Conference Name: STRA International Conference on Engineering & Technology, 18-19 June 2026, Seoul
Conference Dates: 18-Jun- 2026 to 19-Jun- 2026
Conference Venue: Kwangwoon University, 20 Gwangun-ro, Nowon-gu, Seoul, South Korea
Appears in: MATTER: International Journal of Science and Technology (ISSN 2454-5880)
Publication year: 2026

Laila Rasmy, 2026
Volume 2026, pp. 62-63
DOI- https://doi.org/10.20319/stra.2026.6263
This paper can be cited as: Rasmy, L. (2026). Automatic Sub-Pixel Registration of Remote Sensing Images Using a Hybrid Harris-Fourier Method. STRA International Conference on Engineering & Technology, 18-19 June 2026, Seoul. Proceedings of Scientific and Technical Research Association (STRA), 2026, 62-63

AUTOMATIC SUB-PIXEL REGISTRATION OF REMOTE SENSING IMAGES USING A HYBRID HARRIS-FOURIER METHOD

Laila Rasmy
Geomatics Sciences and Topographic Engineering, Hassan II Institute of Agronomy and Veterinary Medicine, Rabat, Morocco
laila.rasmy73@gmail.com

Abstract

In this paper, we propose a new approach for sub-pixel co-registration of remote sensing images based on Fourier phase correlation combined with the Harris corner detector. Since the standard phase correlation method is limited to pixel-level accuracy, an additional refinement strategy is required to achieve sub-pixel matching precision. First, the Harris corner detector is applied to extract stable interest points from both the reference and sensed images. Then, correspondences between image pairs are identified using phase correlation. To improve robustness, windowing functions such as Blackman are used during correlation computation. To reach sub-pixel registration accuracy, two optimization algorithms are employed to refine the correlation peak. The effectiveness of the proposed method is evaluated using very high-resolution (VHR) remote sensing datasets, including Pleiades satellite imagery and aerial images. Experimental results show that phase correlation with a Blackman window gives 91% more reliable matches than the

SURF-based method. Our optimization analysis also shows that the Nelder–Mead algorithm works better than the two-point step size gradient method, both in localization accuracy and in speed. Overall, our approach keeps registration accuracy under 0.3 pixels. It also stays robust even with noise and still gives a lot of correct matches.

Keywords:
Phase Correlation, Harris Detector, Sub-Pixel Accuracy, Nelder-Mead Optimization, VHR Remote Sensing Imagery