



Synthetic Aperture Radar

Synthetic Aperture Radar (SAR) is the state-of-the-art imaging radar which achieves fine along-track resolution by taking the advantage of its platform motion to synthesize an extremely large antenna. From single frequency, single polarization systems, SAR sensors have advanced to multi-frequency (multi-spectral), multi-polarization (polarimetric), and three-dimensional imaging (interferometric) systems. SAR technology has provided terrain structural information to geologists, oil spill boundaries on water to environmentalists, sea state and ice hazard maps to navigators, reconnaissance and targeting information to military operations, and more. This course is aimed to provide a comprehensive overview of the SAR technology, with special emphasis on practical SAR system design and signal processing.

About Go Training

Go Training applies effective pedagogical methodologies that demonstrate case studies and hands-on practical skills, in addition to explaining clearly how things work in principle. Every course that we conduct is delivered by a subject matter expert who holds the academic qualification and working experience in that specialization. On the days when they are not teaching, our trainers work on consultancy projects and technical deliveries. Their work has received numerous recognition and awards in the industry. Our team of trainers has been invited as keynote speakers at numerous international conferences, and as principal consultants for various industries.

Date: 19-23 Oct 2015
(Monday - Friday)
Time: 0900 - 1700
Venue: No. 36, Jalan IMJ 1,
Taman Industri Malim Jaya,
75250 Melaka, Malaysia.

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Course Outline

Module 1: SAR Theory Review

Introduction to SAR

- Overview of SAR Theory
- History of Synthetic Aperture Radar
- Modes of Operation
- Applications of SAR Data

The Radar Equation

- Power Considerations
- The Antenna Properties for Side-Looking Radar
- Radar Cross Section
- System Noise
- The Radar Equation for a Point/Distributed Target

Matched Filtering and Pulse Compression Techniques

- Matched Filter Concept
- Pulse Compression Technique
- Range Compression
- Azimuth Compression

Hands-on Session: Demonstrating SAR concepts via Matlab simulations

Module 2: SAR System Design

SAR Design Parameters

- SAR Equations
- SAR Geometry and Spatial Resolutions
- SNR and Power Requirements
- Signal Processing Parameters

Subsystem Design-1: Antenna and RF

- Overall System Block Diagram
- Design Considerations
- Microstrip SAR Antenna Design
- RF Transmitter Design
- RF Receiver Design

Subsystem Design-2: SAR Recording and Processing Unit

- System Specifications
- Chirp Generation
- Timing Control
- High Speed AD DA Design
- Embedded Processor and FPGA-based Design

System Integration

- Overall System Block Diagram
- SAR Calibration and Experiment
- Flight Mission Planning

Hands-on Session: Exercises on SAR System Design and Measurement

Module 3: SAR Signal Processing

SAR Signal Modeling

- Generic System Model
- Point Scatterer Response
- One Dimensional Image Formation

SAR Processing Algorithms

- Range-Doppler Algorithm
- Chirp Scaling Algorithm
- w-k Algorithm

Raw Data Processing in Practice

- Data Formatting
- Fast Fourier Transform
- Range Compression
- Azimuth Compression
- Image Formation and Presentation

Motion Errors and Compensation

- Image Formation in the Presence of Motion Errors
- Motion Compensation Techniques
- SAR Autofocusing

Hands-on Session: Practical SAR Signal Processing using Matlab

About the Course Coordinator

Ir. Prof. Dr. Koo Voon Chet received his B.Eng (Hons) in Electrical Engineering from the University of Malaya in 1997. He obtained his MEngSc and PhD in Microwave Engineering from the Multimedia University, Malaysia in 1999 and 2005, respectively. His research interest includes synthetic aperture radar design, SAR signal processing, and embedded system design. Prof Koo has vast R&D and industrial experience related to radar system and embedded design. He has been a principal consultant for various government agencies and engineering firms since 2000. He is also the recipient of the inaugural Young Engineer Award by the Institution of Engineers, Malaysia in 2004. Prof. Koo is presently the Chairperson of the Centre for Remote Sensing and Surveillance Technologies, MMU, and Chairperson of the IEEE Geoscience and Remote Sensing Society Chapter, Malaysia Section. He is also the co-founder of iRadar Sdn. Bhd., a technology-based company providing smart sensing solutions.



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