Modeling Bessel Beams and Their Discrete Superpositions from the Generalized Lorenz-Mie Theory to Calculate Optical Forces over Spherical Dielectric Particles

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Abstract : In this work, we propose an algorithm developed under Python language for the modeling of ordinary scalar Bessel beams and their discrete superpositions and subsequent calculation of optical forces exerted over dielectric spherical particles. The mathematical formalism, based on the generalized Lorenz-Mie theory, is implemented in Python for its large number of free mathematical (as SciPy and NumPy), data visualization (Matplotlib and PyJamas) and multiprocessing libraries. We also propose an approach, provided by a synchronized Software as Service (SaaS) in cloud computing, to develop a user interface embedded on a mobile application, thus providing users with the necessary means to easily introduce desired unknowns and parameters and see the graphical outcomes of the simulations right at their mobile devices. Initially proposed as a free Android-based application, such an App enables data post-processing in cloud-based architectures and visualization of results, figures and numerical tables.

Keywords : Bessel Beams and Frozen Waves, Generalized Lorenz-Mie Theory, Numerical Methods, optical forces
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