Exploration of day trippers’ movement in Tokyo metropolitan area through the pattern mining of people flow data

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**Background**

- In the field of geography on tourism, exploring patterns of tourist movement in a space-time dimension have been regarded as important research theme.
- Researchers have investigated it in different scales and settings for clarifying or characterizing tourists in their movement patterns by using various instruments such as questionnaires, GPS loggers, and statistics data, and selected an appropriate analytical method for each.
- However, tourist movement in the area across multiple prefectures such as metropolitan areas including a megacity and peripheral sites has not been sufficiently studied because of difficulties of large data acquisition of tourist to (from) urban area.

**Purpose**

To clarify patterns of day trippers’ movements for sightseeing purposes in the metropolitan areas using a large dataset of people flow

**Methodology**

**Study area**

Tokyo Metropolitan area

**Results**

**Multiple zone visits**

Extracting frequent patterns of multiple zone visits

**Association Rule Mining**

One of data mining techniques that find rules which will predict the occurrence of an item based on the occurrences of other items in the transaction

- **Market Basket transactions**
  - If (Bread, Milk) ⇒ (Butter) and (Bread, Milk) ⇒ (Butter)
  - Based on the conditional probability

**Extracted Rules**

- It is similar to the result of previous study for foreign tourists conducted by Yabe and Kurata(2015)

**Conclusion**

- **Findings**
  - Clarification of the day tripper movement patterns in the Tokyo Metropolitan Area using a large dataset of people flow
  - Most tourists visit one zone in a day
  - Patterns of multiple zone visit are extracted
  - Japanese tourists visit similar places to foreign tourists, although there are differences in a few cases

**Future Works**

- Analysis combining other attribute information such as age, gender, job, home address, transportation etc.
- Other metropolitan areas

**Data processing**

- **Mathematical Analysis**
  - Descriptive statistics
  - Pattern mining of multiple zone visits association rules

- **Visualistic Analysis**
  - Mapping tourist flows space-time pass

Recent data providing services in Japan

In Japan, recent development of providing services for data of people flow enabled us to conduct the investigation about human trajectories based on large samples.

**Recent data providing services in Japan**

<table>
<thead>
<tr>
<th>Company</th>
<th>Data Collection</th>
<th>Data</th>
<th>Area</th>
<th>Date</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoCoMo</td>
<td>Mobile phone</td>
<td>Whole country</td>
<td>365 days</td>
<td></td>
<td>Expenses</td>
</tr>
<tr>
<td>KDDI Citcom</td>
<td>Mobile phone</td>
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<tr>
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<td>Navigation</td>
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**Table 1: Data Collection**

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