\in N_r} \left|r_{ij}(x_i, x_j)\right|^2 + \sum_{(i,k)\in N_s} \left|s_{ik}(x_i)\right|^2$$

  - Minimize a function F(x1, x2, ..., xn) = “how far xi is from its true position”

Optimization and distributing

- Assumption: we aready have a initial estimative of our position

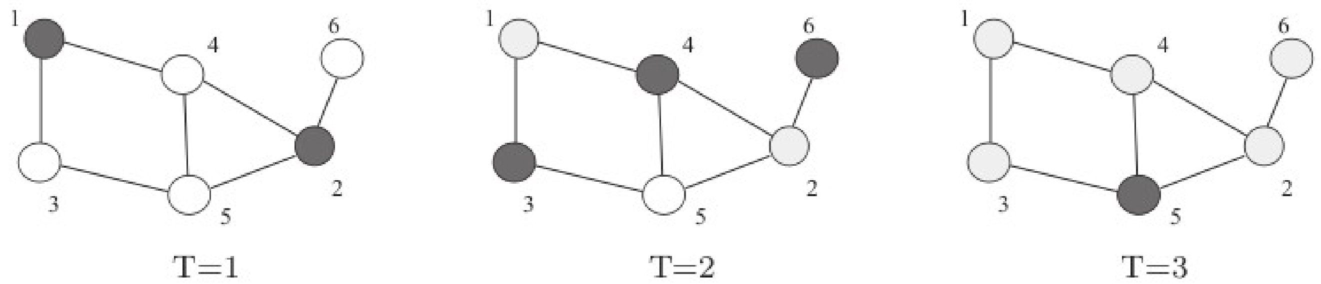
  Calculate our estimative and broadcast it!

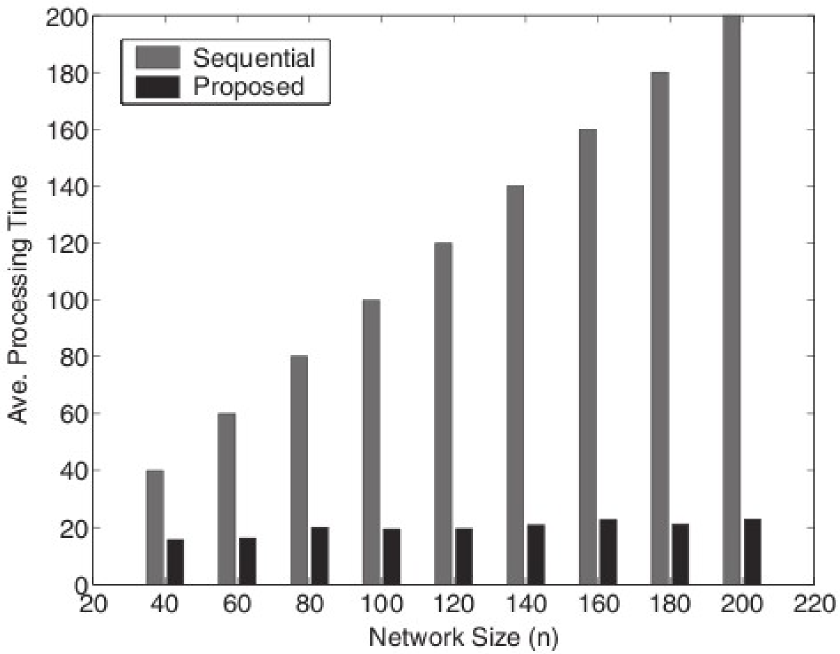
- Iterative methods: Gauss-Seidel, Gauss-Newton

$$x_i^{(t)} = min\,F\left(x_1^{(t+1)}, \ldots, x_i, x_{i+1}^{(t)}, \ldots, x_n^{(t)}\right)$$

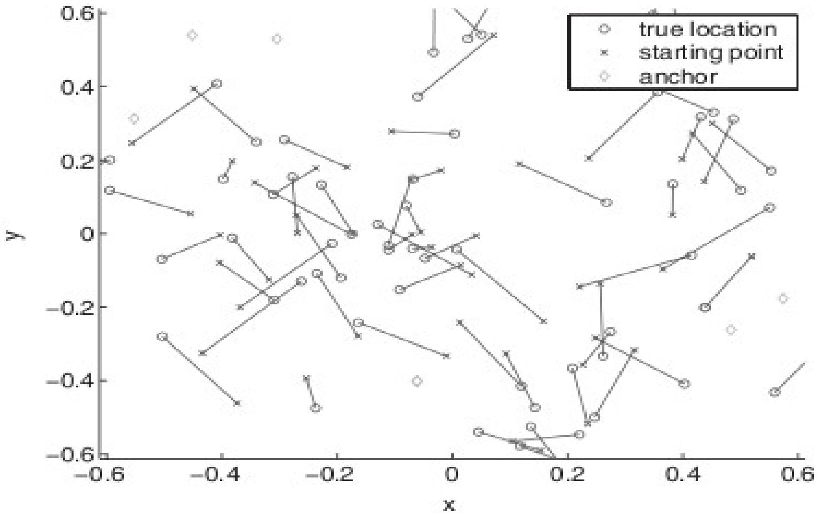
1. Calculate (iteratively) your estimated position
2. Broadcast it to neibohring nodes

The scheduling

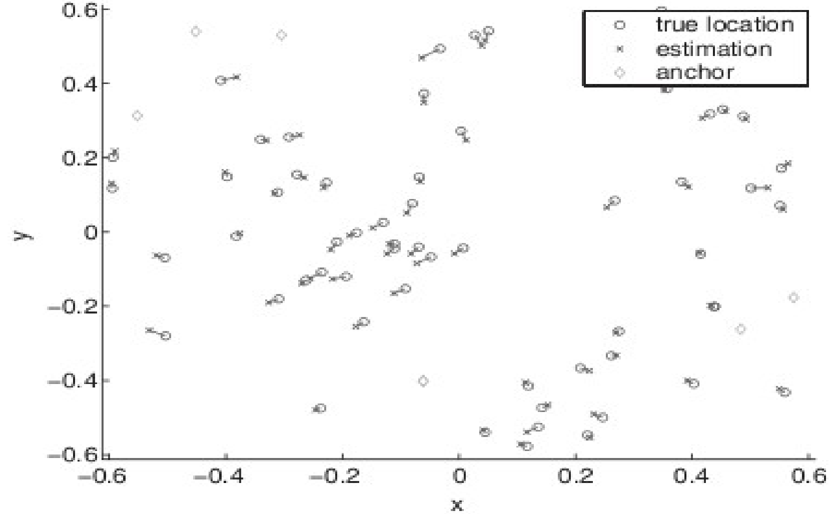




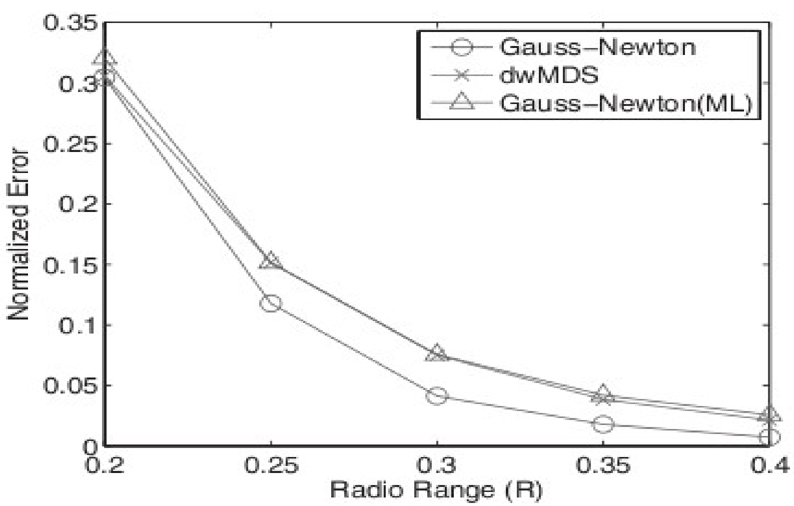
Some results



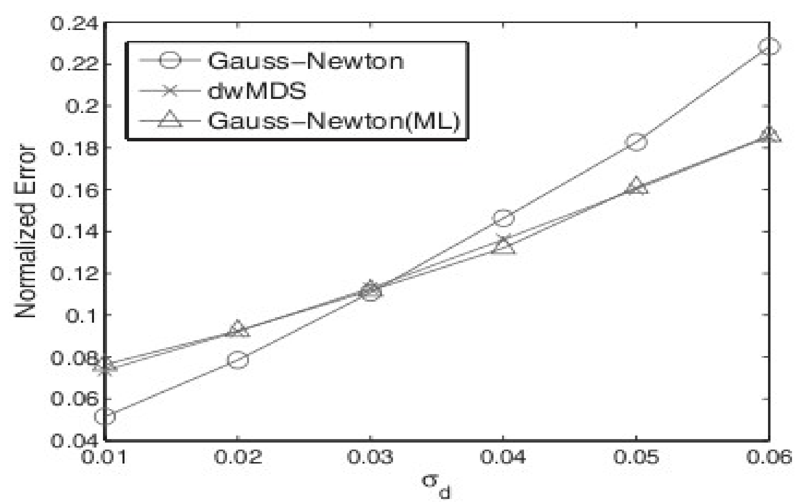
(a) initial estimates



(b) estimation results



(a) radio range variation



(b) noise level variation