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Volume XL-4/W5

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-4/W5, 93-98, 2015 www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-4-W5/93/2015/ doi:10.5194/isprsarchives-XL-4-W5-93-2015 © Author(s) 2015. This work is distributed under the Creative Commons Attribution 3.0 License.

STATISTICAL ANOMALY DETECTION FOR MONITORING OF HUMAN DYNAMICS

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Keywords: Anomaly detection, Human dynamics monitoring, Dirichlet process, Hidden markov model, time-series data

Abstract. Understanding of human dynamics has drawn attention to various areas. Due to the wide spread of positioning technologies that use GPS or public Wi-Fi, location information can be obtained with high spatial-temporal resolution as well as at low cost. By collecting set of individual location information in real time, monitoring of human dynamics is recently considered possible and is expected to lead to dynamic traffic control in the future. Although this monitoring focuses on detecting anomalous states of human dynamics, anomaly detection methods are developed ad

hoc and not fully systematized. This research aims to define an anomaly detection problem of the human dynamics monitoring with gridded population data and develop an anomaly detection method based on the definition. According to the result of a review we have comprehensively conducted, we discussed the characteristics of the anomaly detection of human dynamics monitoring and categorized our problem to a semi-supervised anomaly detection problem that detects contextual anomalies behind time-series data. We developed an anomaly detection method based on a sticky HDP-HMM, which is able to estimate the number of hidden states according to input data. Results of the experiment with synthetic data showed that our proposed method has good fundamental performance with respect to the detection rate. Through the experiment with real gridded population data, an anomaly was detected when and where an actual social event had occurred.

Conference Paper (PDF, 2343 KB)

Citation: Kamiya, K. and Fuse, T.: STATISTICAL ANOMALY DETECTION FOR MONITORING OF HUMAN DYNAMICS, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-4/W5, 93-98, doi:10.5194/isprsarchives-XL-4-W5-93-2015, 2015.

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