



#### [Volume XL-7/W2](#)

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-7/W2, 155-160, 2013  
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-7-W2/155/2013/  
doi: 10.5194/isprsarchives-XL-7-W2-155-2013  
© Author(s) 2013. This work is distributed  
under the Creative Commons Attribution 3.0 License.

## Line-based Classification of Terrestrial Laser Scanning Data using Conditional Random Field

C. Luo and G. Sohn

GeoICT Laboratory, Department of Earth and Space Science, York University, 4700 Keele Street, Toronto, Ontario, M3J 1P3, Canada

**Keywords:** Gaussian Mixture Model, Expectation Maximization, Terrestrial Laser Scanning, Conditional Random Field

**Abstract.** This paper describes a line-based classification method, which labels TLS point clouds into vertical object, ground, tree and low objects. A local classifier implements labeling task on individual site independently of its neighborhood, the inference of which often suffers from similar local appearance across different object classes. In this paper, we describe an approach using contextual information as postclassification improvement to a local generative classifier. The contextual information is expected to compensate for ambiguity in objects' visual appearance. A generative classifier is produced using Gaussian Mixture Model (GMM), model parameters of which are iteratively optimized with Expectation-Maximization (EM). The model we use to incorporate contextual information is the Conditional Random Field (CRF), which improves the classification results obtained from GMM-EM classifier by incorporating neighborhood interactions among labeled objects as well as local appearance. The proposed method was validated with three TLS datasets acquired from RIEGL LMS-Z390i scanner using cross validation.

[Conference Paper](#) (PDF, 555 KB)

Citation: Luo, C. and Sohn, G.: Line-based Classification of Terrestrial Laser Scanning Data using Conditional Random Field, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-7/W2, 155-160, doi:10.5194/isprsarchives-XL-7-W2-155-2013, 2013.

[Bibtex](#) [EndNote](#) [Reference Manager](#) [XML](#)

