NON-DESTRUCTIVE RADAR CHARACTERIZATION OF SOILS AND MATERIAL

KEYWORDS

- Materials characterization
- Non-destructive
- Radar antenna

Technology Market:

The radar processing algorithms and measurement protocols underlying non-destructive electromagnetic characterization support:

Efficient and accurate modeling and calibration of any type of radar antenna system

Application-specific radar antenna systems are modeled in an intrinsic and efficient way through a near-field/far-field calibration procedure. The model in particular accounts for mutual coupling between the antennas as well as between the antennas and the medium with unprecedented computing efficiency and modeling accuracy, leading to robust and accurate medium reconstruction.

Full-wave radar data inversion for wave propagation in planar layered media:

Application-specific inversion strategies are defined for retrieving the electromagnetic properties, i.e., permittivity and conductivity, as well as layer thickness of locally planar layered media through 3-D, “exact” Maxwell’s equation solutions. Frequency dependence of the electromagnetic properties can be retrieved as well, depending on the information content in the radar data. Super resolution is achieved.

Application areas

Digital soil mapping (e.g., for soil moisture retrieval), road inspection, material property characterization and monitoring (e.g., quality control in production chains)… for both industries and research centers.

The UCL invention

Given an ultra-wideband hyper frequency radar system, operating either in the time of frequency domain, processing algorithms are implemented to retrieve the electromagnetic properties of a locally planar medium through full-wave inversion. The radar model in particular accounts for antenna effects including coupling with the medium and is computationally optimal through its intrinsic character. The antennas are characterized through a calibration procedure which provides antenna specific, frequency-dependent complex coefficients. Other existing techniques fail to properly account for complex, near-field antenna-medium coupling, which results in inherent errors in the estimates.

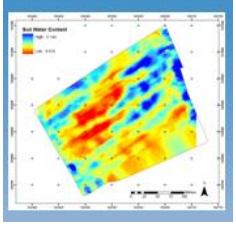
Technology Status

This work is the subject of patent application PCT/EP2012/055416, 2012-03-27 (Publication WO2012130847).

(Internal file reference number UCL-023)

System design

Product



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INTERESTED TO DEVELOP AND / OR COMMERCIALISE THIS TECHNOLOGY?

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