IMC 2014
GIRON

Institut de Mécanique Céleste et de Calcul des Éphémérides

A new meteor detection algorithm for shuttered photography

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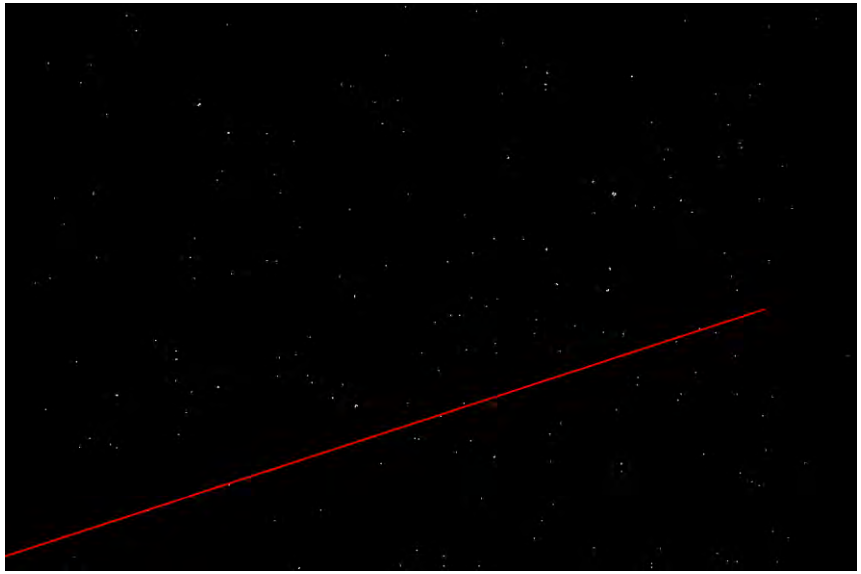
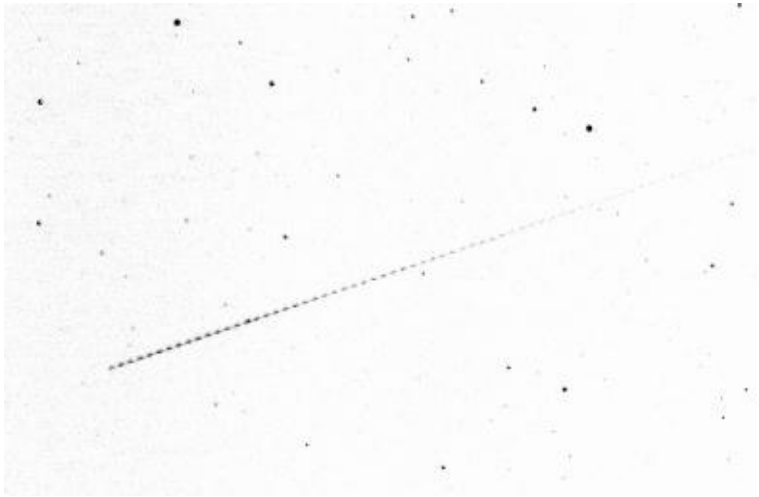


Saturday, September 20 2014

Summary

- Introduction
- State of the art
- Algorithm
- Results
- Conclusion

Introduction



- CABERNET project
- Goal of CABERNET: determine precise orbit
- Aim of my algorithm: reduce the false detections number

State of the art

Probabilistic methods

- NEO orbit prediction (P. B. Babadzhanov and al., 2008)
- Latent Dirichlet Allocation: pixel distribution = $f(intensity)$ (A. Friedlander and al., 2012)
- Pixel stat, band-pass filter, thresholds (A. P. Tzannes et D. H. Brooks, 2002)
- Maximum-likelihood (N. C. Mohanty, 1981)
- Poisson distribution and False Discovery Rate (F. Mojzis, 2012)

Wavelet Transform

(S. Thenappan and al., 2008 and E. Anisimova and al., 2011)

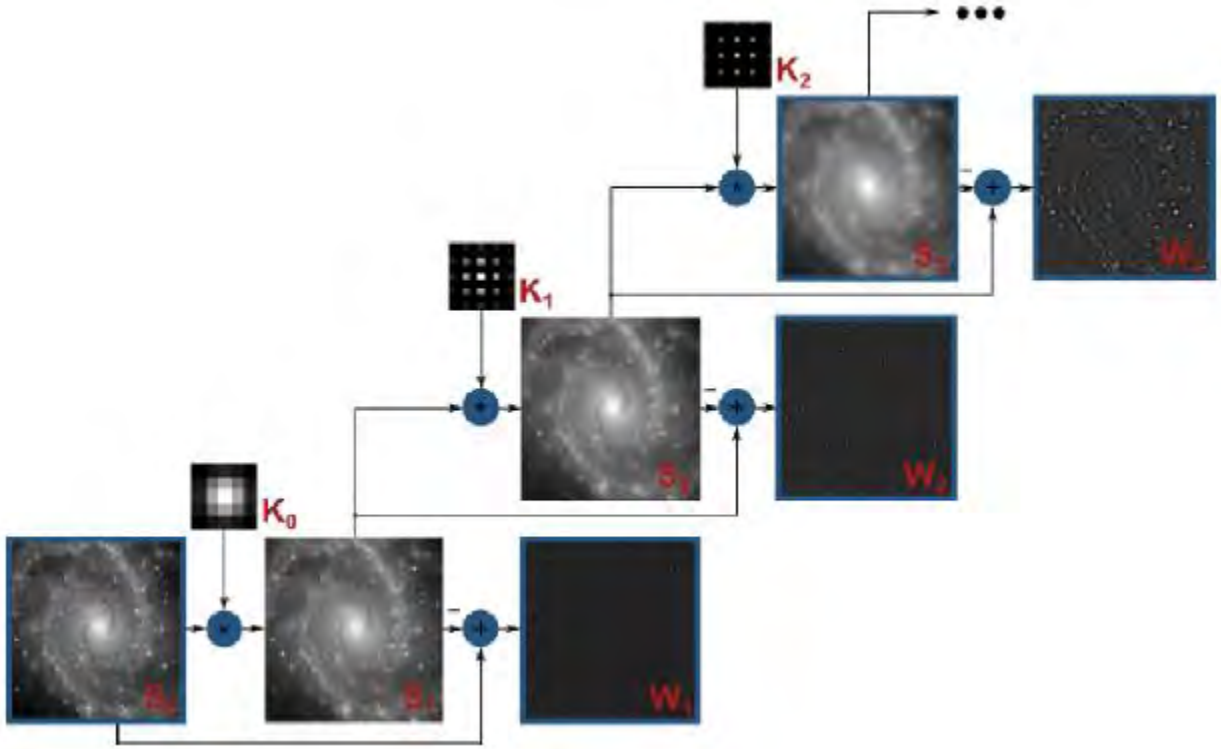
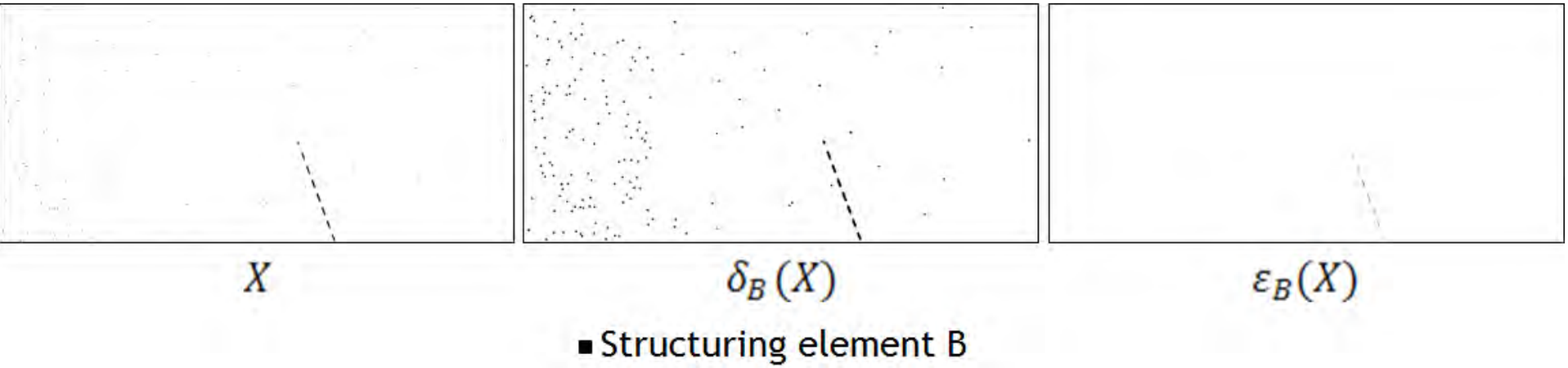


Figure 1. « Algorithme à trous. »

Mathematical morphology



- Example of a dilatation $\delta_B(X)$ and an erosion $\varepsilon_B(X)$ by structuring element B

Hough Transform

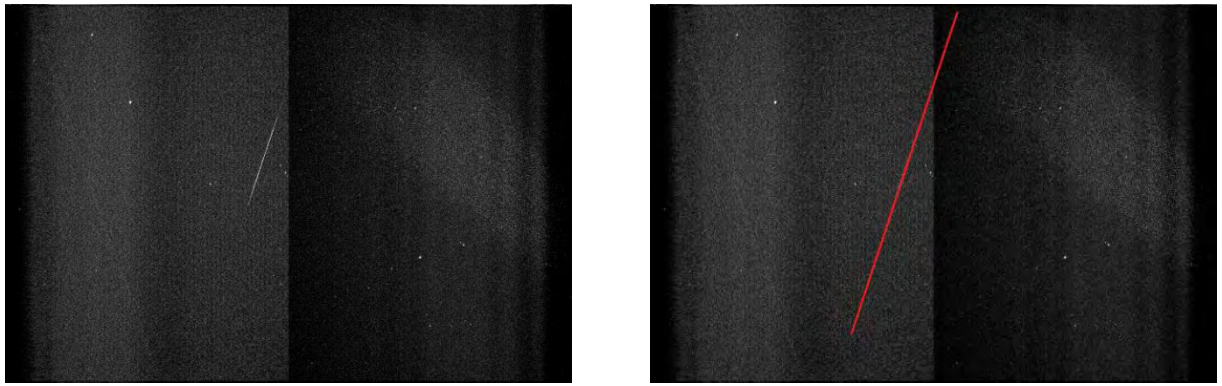
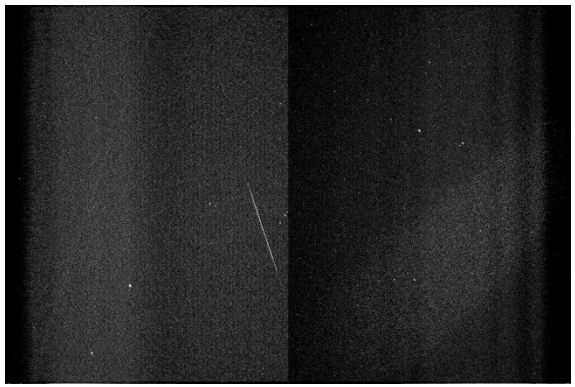


Figure 2. Hough Transform examples
(E. A. Kubickova , 2011 and C. Trayner and al., 1999)

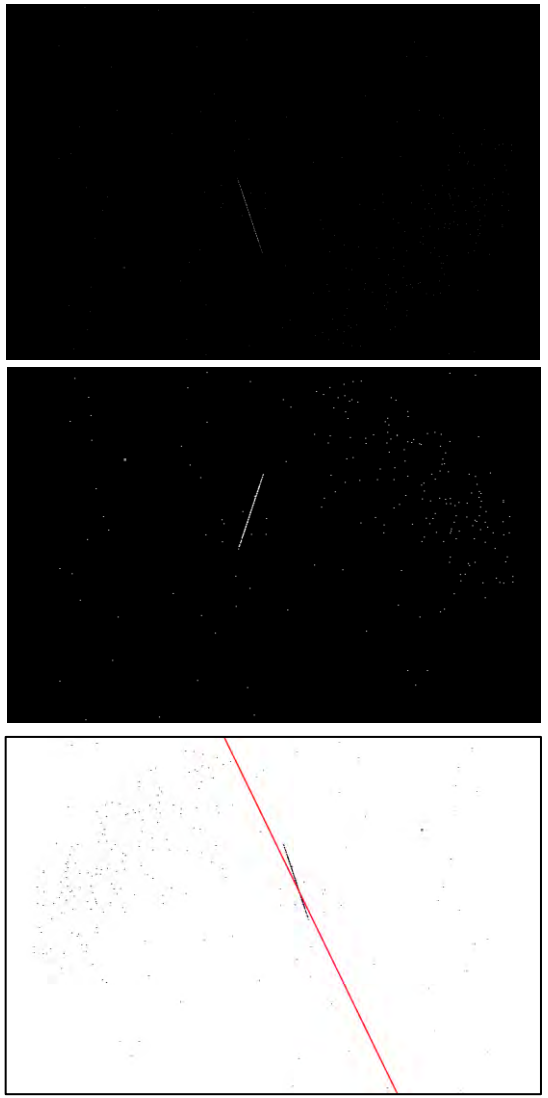
My algorithm

- C language + OpenCV
- Threshold
- Convert 16 byte into 8 byte image
- Threshold

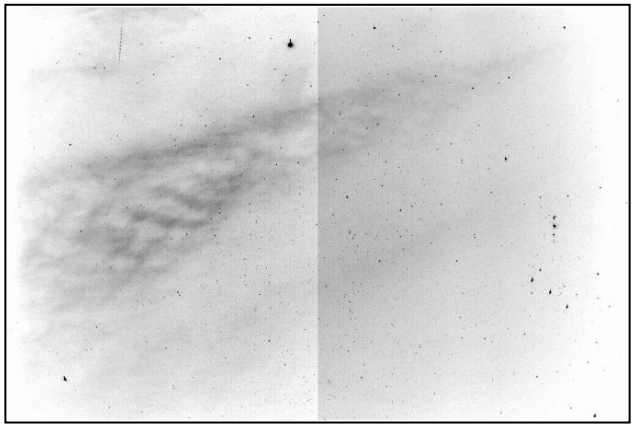


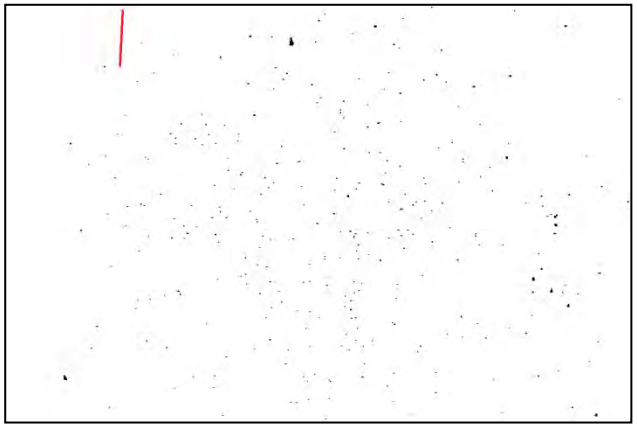
My algorithm

- Image difference
- Dilatation
- Hough Transform



Results





	Meteors detected	Meteors undetected	Total
Image with meteors	16	0	16
Image without meteors	2	49	51
Total	18	49	67

Conclusion

- Results more than satisfying
- Improvement : phase coded disk or matched filter

Acknowledgement

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Questions

Thank you for your attention.