How did you get here? Where will you go?

~Trajectory analysis and prediction using deep learning~

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

1. Segmentation
2. Feature extraction
3. TM estimation

Destination prediction

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

1. Discretization
2. Compute transition probabilities
3. Compute visiting probabilities

Applications

- Concierge service
- Personal activity analysis
- Sightseeing navigation
- Statistical analysis of human mobility

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Time, Lat., Lng.: Time, Lat., Lng.

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

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