AKADEMIKA

PULSED RADAR TRAINING SYSTEM

Features:

- Real time Modular System with facility for min 5 concurrent users to access the radar. (Expandable to 100 Users using Cloud Server)
- Teacher Log-in to start the Radar and Students can Log in to conduct exercises independently real-time.
- Allows users to manipulate live and pre-recorder IQ data from the Radar and work independently on the Modular Block diagram Editor based software with large libraries of Scopes, Filers and Algorithms
- Allows students to play on Radar Signal Conversion Chain by changing signal conversion functions like (STC, DC Suppress, MTI etc.) at different stages concurrently - and independently.
- View multiple A-Scope, B-Scope and PPI –Scope at various stages of the Radar Block Diagram enabling to compare the results and analyze results.
- Modular for future upgrades by adding Modules like Air Traffic Control Modules to meet the requirements of ATCO (Air Traffic Controller) and ATSEP (Air Traffic Security Electronics Personal) curriculum

Curriculam

- Understanding the main components of a radar system.
- Familiarize with the A-Scope , B-Scope & PPI scope of Radar.
- Measuring the Range Resolution of the Radar .
- The Radar Equation.
  - Showing the dependence of the transmitter power and the amplitude.
  - Showing the dependence of the target's distance (range) and the amplitude.
  - Showing the dependence of the antenna gain and the amplitude.
- Radar Cross Section.
  - Showing the dependence of target size and the amplitude.
  - Showing the dependence of target angel and the amplitude.
  - Showing the dependence of target shape and the amplitude.
  - Showing the dependence of target material and the amplitude.
- Sensitivity Time Control.
- Constant False Alarm Rate (CFAR) 1D and 2D
  - Comparing static threshold and 1D and 2D CFAR
  - Cleaning the PPI Screen with CFAR.
- Moving the Target Indication (MTI) .
- Raw I and Q Signals .
  - I and Q Signals in Radar Applications.
  - Understanding the Relationship of Movement and IQ signals.
- Measuring the Antenna Beam Width.
  - Measure the beam antenna half power beam width.
- Introduction into the dB Scale .
  - Measure the half power value in dB.
- FFT and the Doppler Effect.
- Generating plots and tracks as required as defined in ICAO DOC 4444.
- Improve the traditional moving target indication MTI with an image-enhancing post processing
- Conduct moving target detection MTD and understand the difference to MTI
- Apply MTD with Doppler Filter and understand the difference to another movement analysis algorithms
- Apply and analyze standing person recognition algorithms as required e.g. in autonomous mobility
- Creating own complex filters for moving or standing targets
- Improving or varying known composite algorithms
- Improving the radar image by adding additional processing

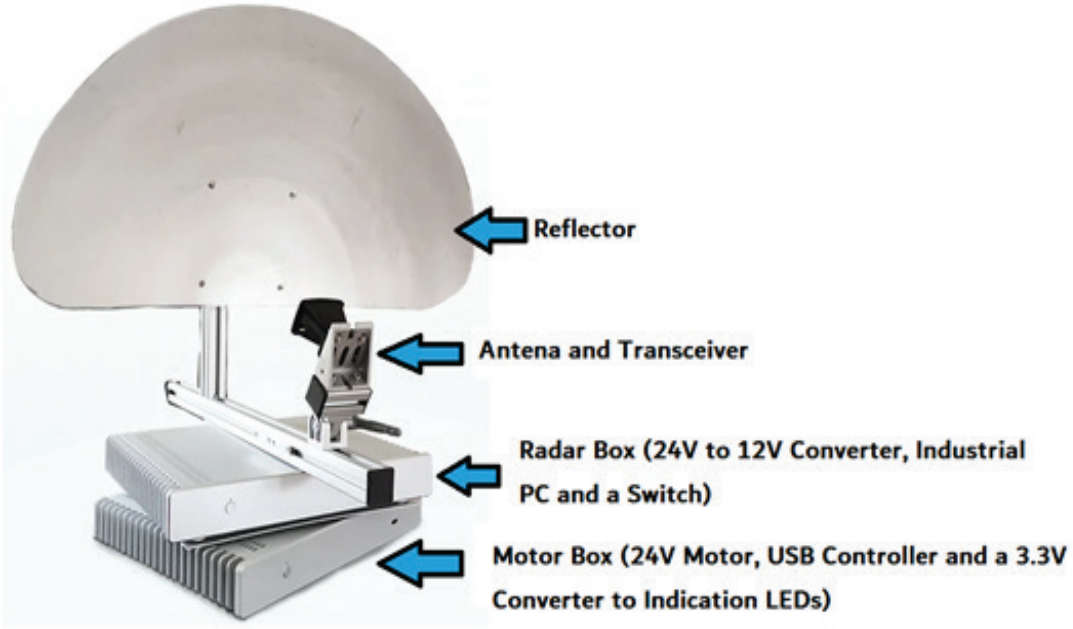
NextGen8GHzPulseRadarTraining System

Technical Specifications

- Range Resolution: better than 10.6 cm
- Range: up to 30 m (when using the parabolic reflector)
- Tx center frequency (ETSI / KCC): 7.29 GHz / 8.748 GHz
- Tx bandwidth (ETSI): 1.4 GHz
- Pulse Width: 0.5 nsec (Gaussian)
- Peak Pulse output power (ETSI): -0.7 - 6.3 dBm
- Max pulse repetition frequency. 90 Hz
- Rx sampling rate: 23.3 GS/s
- Rx gain (ETSI): 12.3 - 15 dB
- Rx noise figure (ETSI): 5.4 - 8.8 dB

Deliverables

-one (1) transceiver and antenna unit 8 GHz,
-one (1) digital signal processing unit (DSP)
-one (1) horn-shaped antenna with adjustable inclination
-one (1) parabolic reflector with adjustable inclination
-one (1) motor control unit (only activated when rotary unit is added)
-one (1) cable set.



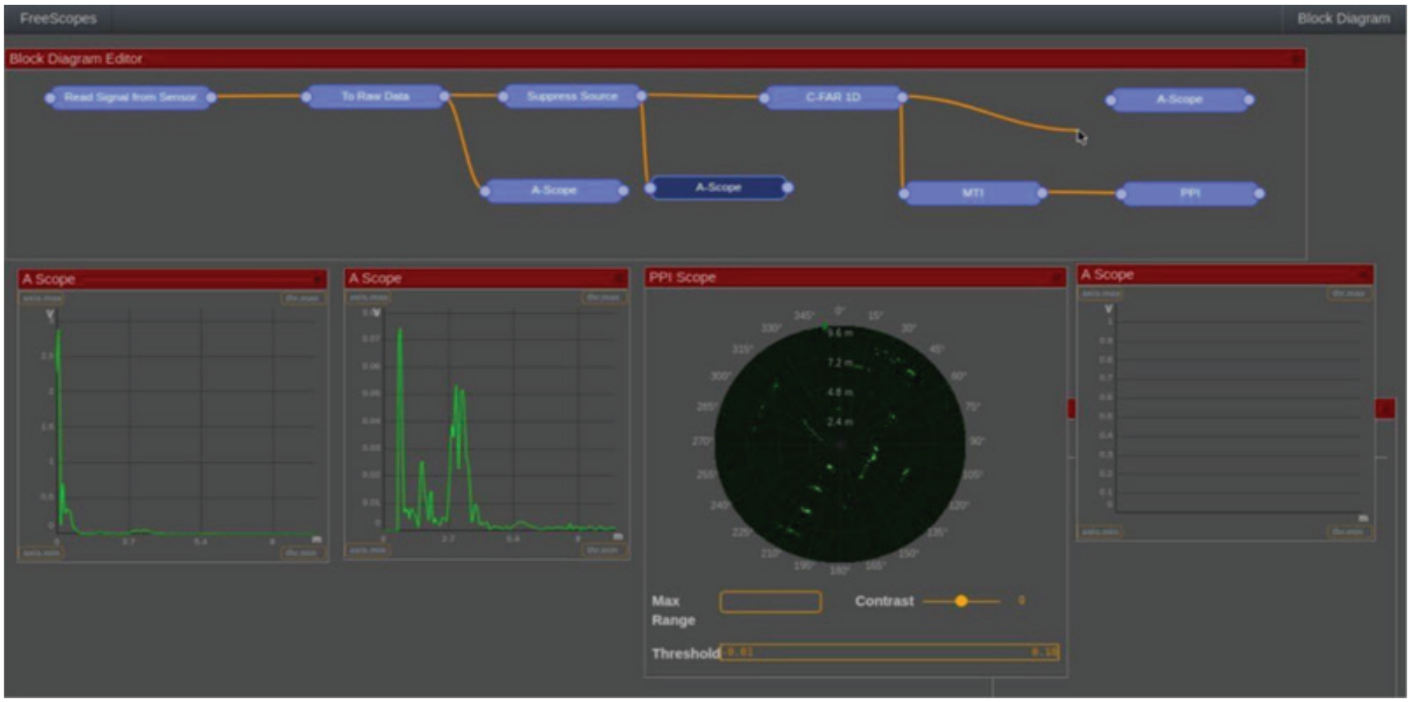
Target Positioning Module

In contrast to traditional target tables, the target is not spatially limited. The system is able to carry various radar targets that are connectable to the target system without the requirement of any tools. Different targets / materials representing various radar cross-sections (RCS) are supplied with the Radar Training System, including a corner reflector (retro-reflector) consisting of three mutually perpendicular, intersecting flat surfaces and two spheres. The device is able to rotate, to rotate the reflectors representing various cross sections.

Deliverables

One (1) Wireless Mobile track vehicle including batteries
One (1) remote controller including batteries
Three (3) targets (01- Corner Reflector and 2 Spheres of different diameter)

Local Web-Server based Radar Control and Data Analysis Software (FreeScope)



1	Graphical User Interface	▸ Modular Block diagram Editor with large libraries of Scopes, Filers and Algorithms. ▸ Capable to joining each block independently and view Signal on the Scope ▸ Control Centre for the Teacher Log-in to Control the Hardwar Parameters Like Motor Rotation and Setting Transmitter Power
2	A-Scope/ PPI Scope/ B-Scope/	▸ Facility to change the threshold to cut noise and small clutter and facility to select a specific section on the Y-Axis ▸ Facility to view multiple A-Scope/ PPI Scope/ B-Scope at various stages of the Radar Block Diagram enabling to compare the results and Analyze results.
3	3-D Scope	▸ Facility to view the 3D (X-Y Axis is A-Scope data and Z –Y Axis is the B Scope Data)
4	Programming Interface	▸ ReadsI and Q data from the Pulse Radar Transceiver, via Programming Interface (Web-API) and capability to use it with MATLAB software for further processing. ▸ JSON File format to be used to feed data to MATLAB

Algorithms & Filters

5	Suppress Source	▸ To clean the scopes from strong reflections of Radar Source. Slider to vary the Size in meters
6	Sensitivity Time Control	▸ Facility to change the exponent of amplification along the range
7	I-Q Splitter	▸ Facility to read I-Q Data as Magnitude and also to filter I and or Q Signal and Plot it
8	Moving Target Identification	▸ Facility to change the order defining which previous pulse to be compared with the current
9	Constant False Alarm Rate in 1D and 2 D	▸ Facility to define the probability of false alarm and detection ▸ Facility to change the size of the observation window to estimate the noise floor
10	Spectogram	▸ Should provide frequency representation of signal in Log Scale
11	Range Select	▸ Facility to focus on the Specific subset of the Range
12	Windowing Technique	▸ Blackman , Hamming ,Hann
13	Fast Fourier Transform	▸ Facility to enable data capture in time domain and display in frequency domain
14	Row and Column Selector	▸ Facility to select only one specific Vector signal matrix for further processing

Air Traffic Control Module

1	Plots Extractor Algorithm	▸ Processes raw data from a surveillance sensor. ▸ Must distinguish target data from: Weather clutter, Ground clutter, Noise, both internal and external and Other objects,
2	Radar Tracks	Should provide Information like ▸ Machine speed (available for all tracks) ▸ History (available for all tracks) ▸ Predict vector
3	Labels	Labels should include: ▸ Aircraft label, Speed vector, Leader Line, Track Symbol ▸ History Dots
4	Algorithms	▸ iMM (interactive Multiple Model) ▸ Kalman filter, ▸ Zero Velocity filter ▸ Clutter Map subtraction ▸ Signal Delay Block

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