Perception Development Kit - RDI Interface

1 Description

Each sensor transmits two sets of data: A RDI list for the near scan and a RDI (Radar Detection Image) list for the far scan. Both lists include a mutable list of detections with the same definition.

The customer's computer receives all radar data and optionally computes a fused representation of the environment. The data is provided by a generic Ethernet socket based interface via the serialization protocol Google protocol buffers ("protobuf").

The raw data detections of the ARS430-Eth radars are provided in a format, called Radar Detection Interface (RDI).

This format provides for each radar detection the following attributes:

Attribute per detection i		**Comments**
r_i	Radial distance (m)	
$v_{r,i}$	Radial relative velocity (m/s)	
φ_{ij}	Azimuth angle (°)	in sensor coordinates, alignment corrected
RCS_{ij}	RCS	
$Prob_{ij}$	Probability of ambiguity (%)	

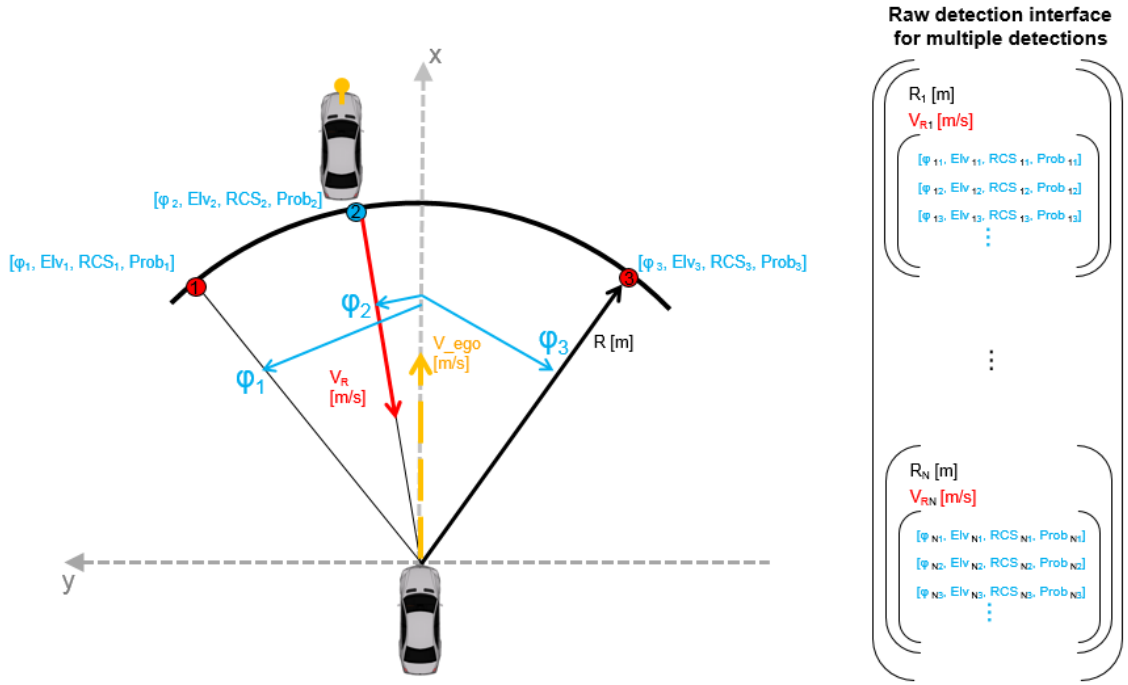

Figure 1 - Radar Detection Interface

2 Signal List

Each radar sends three messages: Radar Status, Radar Detection Image and Radar Detection List. The Radar Status message provides information on the Sensor ID, version and network configuration. The Radar Detection Image Message is provided two times, one for the far range scan and one for the near range scan. It shows the overall number of detections and angular hypothesis. It also contains the Radar Detection List. This message provides the attributes of each detection.

2.1 Radar Status

Signal	Description	Unit
u_SensorId	Sensor ID	uint32
a_SWVersion	ARS firmware version	ByteMultiArray
u_InterfaceVersion	ARS interface version	uint32
u_Ethernet_IP	Current IP address	uint32
a_Ethernet_MAC	Current MAC address	ByteMultiArray
u_Ethernet_VLAN	Current VLAN	uint32
a_SerialNumber	Sensor serial number	ByteMultiArray

2.2 Radar Detection Image

Signal	Description	Unit
u_SensorId	Sensor ID	uint32
e_SignalStatus	Status of the signals in the data packet e_SignalStatus_init = 0 e_SignalStatus_ok = 1 e_SignalStatus_invalid = 2	uint8

f_Vambig	Doppler ambiguity free range [m/s] Range: -100 - 100 [m/s]	float32
u_NofDetections	Number of available detections	uint32
u_NofAngleHypothesis	Number of angle hypothesis	uint32
a_RadarDetectionList	List of radar detections	RadarDetection[]

2.3 Radar Detection List

Signal	Description	Unit
f_Range	radial distance between sensor and detection [m]	float32
f_VrelRad	unambiguous relative velocity in radial direction [m/s]	float32
a_AzAng_hyp	aligned azimuth angle for two most likely hypothesis [rad]	float32
a_RCS_hyp	compensated RCS for two most likely hypothesis [dBm^2]	float32
a_Prob_hyp	probability of azimuth hypothesis	float32
f_RangeVar	variance of range [m^2]	float32
f_VrelRadVar	variance of VrelRad [(m/s)^2)	float32
f_AzAngVar	variance of AzAng [rad^2]	float32
f_Pdh0	false alarm probability	float32

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