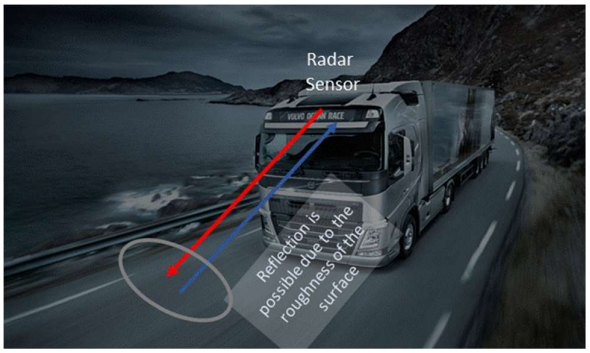
MCCX02-21-04

Road surface recognition at mm-wavelengths using a polarimetric radar

Background



Thin formations of ice on road surfaces contribute to traffic accidents in winter and cause many casualties all over the world. A radar sensor capable of detecting ice in front of a moving car can deliver warning to the driver or to the control system of the vehicle. Mm-wavelengths are attractive for traffic safety related applications due to their short wavelengths, which allow building compact antennas in combination with availability of technology and frequency spectrum. However, at mm-wavelengths the road surface appears to be a distributed target with many random scatters contributing to the reflection. Distributed targets are inherently random, and a single measurement is not sufficient to extract reliable information about its surface properties. Therefore, a statistical *method* must be adopted. In this project we want to use polarimetric attributes such as target entropy (TE), which is a measure of target disorder and polarimetric pedestal (PP), which is a measure of the degree of depolarization generated by the target, to analyze the surface.

Problem description

The final goal of the project is to build a polarimetric radar operating at 80 GHz that can be installed on a vehicle and used to evaluate road surface in real traffic conditions. The RF part will have 2 transmitters (Tx) and 2 receivers (Rx): one Tx/Rx pair for horizontal and one Tx/Rx for vertical polarization.

Workflow

To build the radar you will use a mm-wave radar sensor evaluation kits, which are commercially available from, for example, Texas Instruments (TI)[1]. You will need to suggest and implement a solution able to stream raw data from the radar sensor, process the data in real time and evaluate the properties of the surface. A successful completion of the project will make the suggested method for surface characterization very attractive for commercialization.

Your background

A team of 3, to 6 students from one of the following programs:

Teknisk fysik, Elektroteknik, Datateknik

Contact

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[1] AWR1443 single-chip 76-GHz to 81-GHz automotive radar sensor evaluation module