**Pattern Recognition as Tools for Understanding the Night Sky Brightness Variabilities**

M. Rezky1, R. Priyatikanto2, A.G. Admiranto2, E. Soegihartini1

1 Department of Astronomy, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Bandung 40132  
2 Space Science Centre, National Institute of Aeronautics and Space (LAPAN), Bandung 40173

ABSTRACT

Research on night sky brightness (NSB) in relation to the artificial light pollution issues has been increasing all over the world, covering both global [1] and regional [2] scopes. Various observing/measurement techniques and tools are used for that purpose [3]. These research often produces tens of thousands of data for each observation month such that challenges many scientists to handle, process and analyze data properly, especially when it comes to long-term observations. In this article, we demonstrate an alternative method for processing the NSB data, by utilizing pattern recognition techniques: Canny edge detection [4] and Hough transform [5]. These techniques were applied to identify data and extract important parameter from the NSB density plot semi-automatically. Datasets collected from Bandung, Garut, and Subang were used as the test cases. Three time segments (dusk, night, and dawn) became the main focus of the analyses and our method successfully extracted the following parameters: (1) decrement/increment rate of sky brightness at dusk and dawn, (2) the average NSB at night, and (3) the intersections which indicate transition time. This method enables us to process data more effectively, such that escalation of the observing campaign, in terms of observing station and duration, becomes more feasible.

*Keywords: Sky brightness; Data analysis; Pattern recognition*

References

|  |  |
| --- | --- |
| [1] | F. Falchi, P. Cinzano, D. Duriscoe, C. Kyba, C. Elvidge, K. Baugh, B. Portnov, N. Rybnikova, R. Furgoni, *Science Adv.* **2.6** (2016) |
| [2] | T. Posch, F. Binder, J. Puschnig, *Journal of Quantitative Spectroscopy & Radiative Transfer* **211** (2018) 144 |
| [3] | A. Hänel, T. Posch, S. J. Ribas, M. Aubé, D. Duriscoe, A. Jechow, Z. Kollath, D. E. Lolkema, C. Moore, N. Schmidt, H. Spoelstra, G. Wuchterl, C. C. Kyba, *Journal of Quantitative Spectroscopy & Radiative Transfer***205** (2018) 278 |
| [4] | J. Canny, *IEEE Transaction on Pattern Analysis and Machine Intelligence***PAMI-8.6** (1986) 679 |
| [5] | R. O. Duda, P. E. Hart, *Communications of the ACM* **15.1** (1972) 11 |