Informational limits in optical polarimetry and vectorial imaging

Foreman, Matthew R., author

Abstrak

Central to this thesis is the characterisation and exploitation of electromagnetic properties of light in imaging and measurement systems. To this end an information theoretic approach is used to formulate a hitherto lacking, quantitative definition of polarisation resolution, and to establish fundamental precision limits in electromagnetic systems. Furthermore rigorous modelling tools are developed for propagation of arbitrary electromagnetic fields, including for example stochastic fields exhibiting properties such as partial polarisation, through high numerical aperture optics. Finally these ideas are applied to the development, characterisation and optimisation of a number of topical optical systems, polarisation imaging, multiplexed optical data storage, and single molecule measurements. The work has implications for all optical imaging systems where polarisation of light is of concern.