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An Error-Minimizing Framework for Localizing Jammers in Wireless Networks

Abstract:

Jammers can severely disrupt the communications in wireless networks, and jammers' position information allows the defender to actively eliminate the jamming attacks. Thus, in this paper, we aim to design a framework that can localize one or multiple jammers with a high accuracy. Most of existing jammer-localization schemes utilize indirect measurements (e.g., hearing ranges) affected by jamming attacks, which makes it difficult to localize jammers accurately. Instead, we exploit a direct measurement—the strength of jamming signals (JSS). Estimating JSS is challenging as jamming signals may be embedded in other signals. As such, we devise an estimation scheme based on ambient noise floor and validate it with real-world experiments. To further reduce estimation errors, we define an evaluation feedback metric to quantify the estimation errors and formulate jammer localization as a nonlinear optimization problem, whose global optimal solution is close to jammers' true positions. We explore several heuristic search algorithms for approaching the global optimal solution, and our simulation results show that our error-minimizing-based framework achieves better performance than the existing schemes. In addition, our error-minimizing framework can utilize indirect measurements to obtain a better location estimation compared with prior work.

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