High resolution mono- and bistatic SAR imaging by using a novel modular Radar transmitter and multi-channel receiver system

This work is the continuation of the development of radar sensors within the HITCHHIKER project. While in the first phase of this noise technology related project, the main focus was on the development of the noise transmitter system, the navigation system and the calibration devices as well as on the signal processing in half stationary SAR and on ISAR configurations, now the airborne mono- and bistatic experiments will have to be prepared and performed.

There are some improvements planned for the hardware setup: The SAR sensor on the one hand will be equipped with a larger signal bandwidth (>650 MHz) than before; on the other hand the recording system now enables the continuous streaming of data over a long period of time (in the minute range, depending on duty cycle). As a consequence there are a lot of new possible geometries and configurations to choose from and to evaluate. The new transmitter system contains an integrated arbitrary waveform generator (AWG), which can be switched on and off alternately to the noise source. This enables for the first time a comparison of the (low cost) noise waveform and a standard radar signal source having identical parameters and conditions for the acquisition of the data.

After finalization and calibration of the system, we will plan and realize different mono- and bistatic airborne SAR experiments. These experiments are necessary showing the usability of noise technology for imaging radar. Individual issues like mission planning and data fusion using GNSS and IMU data will have to be solved during this project part.

The main focus lies on the further development of algorithms for multistatic ISAR and SAR applications, in particular looking at computational efficiency, precise mapping of the surroundings and later usability for interferometric and topographic SAR. This also comprises the analysis and correction of the radar data using corner reflectors, transponders and ground truth position measurements. The SAR results obtained by using noise or frequency modulated (classical) waveforms will be analyzed and compared.

The continuation of the project will provide a basis for future novel investigations of the University of Siegen in the field of environmental monitoring using a powerful SAR sensor. The use of a noise source for airborne SAR applications and its signal processing is innovative for the SAR community.

I Project Management and Execution

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