

Accepted Manuscript

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PII: S0378-4371(16)30906-2

DOI: <http://dx.doi.org/10.1016/j.physa.2016.11.101>

Reference: PHYSA 17757

To appear in: *Physica A*

Received date: 3 June 2016

Revised date: 12 October 2016

Please cite this article as: Z. Yang, D. Lian, N.J. Yuan, X. Xie, Y. Rui, T. Zhou, Indigenization of urban mobility, *Physica A* (2016), <http://dx.doi.org/10.1016/j.physa.2016.11.101>

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Indigenization of Urban Mobility

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Abstract

The identification of urban mobility patterns is very important for predicting and controlling spatial events. In this study, we analyzed millions of geographical check-ins crawled from a leading Chinese location-based social networking service (Jiepang.com), which contains demographic information that facilitates group-specific studies. We determined the distinct mobility patterns of natives and non-natives in all five large cities that we considered. We used a mixed method to assign different algorithms to natives and non-natives, which greatly improved the accuracy of location prediction compared with the basic algorithms. We also propose so-called indigenization coefficients to quantify the extent to which an individual behaves like a native, which depends only on their check-in behavior, rather than requiring demographic information. Surprisingly, the hybrid algorithm weighted using the indigenization coefficients outperformed a mixed algorithm that used additional demographic information, suggesting the advantage of behavioral data in characterizing individual mobility compared with the demographic information. The present location prediction algorithms can find applications in urban planning, traffic forecasting, mobile recommendation, and so on.

1. Introduction

Understanding urban mobility of human is very important for disease control [1], city planning [2], and traffic forecasting [3], as well as for increasing business value in location-based services [4,5]. Individuals differ greatly in their mobility patterns [6], but aggregated analyses detect regular displacement distributions, which range from power laws [7,8] to exponential laws [9,10]. These statistical regularities may be the result of combining several parameters, including the preferential return mechanism embedded in individual behaviors [11], the structure of transportation systems [12,13], urban organization [14] and the constraints of travel costs [6,15].

In general, an in-depth understanding can be obtained by classifying people into groups according to their demographic features. For some specific measures, such as predictability, group-based differences are statistically insignificant [16], but recent empirical studies have

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