CURRICULUM VITAE

Guangyang Zeng

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EDUCATION

- **Ph.D. Candidate**, (Sep. 2017 – present)
  College of Control Science and Engineering, Zhejiang University, Hangzhou, P.R.China
  Advisor: Peng Cheng.
  Co-advisor: Junfeng Wu.
  Thesis Proposal: Research on Multi-sensor Data Fusion Algorithms in Target Sensing
- **B.Eng.**, (Sep. 2013 – Jun. 2017)
  College of Control Science and Engineering, Zhejiang University, Hangzhou, P.R.China
  Outstanding Graduate

RESEARCH INTERESTS

Statistical inference, Distributed detection, Localization, Multi-sensor fusion, Anti-drone systems.

AWARDS AND HONORS

- Third Prize of the 16th "Challenge Cup" Extracurricular Academic and Technological Works Competition of College Students in Zhejiang Province, Zhejiang Province, China 2019
- Outstanding Graduate, Zhejiang University, China 2017
- Second Prize of Mathematical Modeling Competition of Zhejiang University, Zhejiang University, China 2016
- Third-class Scholarship for Outstanding Students, Zhejiang University, China 2014, 2015
- First Prize of Physics Innovation Competition for College Students in Zhejiang Province, Zhejiang Province, China 2014

PROJECTS

- Intrusion Detection and Counteraction of "Low-Slow-Small" Aircraft for iCPS Security, The Fundamental Research Funds for the Central Universities (2017XZZX009-01)
- Small UAV Intrusion Detection Based on Swarm Intelligence Perception, National Natural Science Foundation of China (No.61772467)

PAPERS

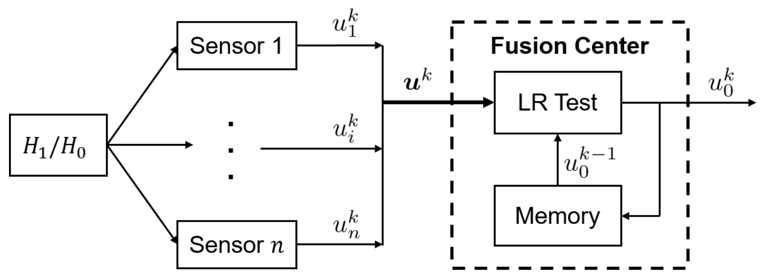
[1] ***Guangyang Zeng***, Junfeng Wu, Xiufang Shi, and Zhiguo Shi, "A Novel Decision Fusion Scheme with Feedback in Neyman-Pearson Detection Systems", ***The 56th Annual Allerton Conference on Communication, Control, and Computing,*** Urbana-Champaign, USA, 2018.

[2] ***Guangyang Zeng***, Xiaoqiang Ren, and Junfeng Wu, "Low-complexity Distributed Detection with One-bit Memory Under Neyman-Pearson Criterion", ***IEEE Transactions on Control of Network Systems,*** conditionally accepted.

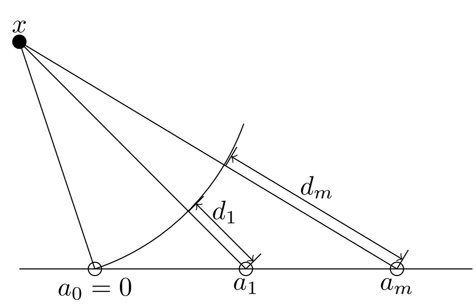
[3] ***Guangyang Zeng***, Biqiang Mu, Jieqiang Wei, Wing Shing Wong, and Junfeng Wu, "Localizability with Range-Difference Measurements: Numerical Computation and Error Bound Analysis", ***IEEE/ACM Transactions on Networking,*** under the 2nd round review.

RESEARCH DESCRIPTION

- **Sequential Distributed Detection**
  We consider a multi-stage distributed detection scenario, where n sensors and a fusion center (FC) are deployed to accomplish a binary hypothesis test. At each time stage, local sensors generate binary messages, assumed to be spatially and temporally independent given the hypothesis, and then upload them to the FC for global detection decision making. We suppose a one-bit memory is available at the FC to store its decision history and focus on developing iterative fusion schemes. We first visit the detection problem of performing the Neyman-Pearson (N-P) test at each stage and give an optimal algorithm, called the oracle algorithm, to solve it. Structural properties and limitation of the fusion performance in the asymptotic regime are explored for the oracle algorithm. We notice the computational inefficiency of the oracle fusion and propose a low-complexity alternative, for which the likelihood ratio (LR) test threshold is tuned in connection to the fusion decision history compressed in the one-bit memory. The low-complexity algorithm greatly brings down the computational complexity at each stage from $O(4^n)$ (worst case) to $O(n)$. We show that the proposed algorithm is capable of converging exponentially to the same detection probability as that of the oracle one. Moreover, the rate of convergence is shown to be asymptotically identical to that of the oracle algorithm. Finally, numerical simulations and real-world experiments demonstrate the effectiveness and efficiency of our distributed algorithm.



- **TDOA-based Source Localization**
  This work studies the localization problem using noisy range-difference measurements, or equivalently time difference of arrival (TDOA) measurements. There is a reference sensor, and for each other sensor, the TDOA measurement is obtained with respect to the reference one. By minimizing the sum of squared errors, a nonconvex constrained least squares (CLS) problem is formulated. In this work, we focus on devising an algorithm to seek the global minimizer of the CLS problem, hoping that the numerical solution meets some precision requirement in terms of relative error. Based on the Lagrangian multiplier method, we first branch the feasible Lagrangian multiplier set into several subsets and develop a workflow in terms of if-then-else control structure to seek the global minimizer by searching for the optimal Lagrangian multiplier. The execution order is carefully organized so that it is in line with the general principle of putting the flow that one normally understands to be executed first. We then dive into detailed searching methods in different cases and conduct computational error analysis, giving the error bound on the Lagrangian multiplier, when we search for it, to meet the precision requirement on an approximate solution. Based on the above achievements, a programmable global minimizer seeking algorithm is proposed for the CLS problem. Simulations and experimental tests on a public dataset demonstrate the effectiveness of the proposed algorithm.



- **Drone Detection Based on Heterogeneous Sensor Fusion**
  The abuse of amateur drones has resulted in emerging threats to personal privacy and public security. To alleviate these threats, we have designed an anti-drone system that integrates multiple sensors, including microphones, RF antennas and cameras. How to fuse these heterogeneous data to enhance detection performance is a challenging problem. We apply specific methods for each kind of sensors to produce some probabilities about the existence of a drone. Then we use the copula theory to depict the complex and non-linear correlations among these probabilities. However, the correlations are generally nonstationary, we will further investigate the adaptive algorithm to select copula models based on the observed environment state.