ARDICLABS
integrated sensing solutions

AL733 – Integrated Navigation Course

Day 1, Morning

Introduction to Inertial Navigation

- Inertial navigation
- Integration architectures
- Example applications

Random Processes

- Random variables
- Covariance matrices
- Random processes

Kalman Filter

- Kalman Filter
- State Augmentation
- Error Analysis
- Nonlinear Systems

Afternoon

Inertial Navigation Mechanization

- Rotational and Translational Motion Eqns.
- Gravity Model
- Navigation Equations

Navigation System Errors

- Perturbation Error Model
- Navigation Error Dynamics

Loosely Coupled INS-GPS Design

- Measurement Processing
- Filter Design and Tuning
- Navigation System Update

Day 2, Morning

Introduction to Terrain Referenced Navigation

- Terrain Aided Navigation
- Concepts
- Modes
- Example Systems
- Applications

Correlation Based Techniques (TERCOM)

- Concept
- Application
- Terrain Roughness
- Critical Issues

Afternoon

Continuous Terrain Referenced Navigation

- Filters
- Measurement Models
- Critical Issues

Terrain Referenced Navigation System

- Modes of operation
- Example systems
- Functions
- Current situation

Day 3, Morning

Introduction to Image Based Navigation

- Introduction
- Landmarks
- Reference Models
- Requirements

Camera Projection

- Imaging Geometry
- Camera Parameters
- Perspective Projection

Pose Estimation-I

- Introduction
- Points and Lines
- Cost Functions

Afternoon

Pose Estimation-II

- LM Method
- Sensitivity
- Camera Parameters

Image/Model Matching-I

- IIR Examples
- Model Structure
- Matching Techniques

Image/Model Matching-II

- Low Cost Munitions
- Related Problems
- Target Models
- ATR Approach

Day 4, Morning

Celestial Navigation

- Introduction
- Coordinate Systems
- Direction Vector

Observation Geometry and Descriptors

- Projective Geometry
- Descriptors
- Sensitivity

Attitude

- Star Centroid
- Attitude Determination
- Example System

Afternoon

GNSS Overview

- GNSS Overview
- Trilateration
- GNSS Signal Structure

GPS L1 Signal Structure

- GPS Receiver Structure
- Ephemeris Data
- Almanac Data

GPS Raw Data

- Satellite Position Calculation
- GPS Errors
- Pseudorange and Delta Range
- User Position calculation
- Computer Demo