PHASE-SHIFT ESTIMATION IN STRUCTURED ILLUMINATION MICROSCOPY BY NORMALIZED PEAK INTENSITY DIFFERENCE

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We present a method for determining the phase-shift of the pattern between the elementary images in 2D structured illumination microscopy (SIM). This determination is required for an artifact-free reconstruction, especially if the experimental phase-shift is not precisely known. In order to estimate this phase-shift with high-precision, even with no prior-knowledge of the parameters of the system, there are different approaches that can be applied [1-2]. Our proposed method is based on an iterative process that weights and measures the relative intensity between the residual peaks in the composition of an enhanced spectrum reconstruction, namely the normalized peak intensity difference (NPID). This parameter provides a goodness estimation of the SIM reconstruction depending on the estimated phase-shift. It can be shown that maximizing the NPID value provides the best estimate of the solution, that is, the closest value between the experimental and estimated phase-shifts.

We have studied the performance of our algorithm by using both simulated and experimental data. By these means, we proved the robustness of the method under different parameters of the illumination patterns as well as in the presence of noise. Furthermore, the presented method is proven to be faster than other existing methods.

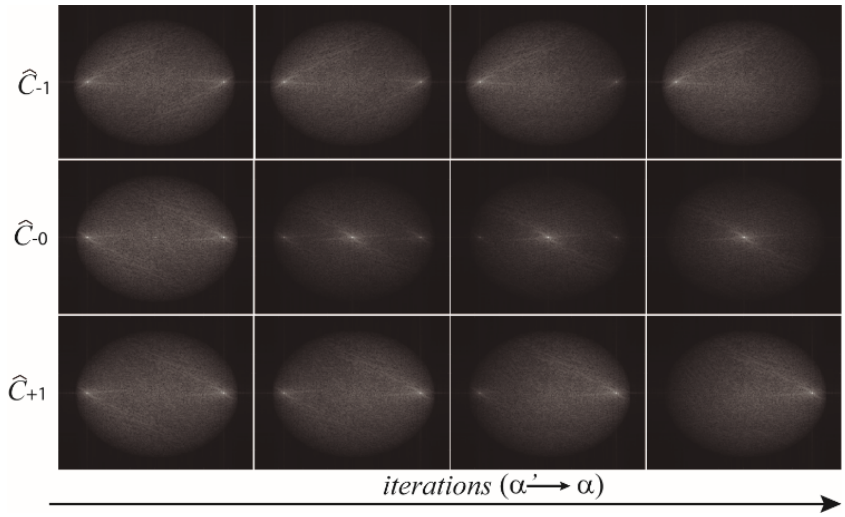

Figure 1: Spectral components provided by the proposed method for different values of the estimated phase-shift.

REFERENCES

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