Contribution ID: **149** Type: **Oral Presentation**

Modal Description of Optical Elements

Monday, 4 July 2022 16:15 (15 minutes)

Optical modal decomposition is a very well-known technique of expressing some arbitrary field as a linear superposition of spatial modes that form a complete and orthogonal basis, not unlike the reconstruction of some signal via a combination of sinusoidal functions with varying frequencies. The reconstruction of a field created out of a superposition of modes chosen from some pre-selected basis has been shown to not only be successful, but with careful selection of the variable beam waist of the basis, it has been demonstrated that the modal decomposition can be optimized to reduce the number of required modes used to accurately describe the field. We are however, not limited to this kind of field, in principle any arbitrary field should have a modal description however such an arbitrary field may require an impractical amount of modes to accurately describe it. Here we investigate the effect of changing the beam waist and switching between different complete and orthogonal bases to reduce the number of modes required to describe some field with high fidelity. We demonstrate the effectiveness of our method by reconstructing the phase and intensity of an arbitrary image and by way of example we reconstruct the field of an OAM mode passing through a triangular slit. We then propagate the modal descriptions of these fields and compare our results to the angular spectrum method of propagation. The recreation of truly arbitrary fields extends the practicality of modal decomposition as a computational and experimental technique and by extension it would allow for the accurate description of the propagation dynamics of a larger array of fields including those that interact with any chosen optical element.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary author: ORNELAS, Pedro (University of the Witwatersrand)

Co-authors: TAVARES BUONO, Wagner (University of the Witwatersrand); FORBES, Andrew (U. Witwatersrand)

Presenter: ORNELAS, Pedro (University of the Witwatersrand)

Session Classification: Applied Physics

Track Classification: Track F - Applied Physics