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ALFI – Automatic Lunar Flash Investigation

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Abstract

Publically available lunar impact flash software is being written, under the Horizon 2020, Europlanet 2020 Research Infrastructure (EPN2020-RI), for the detection of short term temporal changes on both the night and day side of the Moon.

1. Introduction

Lunar impact flashes result when meteoroids strike the lunar surface, travelling at tens of kilometres per second. Just under a percent of the kinetic energy released, from gram to kilogram mass objects, is converted into light. This light is of sufficient flux to produce flashes brighter than magnitude 10 which can be detected by telescopes, equipped with light sensitive video cameras, back here on Earth [1].

The ALFI software being developed is not meant to replace the already highly successful, popular, and publically available LunarScan software [2] by Peter Gural, and made available by NASA's Marshall Space Flight Center. Nor to supercede the more sophistictaed, but not yet publically available, MIDAS software [3] by José M. Madiedo. However because ALFI uses different algorithms to the above, and has some design functionailty to work with non-tracking Dobsonian video imagery, and under lunar day side and terminator condtions, it can handle a greater diversity of lunar observational video.

2. Approach

ALFI utilizes a simple local point detector, looking for maxima within 3x3 portions of each video frame that lie N standard deviations above the neighboring 8 pixels in the spatial domain and above M standard deviations for the same pixel in the time domain. To cater for flashes of different spatial sizes, the algorithm is passed over smaller versions of images produced by averaging 2x2, 3x3, … pixels. Likewise in the time domain the algorithm works on time averages to cater for flashes of different duration.

When applied to the dayside and terminator areas of the Moon, a blurred edge mask will be used to prevent the software triggering false detections due to atmospheric seeing effects on contrasty crater rims.

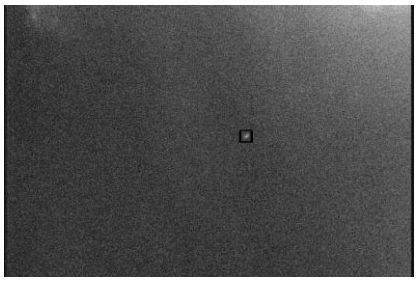

Figure 1. A lunar Leonid impact flash, captured by the author, from Alexandria, VA, USA at 00 :10 UT on 19th November2001 UT. Detected after running the video through the ALFI software.

3. Summary

At the time of writing, the ALFI software is undergoing development, and testing, but when complete will be made it publically available to both amateur and professional astronomers, towards the end of 2017, for detecting short term lunar changes.

Acknowledgements

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References

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