CEA-EPFL Meeting on Non-parametric PSF

Saclay -17 Oct 2016

PSF requirements

- Requirement on PSF area

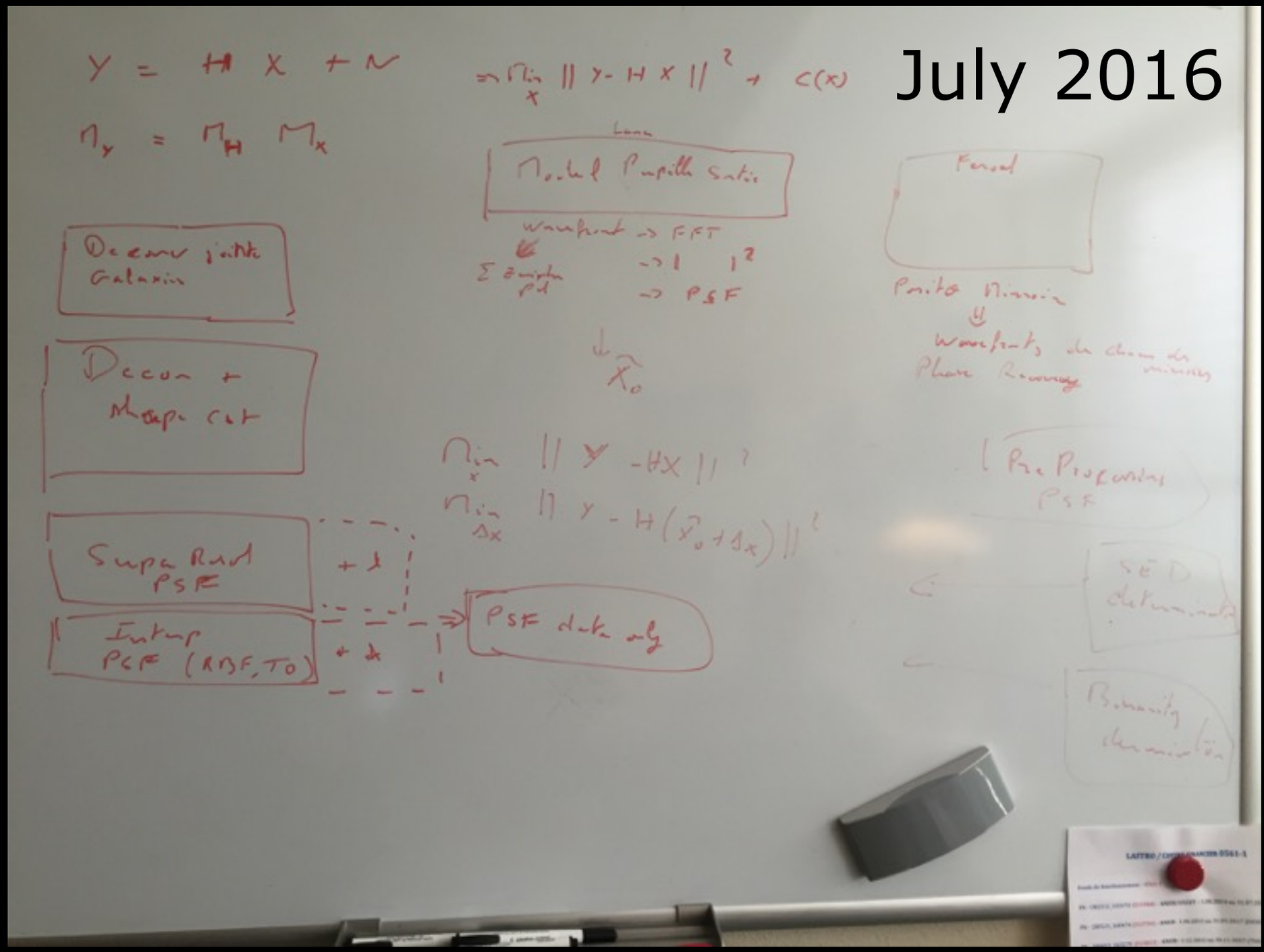
$$\sigma(e_{1,2}) = 10^{-3}$$

- Requirement on PSF ellipticity

$$\frac{\sigma(R^2)}{R^2} = 2 \times 10^{-4}$$

- Assume that thee requirements are for a known SED

Elements of “pipeline”



July 2016

Elements of “pipeline”

Wavefront approach
(Lance)

Model exit pupil
Use pre-defined Zemax modes
FFT
Fit to all stars

Backpropagation
(Ferréol)

Model all mirror surfaces using backgropagation techniques (phase retrieval from intensities)

Model deviations from wavefront estimates (?)

Super resolved PSF
(Fred)

Optimal transport
(Fred)

Inperpolation (BRF, Splines)
(Marc)

Determination of SEDs
(Thibault)

Identify binaries
(Thibault)

Elements of “pipeline”

Adopted by SGS so far

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Goal

Super resolved PSF (Fred)

Optimal transport (Fred)

Inperpolation (BRF, Splines) (Marc)

Determination of SEDs (Thibault)

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Pre-processing

Super resolved PSF (Fred)

Optimal transport (Fred)

Inperpolation (BRF, Splines) (Marc)

Determination of SEDs (Thibault)

Identify binaries (Thibault)

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(Lance)

Model exit pupil
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FFT
Fit to all stars

Backpropagation
(Ferréol)

Model all mirror surfaces using backgropagation techniques (phase retrieval from intensities)

Interpolation schemes

Super resolved PSF
(Fred)

Optimal transport
(Fred)

Inperpolation (BRF, Splines)
(Marc)

Model deviations from wavefront estimates (?)

Goal

Pre-processing

Determination of SEDs
(Thibault)

Identify binaries
(Thibault)

Elements of "pipeline"

Adopted by SGS so far

Wavefront approach (Lance)

Model exit pupil
Use pre-defined Zemax modes
FFT
Fit to all stars

Backpropagation (Ferréol)

Model all mirror surfaces using backgropagation techniques (phase retrieval from intensities)

Interpolation schemes

Super resolved PSF (Fred)

Optimal transport (Fred)

Inperpolation (BRF, Splines) (Marc)

From pixelized PSF only

Model deviations from wavefront estimates (?)

Goal

Pre-processing

Determination of SEDs (Thibault)

Identify binaries (Thibault)

Plan A for the day

10:00 Courbin: General introduction
10:30 Amiaux: The characteristics of the VIS PSF
11:00 Hudelot/Okumura: The CEA-IAP PSF factory (PSFs from OU-SIM or VIS ?)
11:30 Ferreol Soulez: Parametric modeling: backpropagation approach
12:00 Fred Ngole: Non-parametric sparse representation of the PSF

12:30 - 13:30 lunch and coffee

13:30 Kuntzer: Machine learning and PSF characterization and interpolation
14:00 Farrens: Space variant deconvolution of galaxy survey images
14:30 Schmitz: Optimal Transport and its uses in PSF-related problems

14:30 - 16:30 Discussions and actions: combining with Lance's WP

Joseph, et al. 2014 A&A, 556, A63

Plan B for the day

- Plan for the coming months
- How to combine with wavefront methods?
- What simulations do we have?
- What new simulations do we need?
- So far color is not implemented at all in any published method
- Effet of binaries and blends with galaxies