


添付資料 5

Meeting Minutes

(海外事例調査面談記録)

Time Group	Sunday, Jan. 8		Monday, Jan. 9		Tuesday, Jan. 10		Wednesday, Jan. 11		Thursday, Jan. 12	
	A+B		A	B	A	B	A	B	A	B
8	0		Session 200 "Methods and Tools for Collaboration in a New Era" Session 222 (Prof. Ahsan Habib's poster)	Session 211 "Dynamics of Activity Choices: Time of Day, Duration, and Mode"	Session 510 "Behavioral Dimensions of Travel Choice" Session 505 "Activity Patterns"	ADB10 Traveler Behavior and Values Committee	Session 774 "Technology Use in Travel Surveys"	Mark Bradley, at MIM Lounge		
9	0			Session 292 "Dynamics of Activity Scheduling"	Shigeyuki Sakaki, at WB Main Building	Prof. Kay Axhausen, at Henley Park Hotel		Yusak Susilo, at MM Lounge		
10	0						Peter Vovsha, at Poster Session 830	Nancy Lozano Garcia, at WB I-Building		
11	0		Session 280 "Transport Planning and Public Transport in the Developing Countries"			Prof. Fujiwara, at MM Lounge	Michael Lokshin, The World Bank	World Bank Seminar (Transforming Transportation)		
12	0			EASTS Networking Event						
13	0		Prof. Ahsan Habib, MM Lounge					Nate and Peter from PTV, at Eatsa		
14	0	Prof. Kouros Mohammadian, at MM Lounge		Session 359 "Innovative Big Data Solutions for Transportation Challenges"	Session 665 "New Mobility Services: New Research Evidence"	Session 670 (Geraldine Fuenmayor's presentation) Session 622 (Paul Waddell's presentation) Session 647 "Using Big Data Techniques to Meet the Needs of Next-Generation Traffic Management Systems, Part 1"	Dr. Thomas Adler, at MM Lounge			
15	0		ABE90 Transportation in the Developing Countries Committee				Session 864 "Looking Forward to the New National Household Travel Survey Data"			
16	0	John Abraham, at MM Lounge		Session 420 "GPS and Other Advances in Travel Survey Methods"		Moshe Ben-Akiva, Fang Zhao and Shari Gershenfeld, MM Lounge		Johanna Zmud, at MM Lounge		World Bank Seminar (Transforming Transportation)
17	0		Bilal Farouq, MM Lounge							
18	0	Geraldine Fuenmayor, at DBGB						Michael Oliver, Arnd, Nate from PTV, at MM Lounge		
19	0			UIC Reception, at Arcadia Restaurant						
20	0				PTV Reception, at Renaissance Hotel			ITDP Reception, at Touchstone Gallery		
	30									

 : Interviews

 : Sessions

 : Committees

 : Receptions

Meeting Minutes

Date : Sunday, January 8, 2017

Place : Marriot Marquis Lounge, 12th Floor (13:30-15:00)

Main Topic:

Population Synthesizer, Modeling, ABM, Big Data, Recommended People to Meet

Interviewee(s):

Abolfazl (Kouros) Mohammadian (kouros@uic.edu), Professor of the University of Illinois at Chicago

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Deo Nobel

Obtained Data:

(none)

Population Synthesizer

- The US is now developing freight model based on synthesized data. Database being used is FAV Data. OD matrix can be plotted from one firm location to another firm location, down to individual firm (not only big ones). In IL, the TAZ is divided into township and county level, and for other states TAZ is divided into county level.
- Population Synthesizer in the US mostly utilizes the PUMS data with sampling rate of up to 5% which is currently going down to 1%. It usually works by randomly sampling the HH and calibrating it. Also, it can be recognized as the fully-established method in the US.
- Demand forecast software has a built-in feature to synthesize the population. TransCAD with PopGen is an example. However, the capability is limited to certain dimensions.

Modeling

- System of public transit has been changed by the availability of UBER (and any other smartphone-based application) in both developed and developing countries, which it would be difficult to include in the conventional four-step models. In this sense, the four-step models should be executed more properly reflecting current technological and cultural changes. For example, in the US, it is turned out that Uber has contributed to a dramatic increase of frequencies of going out even by residents in inconvenient areas of public transportation.
- Otherwise, modelers will just get an insensitive model with huge constant caused by extremely forced calibration process. It is mathematically correct, but it is likely to be insensitive to the parameters of models such as cost or availability of transportation.
- In terms of sampling rate, 3% of sampling rate like in Jakarta should be enough for developing countries.

Activity-Based Modeling (ABM)

- ABM is essential to be done because conventional model cannot capture emerging changes like road pricing, UBER and autonomous vehicle in the future.
- No entity has done comprehensive ABM in developing countries to the best of Kouros's knowledge. PTV once tried to build ABM in Dubai but they could not after all.
- ABM usually requires more resources for modeling. There is no fix cost for that.
- Two MPOs in Atlanta and Denver tried to make the activity-travel survey data open to the public.
- Nowadays most of the models including ABM are agent-based, such as MATSim, iLUTE, and the model developed by his group (ADAPTS: Agent-based Dynamic Activity Planning and Travel Scheduling).

Big Data

- Problem of Big Data is that the data is not attached to the demographic data. Therefore, we could not profile the travelers to know who they are.
- Big data and social media can be utilized for analysis of special big events.
- Issues of using mobile devices are described in the NCHRP report 775 "Applying GPS Data to Understand Travel Behavior, Volume I: Background, Methods, and Tests".

Recommended People to Meet

- Paul Waddell (UrbanSim) – for Land use Model
- John Abraham and Douglas Hunt (PECAS) – for Land use Model
- Elaine Murakami – for Survey using Mobile Devices
- Elisabeth Greene (chairing ABJ40) – for Survey using Mobile Devices
- Adella Santos – for NHTS

Meeting Minutes

Date : Sunday, January 8, 2017

Place : Marriot Marquis Lounge, 12th Floor and continued to DBGB Kitchen (16.30 – 18.30)

Main Topic:

Land Use Model and Population Synthesis

Interviewee(s):

- John Abraham, HBA Specto Incorporated (jea@hbaspecto.com)
- Geraldine Fuenmayor, HBA Specto Incorporated (gfm@hbaspecto.com)
(Both used to be students of John Douglas Hunt)
- Cecilia Barboza, HBA Specto Incorporated

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data: (by email on Jan. 18, 2017)

- HBO Specto Project Description
- Literature Review on land use – transport models
- TRB Paper: “Population Synthesis Using Combinatorial Optimization at Multiple Levels”
- Paper on “The Synthetic Households and the Residential Built Form for the Caracas Region”
- TRB Paper “UNIFYING LONG AND SHORT DISTANCE PERSONAL TRAVEL IN A STATEWIDE PLANNING MODEL”
- TRB Paper “IMPACT OF TRANSIT FARE INCREASE IN CARACAS: ANALYSIS USING THE PECAS MODEL”

Land Use Model

- The ideal condition of developing land use model is to create unique TAZs with various types of area. However, such detail data is less likely to obtain. Therefore, population synthesis by microzone level works together with TAZ information to make the best use of whatever data can be acquired.
- In the case of five-million populated city of Caracas in Venezuela, Geraldine was able to conduct a comprehensive land use model in PECAS in 2007. She had various sets of data for the establishment of the model, they are: 30% of the raw census data (person, household, employee, and housing) of year 2001, satellite images, buildings footprint, and geological elevation data, including a dataset of a previous study with employment based on place of work. Data regarding Input-Output matrices (money flow interactions between industries in the economy) was public. Such data were provided by the government and her connections in related agencies. The data by TAZ was possible to obtain, and this enabled her to model and analyze up to the microzone level.
- Geraldine Fuenmayor and John Abraham (HBA Specto) are now working on building the similar land use model to Caracas for Alberta, Canada. HBA Specto utilizes the open-

source software called TRANUS (developed several years ago) and PECAS (currently developed) to make the model. Depending on the variables, the data is available 100% or by samples. They have been working with the parcel data for the province for several months. The level of detail in each parcel is extraordinary. We have data for each parcel (e.g. space quantities, current use, zoning regulations, year built, assessment, etc.) from 2001 to 2013. This means that they have floor space and rents not only by space type, but enough data for calibration. It also requires high level of confidentiality.

- The percentage usage of PECAS and TRANUS is sensitive to the direction of how model needs to be developed. TRANUS is “more powerful” for land use model though it was first made in 1984; whereas, PECAS is more detailed and dynamic, so “more powerful” for activity-based model (made in 2003-2005). PECAS and TRANUS have a built-in population synthesizer feature.
- PECAS is commonly applied only in the U.S. cities because it was made only in English. However, they would like to diffuse it to overseas including Venezuela and Chinese cities such as Wuhan and Shanghai.
- TRANUS is more popular in the Southern American countries. It has been widely used throughout the world by planners and modelers. However, the limitation of input data is always a problem.
- Other commonly utilized land use model software are: ILUTE (by Eric Miller), UrbanSim, and MUSSA (specifically in Chile). Among others, MUSSA has been incorporated into CUBE as “CUBE Land”.
- The application of land use model should be considered to be applied to the developing cities because their economy changes dynamically which impacts the land use.

Population Synthesis

- Population synthesizer is a totally separated tool, and normally it is used during the process of developing data for different purposes. Thus, land use and population synthesis models do not have to be conducted together. However, each of them can be integrated to the conventional four-step models or even activity-based models (ABMs).
- For Alberta, Canada, although the government has the parcel data that is very detailed and complete (floorspace, rents, spacetypes, etc.), the population synthesizer was not developed for the Alberta PECAS model. However, it is developed to feed the population and employment data into the ABM for the province.
- Even in the case of Caracas, she used the population synthesis because the data presented in the census never indicated if a house was located in a neighborhood or in a slum area. PECAS requires to know space use rates by different space types and household types, and she knew this in the TAZ where her residential types were not mixing houses in neighborhoods with the ones in the slums.
- Version of the synthesizer was upgraded with increased number of residential types from 3 to 21 types of residential area. This is usually inapplicable in other developing countries.
- HBA Specto has built the population synthesis in Sacramento, San Diego, and Baltimore with PECAS. Furthermore, they also tried to connect the population synthesizer with ABM utilizing PECAS in Atlanta with 30% of sampling rate.
- Besides the population synthesizer, they have developed another tool called “floor space synthesizer” at HBA for the purpose of disaggregating data from TAZ level to

parcel level. It has a similar purpose to the population synthesizer of reconciling diverse data sources using disaggregate synthesis techniques.

- Relevant papers on population synthesis and literature review on land use model will be provided by email.

Meeting Minutes

Date : Monday, January 9, 2017

Place : Marriot Marquis Lounge, 12th Floor (12.15 – 13.45)

Main Topic:

Population Synthesis

Interviewee(s):

Ahsan Habib, Ph.D. (ahsan.habib@dal.ca)

(He used to be a student of Eric Miller.)

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:

(He has 9 papers for this year's TRB meeting.)

Population Synthesis

- Prof. Habib utilized the urban system model with platform ILUTE in the past time and now works with iTLE (platform that integrates transportation, land use, and environment sectors). To run this platform, seeds from PUMS data are needed. This platform can analyze with low cost because of using PUMS data.
- Furthermore, the model can be developed towards integrated model (transportation and land use) or specific transportation model only. However, in some disaster-exposed areas in developed countries, this model is being further developed considering emerging situation related to disaster management.
- Huge input data is required to model such situation. In case that micro data availability is lacking, population synthesis can be the solution and be developed in different agent level (person/individual or household) based on the seeds from the socioeconomic survey.
- The population synthesizer that he is using is called PopGen (Population Generator). It is open-source because there is no commercial market for that. Future projection is made considering land use rather than the macro economy. The idea of population synthesis has been discussed for a long time, but actual application of population synthesis with disaggregation is quite recent (5 to 6 years).
- In doing the population synthesis, Prof. Habib usually utilizes four to five attributes only (age, gender, marital status, immigration, life stage etc.). This actually depends on the complexity of the model needs to be developed. However, keeping the model simple (less complex) and sensible may be the best way.
- As for household attributes, population synthesis may generate household size and house type, but it does not generate vehicles owned by the household, which should be generated through another microsimulation model.
- Smaller/larger household size and younger/older generation in the center/suburb of the city can be synthesized with proper controls, constraints, or rules of the area.

- Population synthesis needs to be developed in the parcel (or land lot) level often with an input from GIS. However, it is a big challenge in developing countries because micro data is not available and census data may not be so reliable in developing countries, even though population synthesis is important and the method to apply to these countries is not so difficult. Even with lower percentage of samples, synthesizing population is still able to be done as long as the surveys are conducted in random. Calibration of the model can be done later with measuring correction factors or put constraint corrections for each model.
- Population synthesis is often linked with a land use model as the first input.
- Best estimation to do the whole population synthesis from scratch according to Prof. Habib takes about 6 months assuming all data is available. Man power of one graduate student and one supervisor are needed. Increase of the number of experts might not contribute to the reduction of time for developing the model, because it usually takes time to find out and understand the problems.
- For a huge city of 10 million people such as Dhaka, 1 year is required for data collection, and 3 years are required including development of the entire model. Example of other cities: Mumbai (2 years) and Mecca (2 years). Additional input of local manpower may make the process faster or more problematic.
- Prof. Habib is doing life-stage transition model in which a full decade data (2006, 2011, 2016, and 2020) are considered in Halifax, where iLUTE was developed spending 2 to 3 years, to be ready to publish a paper in the TRB 2018. He is now waiting for 2016 census data for calibration process.
- He also suggested pushing forward this topic in more academic workshops and symposiums especially in developing countries because they are the ones who need to know this the most.

Meeting Minutes

Date : Monday, January 9, 2017

Place : Marriot Marquis Lounge, 12th Floor (17:00-18:30)

Main Topic:

Population Synthesis

Interviewee(s):

Bilal Farooq (bilal.farooq@polymtl.ca)

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:

(none)

Population Synthesis

- Prof. Bilal utilized ILUTE (Integration Land Use, Transportation, and Environment) first time for his PhD thesis. He, then, developed the platform into his own-made open source software called “SimPSynz” (Simulation-based Population Synthesizer). In the sense of synthesizing the population, he also conditioned level of detail as a built-in feature that can work on the individual level, household level, or family level depending on the purpose and input data of the model. Input for this model comes from PUMS data.
 - Profile -
<http://www.polymtl.ca/recherche/rc/en/professeurs/details.php?NoProf=558>
 - Open source - <https://github.com/billjee/simpsynz>
- His research for population synthesis has just targeted developed cities such as Brussels and several cities in Switzerland. He thinks that it might be difficult for developing cities to obtain accurate and detailed land-use data enough to conduct population synthesis.
- Since population synthesizer involves discrete choice modeling, future total population projected by government is not an input to the population synthesizer. However, some assumptions set by the government such as death rate and migration rate could be utilized as inputs into the population synthesizer.
- Most of his population synthesis work utilizes simulation-based procedure as one of the requirements of latest synthesizing. Prof. Bilal referred to Joshua Auld’s work of synthesizing the population using the method of Hidden Markov Chain Model. This new approach is the latest methodology approach of synthesizing the population.
- Meanwhile, the conventional synthesis approaches such as IPF (Iterative Proportional Fitting) are not able to adequately address the changing trends, challenges, and opportunities such as increase in behavioral richness and complexity and reducing the scope of census and other vital data collection efforts, and are old technology. Ahsan Habib’s work may be based on IPF.

- In the later process of synthesizing, the process matching households and individuals is needed as part or validation. Components such as land use, demographic attributes, dwelling units, census data, vehicle ownership and so on, can also be simultaneously included in the process of synthesizing before the matching step.
- Approximately 3% sampling rate from census data may be enough to synthesize population in the case of 8-10 dimensions.
- He considers that it will take 6 months at the maximum to complete population synthesis with the assumption that data is available and population is not in the level of a big city or metropolitan area. Computationally, it will take 6 to 8 hours to synthesize the population of 3 million.
- He said that, if 2 experts (or good students) worked on the development of population synthesis, 3 months would be enough to complete it.

Meeting Minutes

Date : Tuesday, January 10, 2016

Place : Main Building, the World Bank (9.30 – 10.30)

Main Topic:

Transportation Projects in the World Bank, Data Sharing and Survey Solutions

Interviewee(s):

Mr. Shigeyuki Sakaki (ssakaki@worldbank.org)

Advisor of JICA Project Research:

Prof. Sasaki

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:

none

Transportation Projects in the World Bank

- 総合交通調査(M/P 等)については、世銀で直接実施する場合はあくまでも今後のプロジェクト(F/S 等)のために実施し、その大枠の範囲を掴むことを目的に実施される調査であるため、JICA が実施している M/P レベルの詳細な調査に必要な予算を付けることは困難である。
- そのため JICA の類似案件と比較して、世銀本部の直接発注の交通調査におけるサンプル数は極めて限られる傾向にある。
- 具体的な例としては榊氏が担当しているチッタゴンのプロジェクトが挙げられる。小規模の PT 調査、バスの乗客インタビュー調査(1,000 – 2,000 サンプル程度)、路側 OD 調査、交通量カウント調査、バス乗客利用意向調査等を実施し、CUBE で評価して M/P を策定し、次の BRT プロジェクトにつなげる予定である。発注は世銀本部で行い、QCBS にて評価を行う。
- 世銀直接発注の場合、TOR 作成は基本的に世銀の内部で行う。技術移転を目的に相手国政府に作成してもらうこともあるが、案件のタマを探すことも重要なので、スタッフが作成する場合や個人コンサルタントを雇って作成することもある。
- 相手国政府に資金を貸し付けてその中で都市交通 M/P 策定を行うケースもある。BRT のプロジェクトのサブコンポーネント等で実施する場合がある。その場合も交通調査等については世銀の Task Team で TOR のレビューを行っている。
- 世銀では、Task Team ごとにプロジェクトでの活動方針等（例えば交通計画の場合、大規模データによる集計モデルか少ないサンプルによる非集計モデルを適用するか等）が決定されており、基本的にはチーム主義でケースバイケースであり、部外者には詳細は分からない。
- 借款を実施する際のプロジェクト評価手法についてのガイドラインは存在するが、組織としてそれぞれの案件の実施方針や技術的ガイドラインは存在せず、それに

関わる意思決定権はそれぞれのチームに委ねられている。このため、例えば都市公共交通モードの選定方法もプロジェクトごとである。世銀内部にはエコノミストも多く、あまりお金をかけないで済ませている。また、道路案件は HDM4 で評価を行うこともある。評価結果は公開されている。また、F/S や D/D など、相手国がすべきスタディは世銀では実施していない。

- ・ 榊氏自身は都市交通 M/P は個別プロジェクトの妥当性を説明する際のストーリーの一つとして活用している。上位計画で位置づけられていることを背景等で説明するケースがある。
- ・ 世銀内部の複数の第三者(類似案件経験者)が Concept Review、Appraisal、Decision Review の段階でレビューを実施するサイクルを有している。Project Appraisal Document (PAD)を作成し、評価を行っているが、評価結果はすべて公表されているので世銀のウェブサイトから確認できる。

Data Sharing

- ・ 世銀内部では、JICA がより詳細な交通調査に基づく M/P を実施していることは、十分に認知されているとは言い難い。また、JICA が他ドナーなどに対して今まで蓄積してきた交通データの積極的活用を望んでいることも知られていない。
- ・ 世銀では、交通調査データの他機関への共有は積極的には実施されていない。世銀としてはレポートとしての成果品を受領するだけであり、データの帰属自体は TOR に依るが、相手国政府やコンサルタントの場合もある。
- ・ 世銀の独自予算で、JICA が実施しているような詳細な交通調査に基づく M/P の予算を付けることは困難であるため、精緻な交通調査に基づくデータベースに対する需要は非常に大きいと考えられる。
- ・ 榊氏はダッカとコロンボにおいて JICA の交通調査データを活用させて頂いた経験があるが、その他の事例はあまり聞いていない。JICA の中でもプロセスが決まっていなく、手続きや貸与条件は現地事務所の担当者や東京本部との関係や意向によるところが大きいとの印象である。
- ・ JICA は既存案件の交通データの共有に否定的であるという印象も、一部の世銀担当者には広がっている。
- ・ 既に JICA が M/P を実施している都市については、世銀はその結果を踏まえるべきであると思うが、実際には積極的に実施されていない。
- ・ 要望として、JICA 図書館などは、英文レポートをより容易に閲覧することができる環境を構築してほしい。
- ・ 以下の資料を頂ければ榊氏より関連する世銀職員に JICA の都市交通 M/P について周知することが可能である。おそらく多くの世銀職員が興味を持っていると思われる。
 - ① これまで実施されたプロジェクトのリスト
 - ② そのプロジェクトの英文レポート (JICA 図書館は一部に日本語が残っており、個別案件へのアクセスも容易ではないので、多くの世銀職員は利用しないと思われる。)
- ・ 特に以下の点について、既存案件で得られたデータ貸出プロセスの標準化・シンプル化が進められれば世銀職員の利用が広がり、喜ばれると考えられる。
 - ① 申請窓口
 - ② 貸出条件

③ データ管理

Survey Solutions

- 世銀の Survey Solution については、DEC(Development Economic Group : 世銀の調査研究所)が担当しており、これは特定のセクターに属している訳ではない。
- 日々の活動については、世界銀行のブログ等に掲載されている。
- 最近モバイルデータを使った調査をちらほら聞くようになった。

Japanese in the Transportation Sector of the World Bank

本部

① 主に都市間交通・地方交通等

- 浅田さん
- 荻田さん(PADECO から)

② 主に都市交通

- 榊さん(南アジア担当)
- 石上さん(JICA から)

東京事務所

- 岡澤さん(アルメックから)

Meeting Minutes

Date : Tuesday, January 10, 2017

Place : Marriot Marquis Lounge, 12th Floor (16:00-17:30)

Main Topic:

Future Mobility Sensing (Advance Survey Method)

Interviewee(s):

- Prof. Moshe Ben-Akiva (mba@mit.edu),
- Shari Greshenfeld (shari.greshenfeld@gmail.com),
- Fang Zhao (fangzhao11@gmail.com)

Advisor of JICA Project Research:

Prof. Sasaki, Prof. Fukuda

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:

Presentation Slide of Information Overview of Future Mobile Sensing

Population Synthesis

- Singapore-MIT Alliance for Research and Technology (SMART) developed the FMS (Future Mobility Sensing) and thus it was commercialized by company named Mobile Market Monitor (MMM). FMS is a smartphone-based platform for activity-diary surveys with mobile sensing, machine learning, monitoring and management systems.
 - <https://www.mobilemarketmonitor.com/>
- FMS has been applied in several cities, such as: Phoenix, Arizona (7,000 households and 30,000 persons), Singapore, Tel Aviv (17,000 households), Dar es Salaam, and Brussels. Dar es Salaam was the first city to apply FMS in the developing countries. At that time, the World Bank-funded project purchased Android smartphones for 800 individuals and gave it away to the respondents as an incentive of the survey which is the most difficult point for this kind of transportation surveys. One person was required to do the survey in four weeks but in reality it was 2-3 days a week for four weeks. The total project duration was one year. It is understood that there is a project using CDR (Call Detail Record) data. Detail of the project using CDR data can be inquired to the World Bank.
- To validate the data, respondents received list of further follow up questions in the end of the day for making sure that the recorded trip information was correct. Every recorded trip must be verified at the end of the day or end of the week. This feature of the survey potentially risks the result as people tend to miss some detail chain of their trips or even completely forgot.
- The machine/algorithm in this software is built-in with machine learning feature where the engine can assess/distinguish mode choice on the road with observed GPS and acceleration records and existing transit network data. It can detect walking, cycles,

buses, taxis, vehicles and rails, but it is difficult for this machine to detect shared-mobility such as Uber and GrabTaxi from conventional taxis, about which the application asks the research participants to put their trip information. This machine can distinguish the mode intelligently by looking at some factors such as: repetition of travel behaviors, their departure / arrival times, destinations and so on. In addition, on the application, the participants can register frequent places to stay or stop by with information about what kind of facilities they are such as their home and working place in order to detect trip objectives. Patterns created for numbers of trip repetitions are given to the machine as an input to “learn” the respondent’s trip pattern, so, if the pattern of the trip was too random, the application will give notification and warning. In the case of Dar es Salaam, the machine was challenged with many types of paratransit, so, it would ask the respondent for specific paratransit they are using every time.

- This system didn’t have a special customization for each target areas, because it just needs transit network database. They stick to the same settings for transit modes with considering future application to future target cities.
- In the US, respondents sometimes refused to utilize smartphone for the privacy reason. This was overcome by small GPS logger put in the pocket and it automatically records the trip.
- Smartphone sometimes fails to show exact location in the map. Therefore, respondent’s intervention could be really handy to show better precise location. Level of detail in this software is very disaggregate/detail. Smartphone which is made in China was used for cost reduction.
- Battery life matter is a problem, but, nowadays, there is a method to reduce battery usage by suitably controlling the frequencies of GPS detection and data transmission on this application. The accelerometer, which utilizes less battery, activate GPS device in case people moves. The usage of GPS is no longer excessively consuming the battery. However, there is trade-off between battery use and data accuracy.
- As for data transmission, this application tries to send an accumulated trip data to their server at intervals of 15-30mins especially with Wi-Fi connections. Thus, it is not necessary for smartphones to detect continuous internet connections, which decrease required amounts of the batteries. However, some people concern about their data packet usage.
- Activity-Based Model (ABM) in FMS has more level of detail as it was applied in Tel Aviv. Survey was conducted for 7 days and just a bit of delay. In the case of Dar es Salaam, the above-mentioned survey was not for constructing ABM or any other models.
- For the project in Dar es Salaam, MMM provided service and software. Training was conducted to trainers of the local survey company by MMM via Skype.
- They also applied this FMS application to urban freight study called as FMS-Freight. It has been tested for several developed cities such as Singapore and Boston. They are also trying to include SP surveys in the application.

Meeting Minutes

Date : Wednesday, January 11, 2016

Place : Henley Park Hotel (9:00-11:00)

Main Topic:

Utilization of CDR data, Smart-phone-based Survey, Issues of Telephone-based Data in Developing Countries, Capacity Building and Population Synthesis

Interviewee(s):

Kay W. Axhausen (axhausen@ethz.ch)

JICA Research Team:

Sadayuki Yagi, Hirohisa Kawaguchi, Deo Nobel with Prof. Daisuke Fukuda

Obtained Data:

none

CDR data

- Passive data such as CDR is a preferable choice for a base data of demand forecast even in developing countries in terms of required cost and time. In addition, the increasing diffusion of smartphones in developing countries can supplement CDR data which contain neither trip purpose nor activity contents.
- For analyzing CDR data, mode detection is usually more difficult than purpose detection. Detecting various modes including walk, bicycle, motorcycle, car, taxi, large bus, small bus is tricky. Detecting purposes, if not in detail, may be possible when you look into the time sequence in the accumulated data for weeks.
- We need to acquire additional attribution data of samples such as car and cycle ownership data to remove the potential biases of CDR data.
- From this spring, he will start a new research project for CDR data with 75 big data in Switzerland by looking into the samples.
- Since they work with the phone company (SwissCom), they have to pay some fee to access the CDR. The fee is about one fifth of the total project cost.
- The following people are specialized in this field.
 - Prof. Martin Fellendorf in Graz University of Technology, Austria: martin.fellendorf@tngraz.at
 - Prof. Rein Ahas in University of Tartu, Estonia: rein.ahas@ut.ee
 - Mr. Michael Balme in Senozon AG, Switzerland : balmen@senozon.com

Smartphone-based Survey

- One issue of smart-phone-based activity diary survey is manual verification process. While the machine learning process can propose travel mode and activity, it is reported that some respondents verify them without reading the contents.

- Other issue is battery use. Most of groups are facing this issue while some group such as Prof. Yusak Susilo developed application in which uses less battery by reducing the time of activating GPS device.
- The following organizations are specialized in this field.
 - Motion Tag UG from Berlin
 - RSG (Tom Adler)
 - KTH (Prof. Yusak Susilo)

Issues of Telephone-based Data in Developing Countries

- The higher dependence on pre-paid phones which causes frequent changes of their telephone numbers could be challenging for the data accuracy.
- Many phone companies tend not to know user attributions.
- Actually, even though CDR data tend to be biased by the attributions of mobile phone ownerships, nobody cannot manage and handle survey datasets which have a conventional sample size such as 3% in the case of large metropolitan area such as Jakarta, Indonesia.
- Privacy problem should be considered well too.
- The biased data should be adjusted by other data such as IC card data of BRT, LRT and MRT usage data and video-shooting.
- Other socio-economic data such as age, income, education, family, car ownership, mode of transport and address of the samples should be acquired.
- In Japan, since a phone company, NTT Docomo, has already got the information about their user attribution such as age and sex, they can provide an aggregated CDR data, which can make a contribution to cover their privacy problems. (Prof. Fukuda)
- In Germany, it is difficult to analyze the period patterns of transportation behaviors, because phone companies open only one-day CDR data due to privacy protection.
- The best way to research for CDR data is to work with telephone companies and have academic collaborations for that.
- Also, a success in data aggregation into OD-matrixes level could contribute to cover privacy problems.

Capacity Building

- The requirement to success in capacity buildings is that adopted models should be easy enough for them to manage.
- Local authorities even in Japan and the US are not likely to have an enough budget and capacities to manage their model.
- Thus, it might be a good way to have packages to make a model.
- Since one-fits-all model cannot be easy, what kind of model should be applied depends on project sites in developing countries.

Activity-based Model

- An application of activity-based models is a better way in terms of the potential reduction of the number of survey samples.
- Of course, it is significant for us to figure out a local pattern of transportation behaviors including small vehicles and rickshaws to construct this kind of models.

- In his laboratory, there is a student studying an activity-based model using MATSim targeting Jakarta.
- MATSim can be a good option for activity-based modeling as it is an open-source agent-based model which can integrate whole level of analysis such as scheduling, mode choice and equilibrium assignment. It is applied in Tel Aviv (integrated with Harry Timmerman's ALBATROSS) and Singapore etc. Prof. Axhausen is a member of developing the MATSim. MATSim has also been linked with VISUM.
- We can choose a full-day or peak-hour model which depends on what kind of policy-decision we want to make by the model.
- Even four-step model is also enough for infrastructure development as long as policy makers are not interested in TDM policies, equity issue and environmental aspect.
- Varieties of models are also available such as "Comprehensive Econometric Micro-simulation for Daily Activity-travel Patterns (CEMDAP)" developed by Chandra R. Bhat and, "Prism-Constrained Activity-Travel Simulator (PCATS)", developed by Kitamura and Fujii.

Population Synthesis

- The key challenge for population synthesise is to have core samples which have an enough information to expand (scale-up) them to the original size of population.
- This challenge might be conquered by supplemental data such as electricity consumption, car registration and satellite data.
- The following people are specialized in this field.
 - Kirill Muller: kirill.mueller@ivt.bang.ethz.ch (Approach-based artificial Population, Model in Switzerland)
 - Pieter Jacobus Fourie: fourie@ovt.bang.ethz.ch
 - Lijun Sun: sunlijun@mit.edu (Model in Beijing based on Singapore Model.)