Dynamic route choice behavior

Summer course of travel and behavior model

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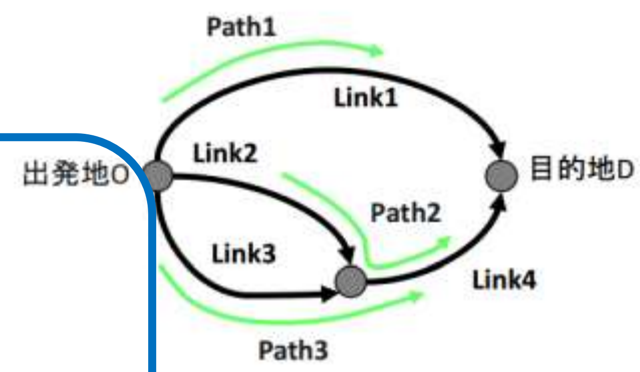
1. Background

<u>route choice behavior</u>



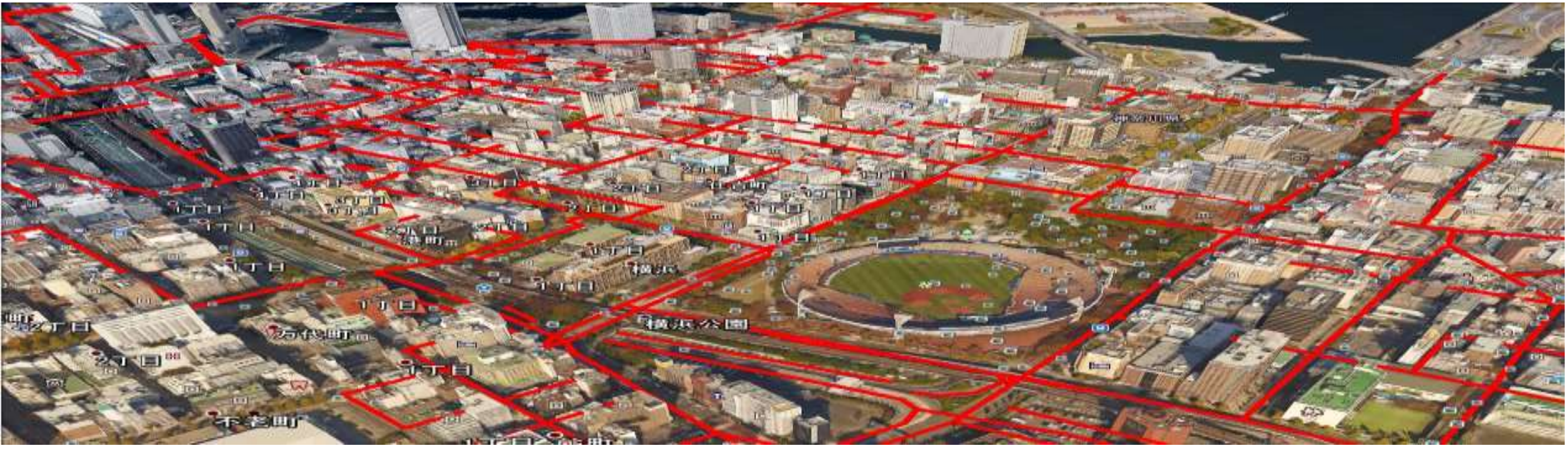
difficulties

⇛numerous factors

⇛enormous choice set

⇛dynamic & successive decision making

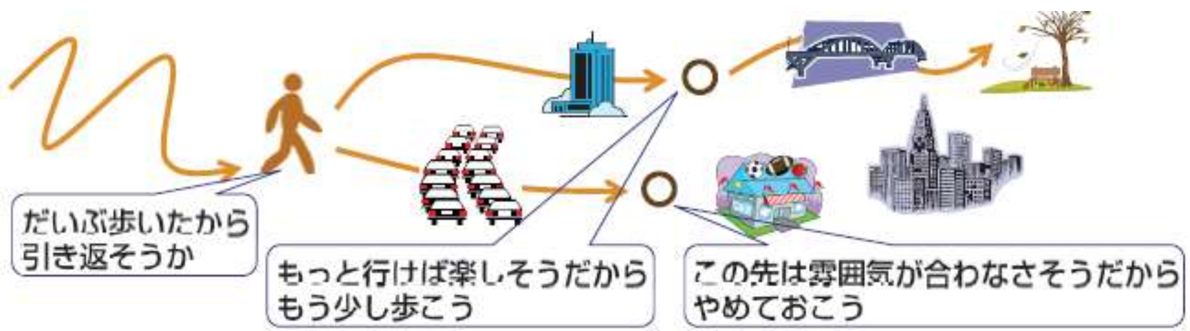
⇛GPS accuracy



3. Model

Dynamic Successive choice model

■dynamic



■successive

Value function utility

$$V(i) = \max_{j \in A_i} \{U(j) + \beta V(j)\}$$

Time discount rate

MNL-based probability

$$P(i,j) = \frac{\exp(V(j))}{\sum_{k \in A_i} \exp(V(k))}$$

Log-Likelihood function

$$LL = \sum_{n} \sum_{t=1}^{T_n - 1} \ln P(s_{n,t}, s_{n,t+1})$$

4. Dataset

※ We'll explain later

■real data →**map matching**

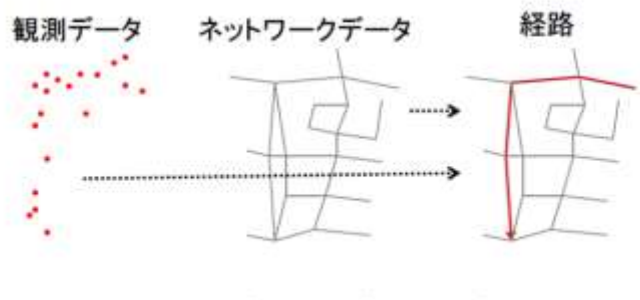


図 1 マップマッチングのイメージ図

■network data

■explanatory valuables

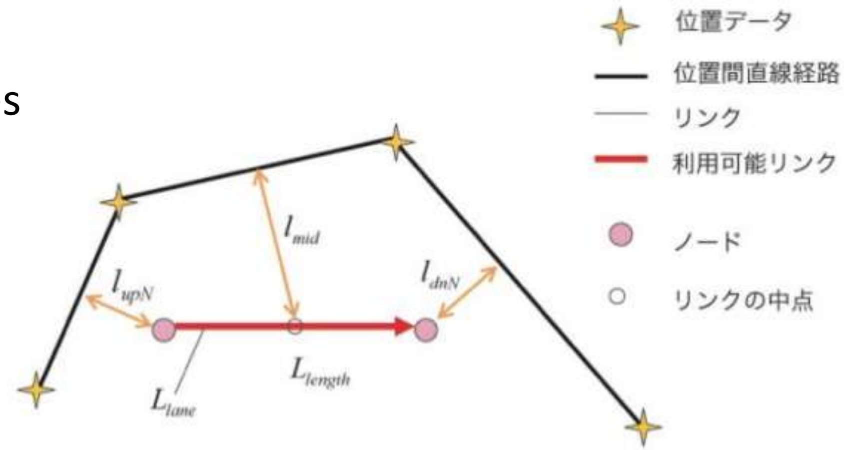
Dummy(tree, park and convenience store)
The number of lanes, stores , parking lots and parking meters

4. Dataset

■Map matching

Map matching is a technique in GIS that associates
a sorted list of user or vehicle positions
to the road network on a digital map.

We can correct the errors in GPS location data.



$$LL = (l_{upN} + L_{dnN} + \alpha \times l_{mid}) \times \frac{L_{length}}{\beta \times L_{lane}}$$

LL :リンク尤度

l_{upN} :起点ノードから位置間直線距離までの最短経路

l_{dnN} :終点ノードから位置間直線距離までの最短経路

l_{mid} :リンク中央から位置間直線距離までの最短経路

L_{length} :リンク長

L_{lane} :リンク車線数

5. Preparation for Estimation

■Procedures

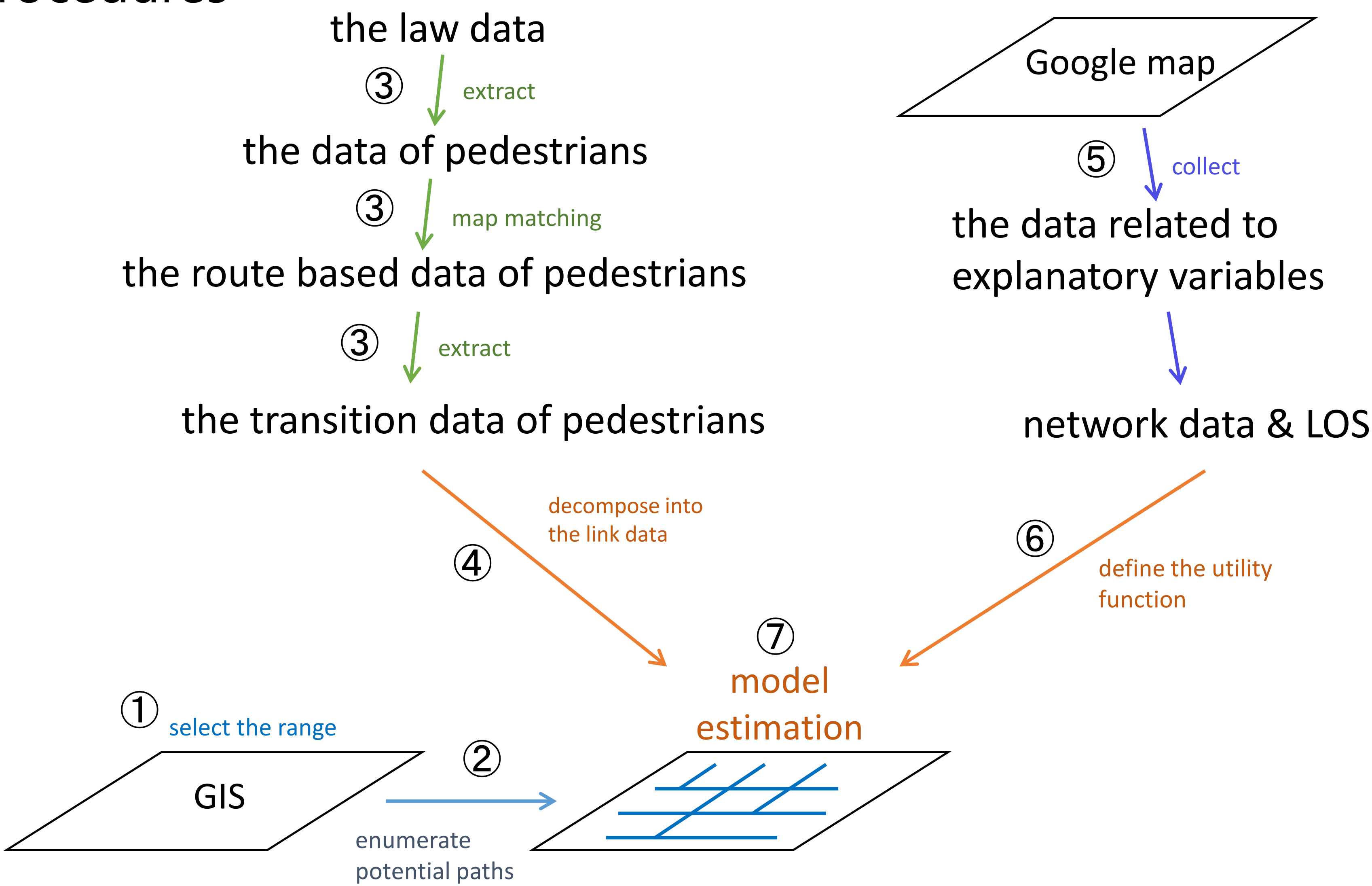
①Select the range on a digital map using GIS
②Enumerate all paths which might be potentially chosen
③Organize network data to extract important data we need for estimation

Extract the data of pedestrians
(We focus on the pedestrians' route choice)
→Correct the errors in GPS location data(**map matching**)
→Extract the transition data of pedestrians from
(We use Dynamic sequential model.)

④Decompose the transition data into the link data
Make the link data correspond to the map in GIS
⑤Collect the data related to explanatory variables using
Google map and make a data set for estimation
⑥Define the utility function
⑦Estimation

5. Preparation for Estimation

■Procedures



6. Result


```
> ## 推定パラメータ値
> b   <- res$par
> print(b)
[1]  0.1760338 -0.3487766  1.2718536  0.7020185  0.6226001 -0.4671320 -0.3332825  0.8222612 -4.0601687
>
> ## t値の計算
> hhh <- res$hessian
> tval <- b/sqrt(abs(diag(solve(hhh))))
> print(tval)
[1]  0.464512038 -1.779635734  3.407759813  2.567895261  2.714719427 -1.775525773 -1.225970473  2.445897579
[9] -0.001676659
>
> ## 初期尤度
> choiceno <- matrix(numeric(nrow(chikuji)),nrow(chikuji),1)
> for (i in 1:nrow(chikuji) ){
+   choiceno[i] <- rowSums(seni)[chikuji[i,1]]
+ }
> L0 <- sum( log(1/choiceno) )
> print(L0)
[1] -1140.618
>
> ## 最終尤度
> LL <- res$value
> print(LL)
[1] -1111.097
>
> ## 結果の出力
> ##ρ^2値
> print((L0-LL)/L0)
[1] 0.02588209
> ## 修正済ρ^2値
> print((L0-(LL-length(b)))/L0)
[1] 0.01799163
>
>
```