Pedestrian Behavior Modeling

Bin_B

Seigo Yakushijin
Soga Shigemura
Takumi Murayama
Mahiro Nishio
Taisuke Uchitani
Yuma Kadosaka

Theme

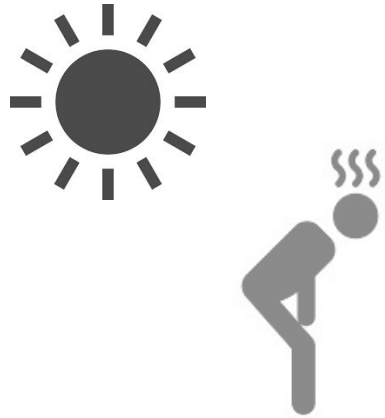
Background

In car-oriented local cities in Japan, it is important to increase pedestrian flows in order to maintain and create a vibrant city.

An aging society and an increase in the number of hot days may lead to the reduction of pedestrian movements.

Objective

Identify what is needed to make urban spaces attractive for pedestrians in such societies



Framework

Analysis of pedestrian behaviors in Matsuyama.

Matsuyama PP data(2022)
→Map matching based on the original data (manually)

Atmosphere of the streets
= restaurants along the links
→Scraping from Tabelog (restaurants info website)

Extremely hot day
→The importance of shade
→PLATEAU's data

Discrete route choice model

Policy making & simulation

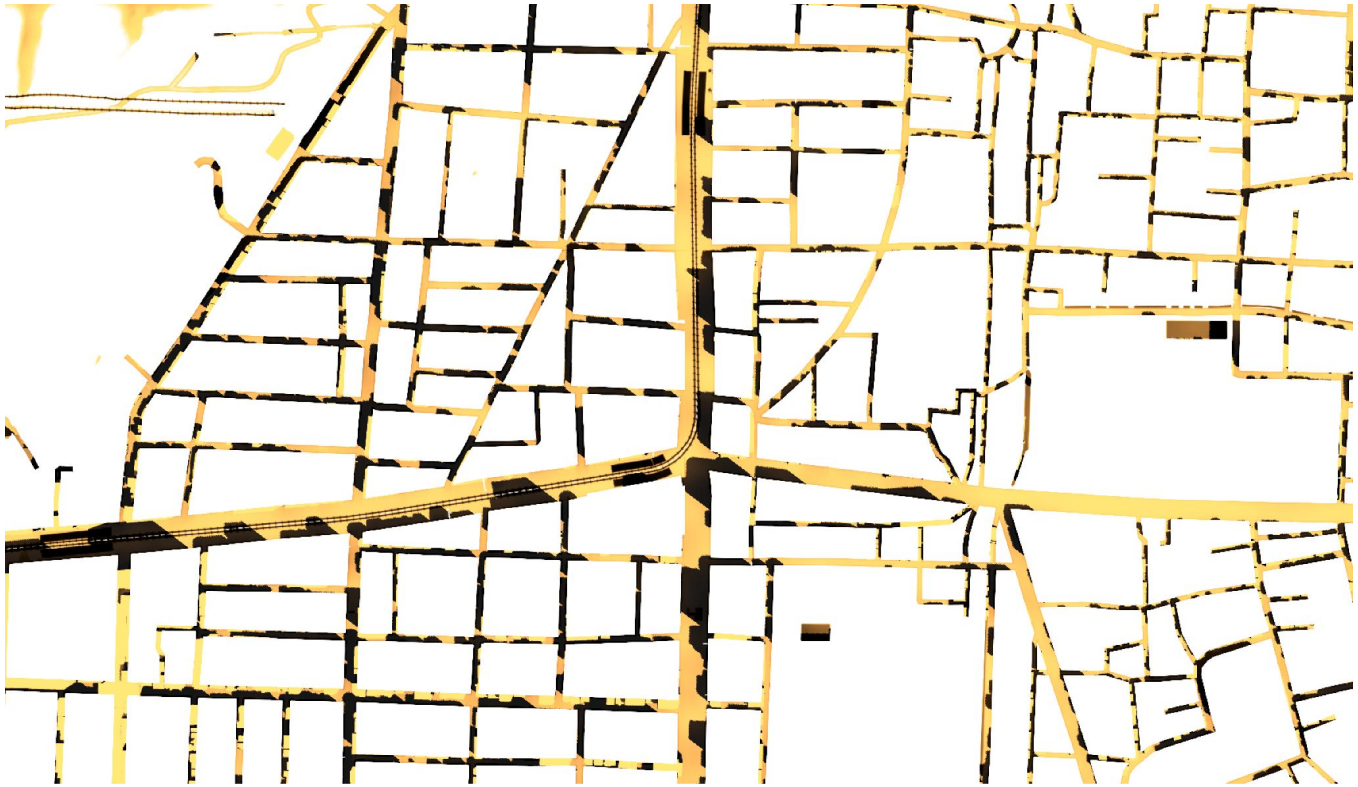
Map matching

Create polygons on both sides of a road where sidewalks are located, and check which polygons contain location data.

Remove outliers and identify which links pedestrians passed through.

This allows for examining the preference for the defined area in route choice.

PLATEAU’s data



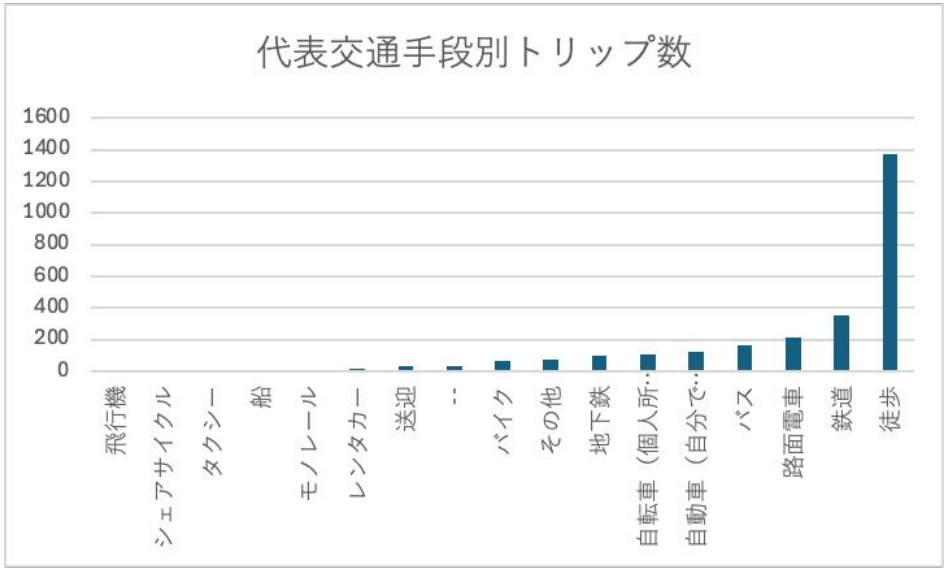
Calculating the percentage of the footway area shaded in the PLATEAU.

https://www.mlit.go.jp/plateau/use-case/uc22-045/

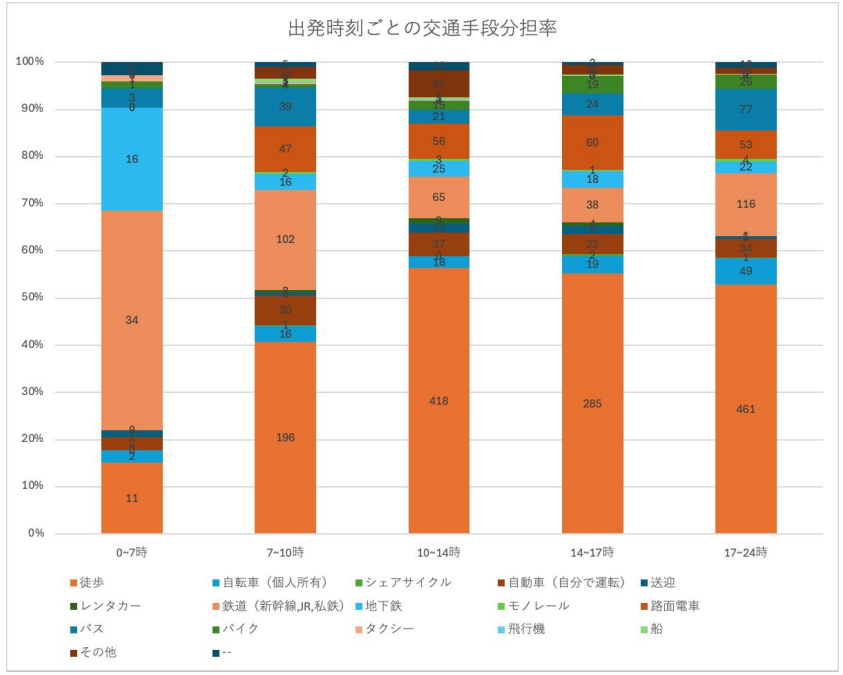
Basic analysis

Key findings from basic analysis

- Walking is the main traffic mode in the central city of Matsuyama.

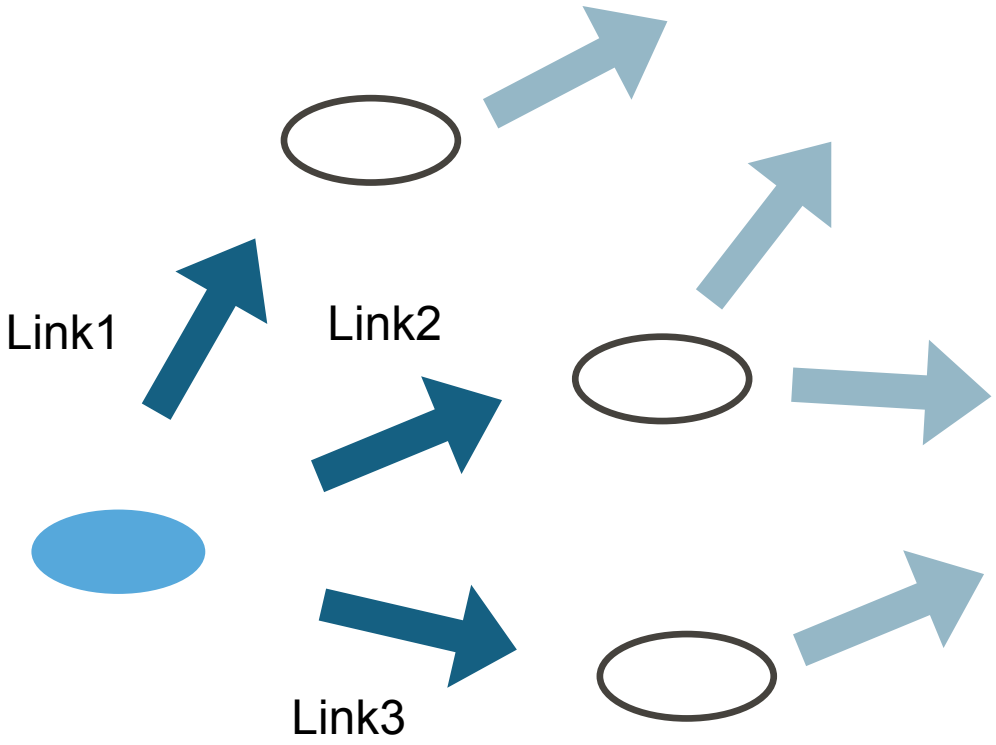


The number of Trips by Mode of Transportation Represented



Transportation Share by Departure Time

Estimation – Model Form

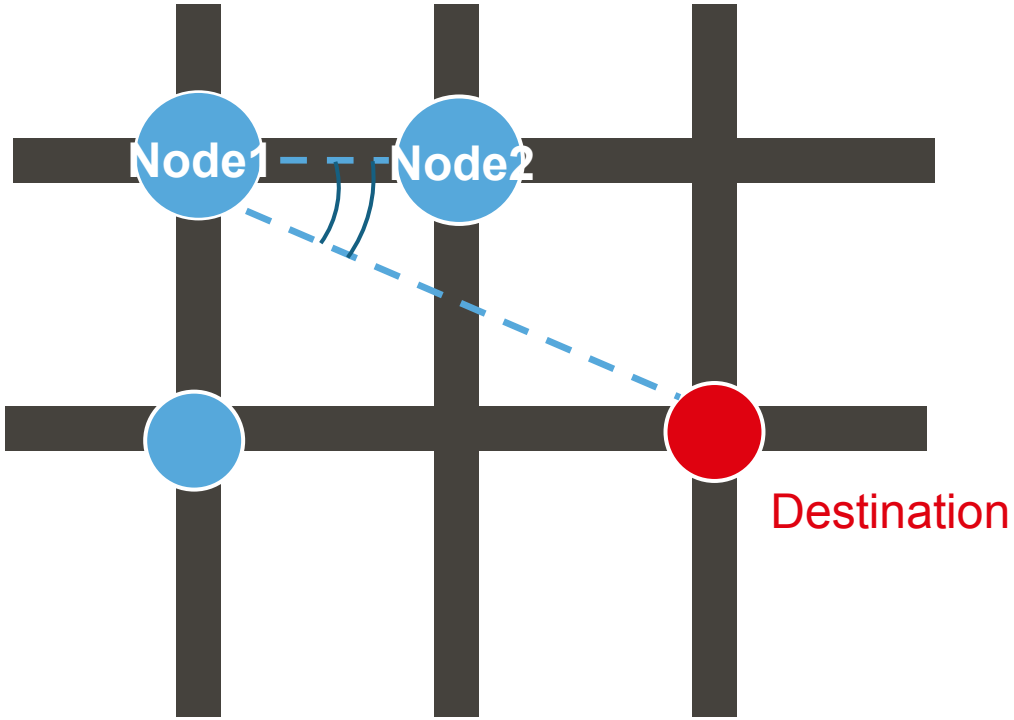


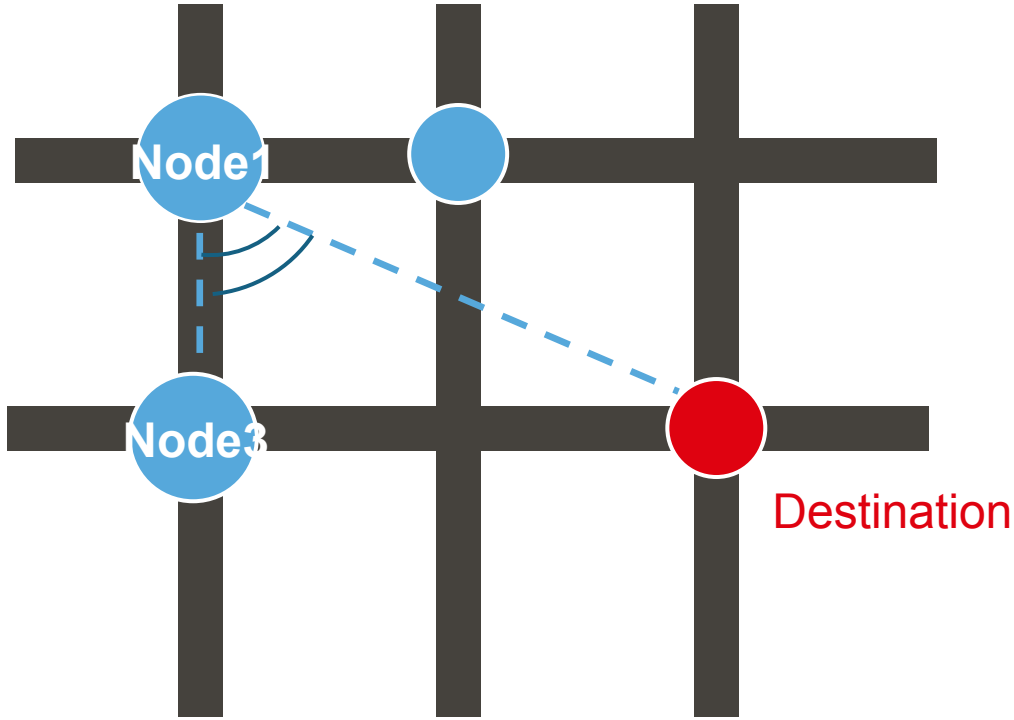
Corresponding weather & date

	Shade Ratio	Angle
Link1		
Link2		
Link3		

Applying MNL for each node

Estimation – Angle





Put the absolute value of the angle into the explanatory variables.

Estimation Results

- $V_{link} = \beta_{angle} x_{link,angle} + \beta_{straight} \delta_{link,straight} + \beta_{light} \delta_{link,light}$

  $x_{link,angle}$: angle extranatory variables

  $\delta_{link,straight}$: straight dummy

  $\delta_{link,light}$: traffic light dummy

parameters	x	tval	
angle	-1.77	-0.84	
is_straight	13.90	1.90	
has_traffic_light	-2.37	-3.26	**
Sample size	4579		
Initial log likelihood	-13126.54		
Final log likelihood	-7055.91		
ρ^2	0.46		
Corrected ρ^2	0.46		

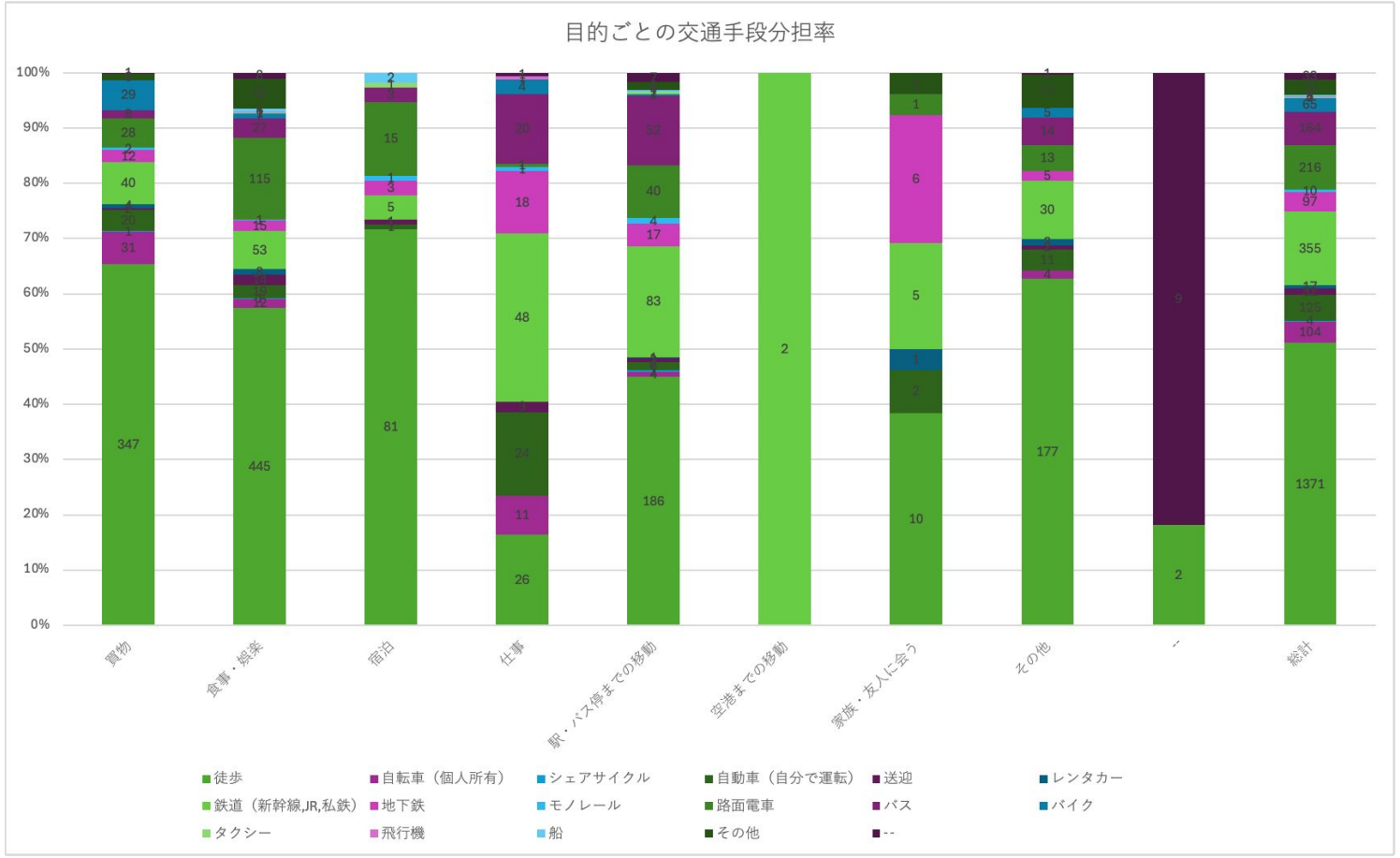
Estimation Results

- Other variables we have tried in the process of the estimation:
  - Shade ratio
  - The number of restaurants
  - Atmospheres of restaurants
  - The number of other facilities
  - The width of the road

- These variables were incorporated into the utility function, but no significant results were obtained.

Thank you for listening.

Appendix



Transportation share by purpose