MODELING AND COMPENSATINGPOLARIZATION ABERRATIONS IN OPTICAL SYSTEMS

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When designing polarization-sensitive systems, it is important to keep track of the polarization state of light along all beam paths. This is best done by using polarization-relevant modeling. Either Jones or Mueller matrix formalism can be used to model the polarization-related behavior of optical elements, such as waveplates, mirrors (dielectric or metallic), dielectric plates, beamsplitters, etc. Polarization can additionally be affected by coatings, angle of incidence and other factors. Adequate modeling is badly needed, especially in folded designs. In many cases, polarization-changing optical components with retarder behavior need to be compensated for, i.e. the difference in phase retardation introduced by them needs to be nullified. This talk proposes a method of measuring and modeling polarization aberrations, and compensation by means of appropriate linear retarders, whenever possible. Further, the spatial inhomogeneity of the generalized global Mueller matrix is discussed and modeled, and ways of its equalization and/or compensation are suggested. Practical suggestions for laser scanning systems are formulated, in order to keep system-caused polarization changes low.

Biography

Boris Gramatikov obtained his Dipl.-Ing. degree in Biomedical Engineering in Germany, and his Ph.D. in Bulgaria. He has completed a number of postdoctoral studies in Germany, Italy and the United States. He joined the faculty of the Biomedical Engineering Department of The Johns Hopkins University in 1996, and has been working in the Laboratory of Ophthalmic Instrumentation Development at The Wilmer Eye Institute since 2000. His areas of expertise include electronics, optoelectronics, computers, computer modeling, signal/image processing, data analysis, instrumentation design, biophotonics, ophthalmic and biomedical optics, polarization optics, all applied to the development of diagnostic methods and devices for ophthalmology and vision research. His team has developed a series of pediatric vision screeners. He has 147 publications, 43 of which in high-impact peer-reviewed journals. He serves as a reviewer and editorial board member with a number of technical and medical journals. Boris is the Director for Continuous Electrical Engineering Education (CEEE) at the Baltimore Section of the IEEE. He is the inventor or co-inventor on six issued US patents.