Angela Marino

Target detection and localization via active/passive radars

Tutor: Augusto Aubry co-Tutor: Paolo Braca

Cycle: XXXV Year: 2019-2020

My background

- **Master Science degree:** Telecommunication Engineering at the University of Naples, “Federico II”
- **Research group/laboratory:** Radar Signal Processing and Electronic Defense Research Group (RSPRG)
- **PhD start date:** 01/11/2019
- **Scholarship type:** funded by NATO Science and Technology Organization - Centre for Maritime Research and Experimentation

Research field of interest

Radar Signal Processing

- FDA-MIMO radar
- Passive Bistatic Radar
- Adaptive Target Detection
- Target Localization

Summary of study activities

Study activities

- Advanced Radar Techniques
- Detection and Localization Theory
- Optimization Theory
- Statistical signal processing
- Radar Tracking Algorithms

Ad hoc PhD courses / schools

- Intelligenza Artificiale ed Etica: La ricercar in IA alla prova delle sfide etiche
- Deep Learning for Computer Vision: Classification, Segmentation, and Recognition
- Scientific Programming and Visualization with Python
- Matlab Fundamentals
- Innovation management, entrepreneurship and intellectual property
- Machine Learning
- Strategic Orientation for STEM Research & Writing

Courses attended borrowed from MSc curricula:

- Tecniche Di Elaborazione Dei Segnali Per la Bioingegneria

Conferences / events attended

- 2020 IEEE Radar Conference (Florence, Italy), Sept. 2020 (1 paper presented)

Summary of study activities

	Courses	Seminars	Research	Tutorship	Total
Bimonth 1	1.9	0	3	0	4.9
Bimonth 2	0	0.2	6	0	6.2
Bimonth 3	4	1	7	0	12
Bimonth 4	5	4.6	6	0	15.6
Bimonth 5	4	0.2	6	0	10.2
Bimonth 6	12,6	2.4	6	0	21
Total	**27.5**	**8.4**	**34**	**0**	**69.9**
Expected	20 - 40	5 - 10	10 - 35	0 - 1.6	

Research activity: Overview

- Problem
  - Target localization through the joint use of co-located PBR and active radar.
- Objective
  - Development of advanced target position estimate algorithm, jointly accounting for PBR and active radar information.
  - Overcoming the intrinsic fixed-acquisition-rate limitations of the active rotating platform (provisioning of gap filler capabilities to the surveillance system).
- Intended contribution
  - Formalization of ad-hoc constraints for the localization process accounting for PBR receive antenna mainbeam size and active radar data.
  - Definition of the position estimation problem resorting to the constrained Least Squares estimation paradigm.
  - Design of an efficient optimization algorithm (via KKT condition exploitation) to globally solve the formulated non-convex optimization problem and determine the location estimate in closed-form.
  - Improvement of the position estimate quality with respect to some localization algorithms counterparts, for both static and dynamic scenario.

Research activity: Overview

- Problem
  - Design of novel adaptive detection architectures exploiting the GLRT criterion.
- Objective
  - Development of advanced receivers to reliably detects targets in FDA-MIMO radars.
  - Estimate the range of detected targets.
- Intended contribution
  - Development of an algorithm to determine the ML estimates of all unknown parameters (under both the hypothesis) as well as the devising of some low complexity sub-optimal counterparts.
  - Near to benchmarks detection performance.

Products

[C1]	L. Lan, A. Marino, A. Aubry, A. De Maio, G. Liao, and J. Xu, "Design of adaptive detectors for FDA-MIMO radar", IEEE 11th Sensor Array and Multichannel Signal Processing Workshop, SAM 2020, Published, 2020.
[C2]	L. Lan, A. Marino, A. Aubry, A. De Maio, G. Liao, and J. Xu, "Design of adaptive detectors for FDA-MIMO radar", IEEE 11th Sensor Array and Multichannel Signal Processing Workshop, SAM 2020, Published, 2020.
[J1]	L. Lan, A. Marino, A. Aubry, A. De Maio, G. Liao, and J. Xu, "GLRT-Based Adaptive Target Detection in FDA-MIMO Radar", IEEE Transactions on Aerospace & Electronic Systems, IEEE TAES. Accepted, 2020.
[C3]	A. Marino, A. Aubry, A. De Maio, and P. Braca, "2D Constrained PBR Localization Via Active Radar Designation" ,2020 IEEE Radar Conference (Florence, Italy), Sept. 2020, RadarConf20. Published, 2020.
[J2]	A. Aubry, P. Braca, A. De Maio, and A. Marino, "2D PBR Complying with Constraints Forced by Active Radar Measurements", IEEE Transactions on Aerospace & Electronic Systems, IEEE TAES. Under revision (RQ),2020.

Thank you for your kind attention.