

Supplementary materials

Generalized Eigenvalue Calibration Method for Mueller Imaging Polarimeters Based on Micro-Polarized Sensors With Optimal Set of Calibration Samples

Ivan MONTES-GONZALEZ*, Irene ESTÉVEZ, Monica CANABAL-CARBIA,
Angel LIZANA, and Juan CAMPOS

Optics Group, Physics Department, Universitat Autònoma de Barcelona, Bellaterra 08193, Spain

*Corresponding author: Ivan MONTES-GONZALEZ

E-mail: montes_ivan@yahoo.com

Appendix A

Considering the explicit form of the MP Pseudo-inverse, $\mathbf{D}^+ = (\mathbf{D}^T \mathbf{D})^{-1} \mathbf{D}^T$:

$$(\mathbf{A}_{(n \times 4)} \mathbf{G}_{(4 \times 4)})^+ = [(\mathbf{A} \mathbf{G})^T \mathbf{A} \mathbf{G}]^{-1} (\mathbf{A} \mathbf{G})^T \quad (\text{S1})$$

using the transpose matrix properties,

$$[(\mathbf{A} \mathbf{G})^T \mathbf{A} \mathbf{G}]^{-1} (\mathbf{A} \mathbf{G})^T = [\mathbf{G}^T \mathbf{A}^T \mathbf{A} \mathbf{G}]^{-1} (\mathbf{G}^T \mathbf{A}^T) \quad (\text{S2})$$

and then using the inverse matrix properties

$$\begin{aligned} [\mathbf{G}^T \mathbf{A}^T \mathbf{A} \mathbf{G}]^{-1} (\mathbf{G}^T \mathbf{A}^T) &= [\mathbf{A}^T \mathbf{A} \mathbf{G}]^{-1} (\mathbf{G}^T)^{-1} \mathbf{G}^T \mathbf{A}^T \\ &= \mathbf{G}^{-1} (\mathbf{A}^T \mathbf{A})^{-1} \mathbf{A}^T. \end{aligned} \quad (\text{S3})$$

Considering the definition of the MP pseudoinverse $\mathbf{A}^+ = (\mathbf{A}^T \mathbf{A})^{-1} \mathbf{A}^T$ thus,

$$(\mathbf{A}_{(n \times 4)} \mathbf{G}_{(4 \times 4)})^+ = \mathbf{G}_{(4 \times 4)}^{-1} \mathbf{A}_{(4 \times n)}^+. \quad (\text{S4})$$

Appendix B

We provide a flowchart of the calibration method, as shown in Fig. S1.

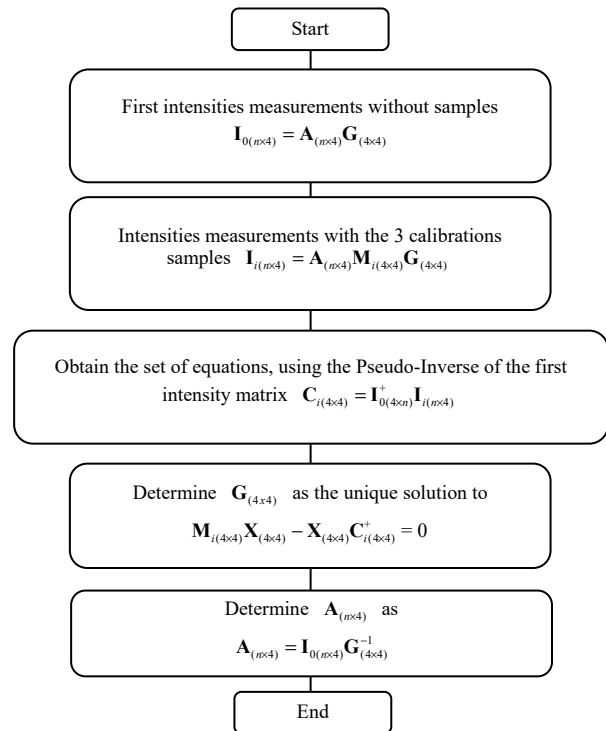


Fig. S1 Flowchart of the calibration method.

Appendix C

Intensity distributions in the experimental measurements are shown in Fig. S2.

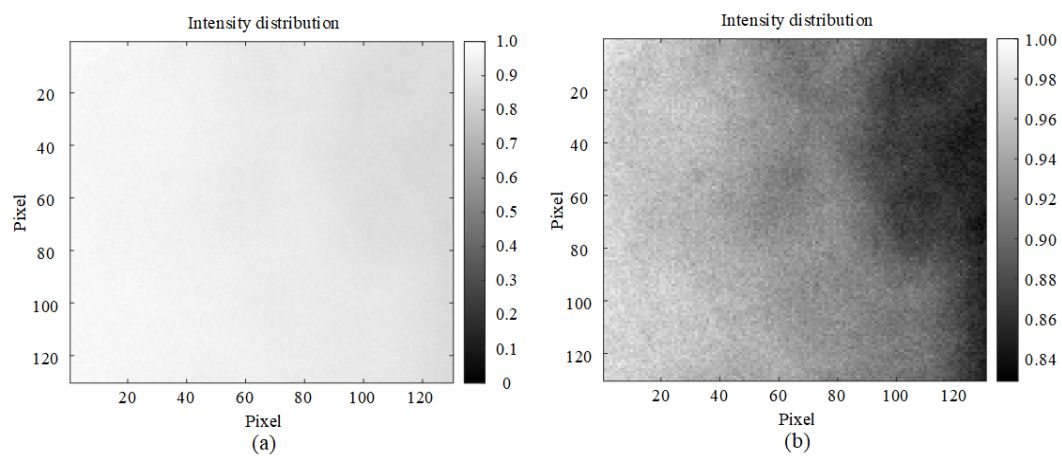


Fig. S2 Normalized intensity distribution in the polarimetric sensor, shown with different grayscale ranges: (a) from 0 to 1 and (b) from 0.82 to 1 to highlight subtle variations.