

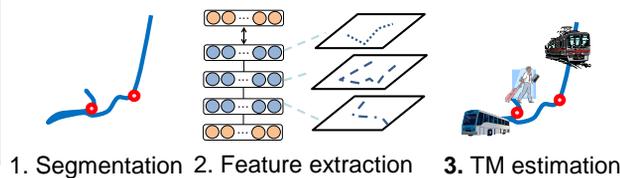
Abstract

Our technique predicts latent contexts of user movement activities from movement trajectories obtained by using positioning devices equipped in smartphones, etc. This exhibition introduces two methods: **transportation mode estimation** and **destination prediction**. (1) Our method estimates transportation modes such as walking, train, and car by utilizing deep neural networks (DNNs) that **automatically extract movement features from trajectory images**. This yields **better accuracy** than existing methods. (2) Our method predicts a user's destination by modeling human movements using recurrent neural networks (RNNs). This method can **achieve better prediction** than existing methods because the modeling is **robust against data sparsity** and can **consider long-term dependencies of user's movement**. Our technique enables us to **deeply understand user movement activities**, which leads to various applications such as personal navigation services and human mobility analysis and control.

Methods

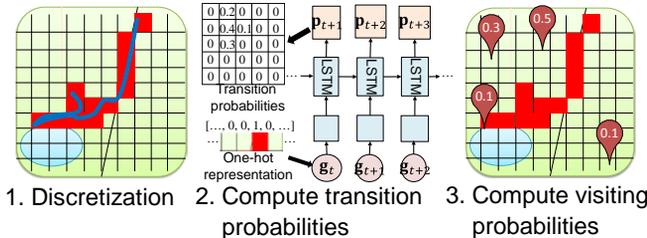
Transportation mode (TM) estimation

- ✓ Extract features from trajectory images using DNNs
- ✓ Robust estimation against noise

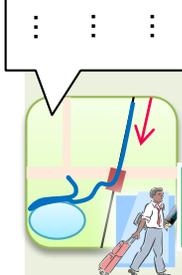


Destination prediction

- ✓ Discretely modeling long-term transitions using RNNs
- ✓ Efficient and robust prediction against data sparsity



Time, Lat., Lng.



Movement trajectory*

The user will visit café XX

Applications

Concierge service

● Personal activity analysis

【Car】 Voice navigation
【Railway】 Screen navigation

Would you like to visit a just-opened cake shop if you will go to Shibuya?



Sightseeing navigation

● Statistical analysis of human mobility

You can get to the next destination earlier on foot



*Trajectory data are obtained by using mobile devices with sensors such as GPS

【Reference】

- [1] Y. Endo, H. Toda, K. Nishida, A. Kawanobe, "Deep feature extraction from trajectories for transportation mode estimation", In Proc. PAKDD 2016, Apr. 2016.
[2] A. Y. Xue, J. Qi, X. Xie, R. Zhang, J. Huang, Y. Li, "Solving the data sparsity problem in destination prediction". *The VLDB Journal*, 24(2):pp. 219-243, Apr. 2015.

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