The extraction of the Point Spread Function (PSF) from astronomical data is an important issue for data reduction packages for stellar photometry that use PSF fitting. High resolution Adaptive Optics images are characterized by a highly structured PSF that cannot be represented by any simple analytical model. Even a small PSF excursion from the frame can be affected by field crowding effects. In this paper we use blind deconvolution in order to find an approximation of both the unknown object and the unknown PSF. In particular, we adopt an iterative least square alternating minimization method where each iteration (that we called outer iteration) consists in alternating an update of the object and of the PSF, by means of fixed number of (inner) iterations of the Scaled Gradient Projection (SCG) method. The use of SCG allows the introduction of different constraints on the object and on the PSF. In particular, we introduce a constraint on the PSF which is an upper bound derived from the Strehl ratio (SR), to be provided together with the input data. In this contribution we show the photometric error dependence on the crowding, having simulated sources with synthetic PSFs available from the Phase-A study of the E-ELT MCAO system (MAORY) and different crowding conditions.

The blind deconvolution method

In order to improve the PSF reconstruction (necessary for an accurate detection of a crowded field) we use a novel method of blind deconvolution [3] based on an iterative alternating minimization method.

The implemented algorithm is iterative and each outer iteration consists of alternating an update of the object and the PSF by means of fixed number of (inner) iterations of the scaled gradient projection (SCGP) method [4, 5]. A scheme of the blind deconvolution is shown in the following figure.

For a detailed description of the SCGP method, see Carbillet, M., et al., Deconvolution in a super-resolution problem for post-processed data, this conference.

References

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