Distributed Sequential Location Estimation of a Gas Source via Convex Combination in WSNs

Localization of the hazardous gas source plays an important role in the protection of public security, since it can save a lot of time for subsequent rescue works. For gas source localization (GSL), a large number of gas sensor nodes can be rapidly deployed to construct a wireless sensor network (WSN) and cover the whole concerned area. Although least-squares (LS) methods can solve the problem of GSL in WSNs regardless of the distribution of measurement noises, centralized LS methods are not power efficient and robust since they require the gathering and processing of large-scale measurements on a central node. In this paper, we propose a novel distributed method for GSL in WSNs, which is performed on a sequence of sensor nodes successively. Each sensor node in the sequence conducts an individual estimation and a convex combination. The individual estimation is inspired by the LS formulation of the problem of GSL in WSNs. The proposed method is fully distributed and computationally efficient, and it does not rely on the absolute location of the sensor nodes. Extensive simulation results and a set of experimental results demonstrate that the success rate and localization accuracy of the proposed method are generally higher than those of the trust-region-reflective method.