

SmIC: A new data reduction algorithm for the integral field spectrograph of SPHERE

Anthony Berdeu¹, Éric Thiébaud², Ferréol Soulez², Loïc Denis¹, Maud Langlois²

¹ Université de Lyon, UJM-Saint-Etienne, CNRS, Institut d'Optique Graduate School, Laboratoire Hubert Curien UMR 5516, F-42023, Saint-Etienne, France

² Université de Lyon, Université Lyon1, ENS de Lyon, CNRS, Centre de Recherche Astrophysique de Lyon UMR 5574, F-69230, Saint-Genis-Laval, France

anthony.berdeu@univ-st-etienne.fr

The Very Large Telescope instrument SPHERE is equipped with an integral field spectrograph [1] whose scheme is given in figure 1.a. The sensor field is composed of thousands of spectra produced by a hexagonal lenslet array (see figures 1.b-c).

We propose a new data reduction algorithm based on an inverse problem approach whose data fidelity is enforced by robust penalization to automatically identify the defective pixels (see figure 1.d). Our reconstructions by inversion of the forward model (see figure 1.e) represent a notable improvement with respect to reconstructions obtained with the current data reduction pipeline (reconstructions based on data interpolation).

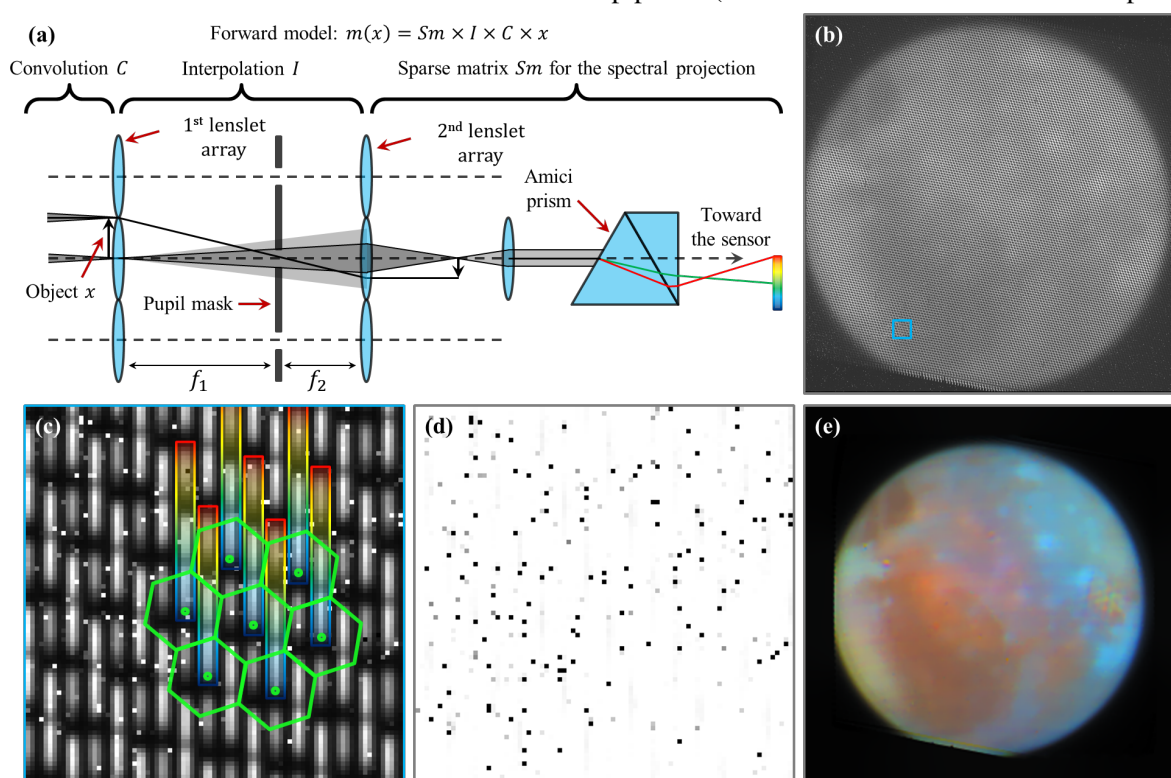


Fig. 1 : (a) Scheme of the integral field spectrograph of SPHERE. The forward model is composed of a convolution C accounting for the hexagonal pupil of the lenslets, an interpolation I of the hyperspectral cube on the lenslet positions due to the BIGRE optical design [2] and a sparse matrix Sm managing the spatial projection of the lenslet spectra on the sensor. (b) Example of raw data on Ganymede. (c) Zoom on the region of interest framed in blue in (b). The spectra (rainbow color) are spread on a hexagonal grid (green). (d) Automatic identification of the defective pixels (black) thanks to the robust penalization. (e) 2D rendering of the reconstructed hyperspectral cube spectrally shifted in the visible. The color variations show the diversity of the spectra on the Jovian moon surface, tracing different chemical compositions.

REFERENCES

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