Travel Behavior Analysis & discrete Choice Models

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Doctoral student
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Why I chose Kitamura’s lab to study in?

Under graduate,

I took Kitamura-sensei’s class “Transportation Engineering”

“behavior analysis approach”.

His humor and joke captivated me.

I chose “Kitamura lab.”.

I studied for 5 years with

- OD estimation (Geostatistics)
- Traffic flow simulation (DEBNetS)
- Land price model (Geostatistics)
- Discrete choice model

When we achieved our goals, Kitamura-sensei always gave us a big smile
Critical Thinking

Every spring, Kitamura sensei told new comers.

“Please learn the critical thinking!!”

News, Books, Text books, Papers

“Is that true??”

“Critical Thinking” is necessary for researchers.
All work and no Play makes Jack a dull boy

Foot Ball tournament @ Kyoto Univ.
1. Travel Behavior Analysis

<Departure time under uncertainty>

- safety margin (considering travel time uncertainty)
  Kengo USHIWAKA, 2004
- the cognitive travel time (focused on the heuristics)
  Atsushi NAGAKUBO, 2006

2. Discrete Choice Models

- the property of “Mixed logit models”
The Analysis of Safety Margin Considering Travel Time Uncertainty

Kengo USHIWAKA
2004
Questions

How will commuters perceive “uncertainty” in travel time?

How will the “safety margins” are related with the perception?

Distribution of cognitive travel time

- Ordinary departure time
- Ordinary arrival time
- Safety Margin
- Limitation of arrival time
Data & Summary

Data: 6 weeks diary questionnaire (commuter)
SP data (Cognitive travel time)

Findings:

The cognition of uncertainty as expressed by difference between the maximum and minimum travel time that experienced by daily commuting has little to do with the variance of reported travel time.

The size of safety margin is a function of the difference between the maximum and minimum travel times.
Analysis of the Cognitive Travel Time Focused on the Heuristics
But, past researches considered partly.

How drivers perceive Travel Time Variance?

And How drivers shape ones’ perceived travel time.
Outline of Analyses

Atsushi NAGAKUBO (2006)

- Observed Travel Time
  - Diary Questionnaires in 6 weeks
  - Laboratory experiment
- Perceived Travel Time

How drivers perceive Travel Time Variance?
Outline of Analyses

- Observed Travel Time
  - Diary Questionnaires in 6 weeks
  - Laboratory experiment

And How drivers shape one's perceived travel time
summary

From the result of Diary Questionnaires in 6 weeks
Commuters don’t perceive the actual travel time variance well.

From the result of laboratory experiment
Perceived travel time is altered before and after habitualization.

In this study, it is indicated that when we analyze the traffic behavior, perceived travel time is very significant.
On the Stability of Mixed Logit Models

Shusaku NAKAI

2008
Problems

First, researcher must specify the utility function.

People can’t know the correlation of unobserved term among alternatives.

People can’t know what type of utility function should be specified.

Verification of the property:
Model’s relative goodness-of-fitting
the value of true population parameters: never known
Objective

Verify the identification problems of non-IIA models.

Focus on:
- Identification of the parameters,
- Correlation coefficient of error terms,
- Specification of the error structure.

By using the simulated discrete choice data

the value of true population parameters: known
Structure of the utility function: known

1st step: Mixed logit models
The flow of verification

Simulated discrete choice data

Estimate the parameters of MXL

Estimate the same parameters
By using the several data sets

Comparison with
the value of true population parameters
accuracy and estimability

Shusaku NAKAI (2008)
Result of parameter estimates

Frequency distribution
(parameter estimates â for explanatory variables)

Compared with the true parameter value,
When the error correlation coefficient approaches 1.0,
the accuracy of estimations become lower.
Conclusion

When the strong correlation exists among the alternatives,

- Parameter estimates fluctuate hard.
- Estimation encounters difficulties.

When the error correlation coefficient approaches 1.0,
- the accuracy of estimations become lower.
Thank you for your attention!
Laboratory Experiment

1. The explanation of simulated circumstances of the experiment

   The home-to-school distance and class starting time were given to the subject.

2. The subject was prompted to indicate a departure time.

3. The commute trip of the day was simulated on the PC monitor.

4. The arrival time as a result of the simulated travel were displayed on the monitor.

5. Answer about the Perceived travel time

   how long do you think it takes to travel from home to school?

Repeat the process 2 5, 40 times.

That is, subject experienced attending school during 40 simulated days.
Traveler’s Perception

For example...

About 60 minutes

Perceived travel time

Day n

Perceived Variance

Day n+1

Day n+2

Home

Working place

between 50 and 70 minutes

Atsushi NAGAKUBO (2006)
Hall, 1983
Hypothesis
Habitualization in departure time decision implies fixation of the perceived distribution of travel times.

< Habitualization >
After repeating the same decision over, some elements of the decision process are suppressed and a simplified decision process is adopted.

1. the number of decision alternatives taken into consideration decreases
2. decision making becomes quicker

Concept
No experience
repeating
habitualization