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Troubleshooting Sketchup Stokes Problems Using Spectroscopic Stokes Additional Parameter Based on the Fourier Transform Spectrometer Partition Method

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Abstract

[1]The Navier-Stokes (N-S) equations are solved in 3D incompressible viscous flow problems with and without through-flow boundaries using an alternate vector potential formulation. The application of boundary conditions for through-flow borders and the numerical treatment of fourth-order partial differential equations are challenging aspects of the vector potential formulation. On the other hand, benefits include decoupling pressure from velocity and automated fulfilment of the continuity equation. The purpose of this study is to introduce the proper gauge and boundary conditions to the localised meshless vector potential formulation. A Coulomb gauge condition is imposed on the vector potential to guarantee its existence and singularity analytically, handling the divergence-free quality. For measuring the spectroscopic Stokes parameters with a Fourier transform spectrometer, two approaches are suggested. [2]It is intended for single point measurement in the first approach. Using an optical set-up that includes a white light source, a polarizer set to 0, a quarter-wave plate, and a scanning Michelson interferometer, the parameters are recovered. The parameters for the suggested method are taken from the interferogram intensity distributions obtained with the quarter-wave plate rotated to 0°, 22.5°, 45°, and 45°, respectively. For the second strategy, a specific angle design in a polarizer and a quarter-wave plate can be used to create a full-field and dynamic measurement based on the first technique. Consequently, using a pixelated phase-retarder and polarizer, it is also possible to simultaneously extract the interferograms of two-dimensional detection. Based on a multi-channel analogue to digital converter and parallel read-out circuit with a high-speed CCD camera. As a result, a full-field, dynamic Stokes polarimetry without any spinning parts may be created. Both numerical and experimental evidence is presented to support the efficacy of the suggested strategies. According to the authors' knowledge, this might be the most straightforward optical setup for obtaining the spectral Stokes parameters. It's significant that the latter technique avoids the necessity for rotating optical system components and so offers a simple experimental method for obtaining the dynamic spectral Stokes parameters.

Keywords: Navier–Stokes equations • Vector potential formulation • Gauge condition • Stokes' theorem • Through-flow boundary

Introduction

Significant emphasis has been given to the challenge of measuring the Stokes parameters in the literature. Hauge and Dill created a digital Fourier ellipsometer to measure the state of polarisation (SOP) [3]of light reflected from a sample that combines a revolving compensator and a fixed analyzer introduced a rotating-compensator-based multi-channel spectroscopic ellipsometer for monitoring the evolution over time of the Stokes parameters of light reflected from a growing film's surface. [4] To measure all of the Stokes parameters of polychromatic light using a single-channeled spectrum, Oka devised a spectropolarimeter including a pair of birefringent retarders. introduced a

Fourier transform spectropolarimeter that used two Yttrium vanadate (YVO4) crystal retarders to implement the channelled spectral technique suggested in. In general, amplitude modulating the Stokes parameters onto the spectrum carrier frequencies is how channelled spectropolarimetry systems estimate the whole SOP of a light beam. But in this method, the high-frequency spectral features could interact (alias) with nearby carrier frequency channels, leading to erroneous polarimetric fingerprints. The inaccuracy caused by these non-band-limited features is therefore reduced and calibrated using a false-signature aliasing reduction technique. In this paper, two optical setups are suggested for employing a white light source and a scanning Michelson interferometer to solve the aliasing issue in channelled spectropolarimetry. In comparison to conventional dispersive spectrometers, white light Fourier transform spectrometers provide a variety of advantages, including a greater signal-to-noise ratio and a quicker measuring time. As a result, in the first configuration, a polarizer and quarter-wave plate are positioned in front of the interferometer, and the spectral Stokes parameters are extracted using Fourier transformation from the interferograms generated under the assumption that the wave plate will rotate at four different angles. [5] In the second technique, it is specifically made for a full-field measurement. In the second method, a high-speed CCD camera is used to immediately obtain the four interferograms needed to compute the spectral Stokes parameters. with a polarizer array and a pixilated phase-retarder placed behind the interferometer. It should be emphasised that both reflection and transmission modes can be used to measure spectral Stokes parameters. Additionally, spectrum data on the birefringence, diattenuation, and depolarization properties in anisotropic optical materials might be obtained using this technology.

Fragments of sections

The first setup suggested in this study to measure the spectral Stokes parameters (S0(), S1(), S2(), and S3()) after the light passes through a sample is shown in Fig. 1 using a white light source and a scanning Michelson interferometer. This setup is based on theoretical analysis in the extraction of spectral Stokes parameters using a scanning Michelson interferometer. Polarizer P is set to 0° and quarter-wave plate Q is rotated during the measurement process [6] respectively, 45°. Driving the moveable mirror (M2) in the Numerical Validation of Proposed Method produces the matching interferograms.

Numerical simulations were used to examine the viability of the strategy outlined in Section 2. The input spectral Stokes parameters, S0(), S1(), S2(), and S3(), [7] were assumed to have the Gaussian shapes depicted in when the simulations were being run. Keep in mind that each parameter ranges from 400 to 1000 nm (or 1 104 to 2.5 104 cm). Additionally, it was assumed that the light leaving the sample was totally polarised, with S02 ()=S12 ()+S22 ()+S32 ().displays the outcomes of [8]

Different optical configuration

An alternative optical set-up was created, as seen in Fig. 12, in which the quarter-wave plate Q and polarizer P from Fig. 1 were relocated behind the scanning Michelson interferometer. The identical experimental approach and signal-processing scheme as those reported in 2 Theoretical analysis in the extraction of spectral Stokes parameters using scanning Michelson interferometer, 3 were then used to extract the Stokes parameters. Statistical confirmation of [9].

Conclusions and Discussions

An alternative optical set-up was created, as seen in which the quarter-wave plate Q and polarizer P from were relocated behind the scanning Michelson interferometer. The identical experimental approach and signal-processing scheme as those reported in 2 Theoretical analysis in the extraction of spectral Stokes parameters using scanning Michelson interferometer, 3 were then used to extract the Stokes parameters. Statistical confirmation of [10].

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