MFI 2024: Tutorial proposal

Title

Introduction to Electronic Intelligence (ELINT) and Electromagnetic Surveillance (ES)

Intended Audience

Students and professionals with an interest in Electromagnetic Warfare and Electronic Intelligence. No background knowledge required.

Description

Dominance in the Electromagnetic Spectrum (EMS) plays an increasing role in modern conflict scenarios. Technological advancements raise the complexity of electromagnetic signals, which makes reconnaissance and surveillance a challenging task. State-of-the-art radar systems are increasingly agile and hence cannot be recognised or identified with traditional approaches. Moreover, the crowded spectrum makes it easier to hide potentially threatening activities.

This tutorial provides a beginner-friendly introduction to Electronic Intelligence (ELINT) and Electromagnetic Surveillance (ES), two critical components of modern electromagnetic warfare and reconnaissance. ELINT involves the collection, analysis, and exploitation of radar signals for intelligence purposes, while ES refers to the techniques and systems used to detect, locate, and identify sources of electromagnetic emissions. By intercepting and analysing electromagnetic signals, these disciplines provide valuable information about capabilities, intentions, and activities in the EMS.

After locating ELINT and ES in the bigger context of intelligence and electromagnetic warfare, we will cover the components of the ELINT and ES processing chain, such as radar signal interception, signal analysis techniques, and emitter identification. Attendees will learn about the basics as well as how artificial intelligence (AI) can be used within individual workflow components and inspire additional applications. Some selected research insights highlighting applications and advancements in ELINT and ES will be presented. Furthermore, the meaningful integration of human operators into the processing chain is an important topic that will also be addressed.

By the end of this tutorial, attendees will have a solid foundation in ELINT and ES, enabling them to comprehend their role in electromagnetic warfare and intelligence domains.

Biographies

Snezhana Jovanoska earned her degree in Electrical Engineering and Computer Science from Jacobs University Bremen and completed her Dr.-Ing. in Electrical Engineering at Ilmenau University of Technology in 2020, focusing on UWB sensor-based detection, localization, and tracking of people. She is currently a research associate at the Sensor, Data and Information Fusion department at Fraunhofer FKIE in Wachtberg, Germany, where she develops and enhances ELINT and ES techniques. Her research interests include radar signal analysis, classification, multi-target tracking, and data fusion techniques. Her previous tutorial experience includes short courses on Multi-Sensor Data Fusion at the International Microwave Symposium 2014 and the European Microwave Week 2017.

Isabel Schlangen holds a German Diploma in mathematics from the University of Bonn (Germany) and a joint M.Sc. degree in vision and robotics from the University of Burgundy, France; University of Girona, Spain; Heriot-Watt University, Edinburgh, UK. In 2017, she received the Ph.D. degree from Heriot-Watt University for her research on multi-object filtering with second-order moment statistics. She is a research associate with Fraunhofer FKIE, Wachtberg, Germany, working on multi-object estimation, resource management, and signal intelligence applications. Previously, she gave tutorials on different aspects of single- and multi-target tracking at Fusion 2016, the UDRC Summer School 2017, and the CCG Seminar SE 2.18, 2024.