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Polarimetry for material characterization in remote sensing applications

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When an optical beam interacts with matter its polarization state can change as a function of certain properties of the material (refractive index, surface roughness, ⋯) and the beam characteristics. Therefore, small differences in such properties can cause the material to reflect or transmit the same polarized incident beam differently. Consequently, measurements of polarization can be used as a technique to characterize materials. The information provided by polarization techniques can enable accurate studies of a variety of sample condition properties (existence and orientation of surface defects, stress patterns, coating microstructure, ⋯) and it can provide an additional degree of freedom in order to remotely obtain further information about samples.
Polarimetry is the name for a family of optical methods based on measurement and interpretation of the polarization of electromagnetic waves. In order to measure, visualize, and utilize this polarization information, polarimeters are needed. Polarimetry has a strong potential for remote sensing applications. In particular, the information about the sample obtained via polarization measurements could be used for material characterization when considering anisotropic or depolarizing samples. In this context, we are studying the benefits of introducing polarimetric techniques to enhance the detected information and to improve the accuracy of material recognition in order to develop new types of sensors.
In this presentation, I will present a brief overview of polarimetry and the phenomenological reasons for designing polarimetric sensors. Also, I will describe the polarimetric facility developed at the CF-UM-UP and the benefits of introducing polarimetric techniques to expand the volume and nature of the acquired information. In particular, I will focus on the use of polarimetry for increasing material recognition performance.

Scientific Area

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