

“Technical Research and Development for Road Policy Quality Improvement” Study Summary

No.	Title	Principal Researcher
No.24-1	Development and Implementation of Advanced Travel Survey, Analysis and Forecasting Method	Kumamoto Univ. Assc. Prof. Takuya Maruyama

We develop a smartphone-based travel survey method and implement the method with collaborated with 2012 Kumamoto Metropolitan Person Trip Survey. Then, we compare the results with existing method and analyze the data. In addition, we implement advanced travel forecasting method.

1. Backgrounds and Objects

Some professionals argue that current traffic planning based on large-scale survey (e.g. road-traffic census survey and person trip survey) with high cost has decreased its value for money. Meanwhile, almost everyone brings a smartphone and analysts can now obtain the large-scale tracking data for free using smartphone-based application.

Many professionals consider the smartphone-based travel survey method as promising and so many researchers conducting these projects in all over the world. However, we still have to consider several research topics in this field; efficient method to increase the participants, sampling bias problem, data adjustment method, among others. In order to make smartphone-based survey method as practical one, we have to summarize its issues based on actual experiences and develop methods to solve some problems.

This research project develops a smartphone-based survey method with low cost and implement the method with collaborated with 2012 Kumamoto Metropolitan Person Trip Survey. Then, we compare the results with existing paper-based self-reporting method and summarize its possibilities and limitations.

2. Activities in Research Period

We implemented the smartphone-based travel survey method collaborated with 2012 Kumamoto Metropolitan Person Trip Survey. As far as we know, this was the pioneering project in the world in 2012 because we prepared both iPhone and Android version and required more than ten thousand households in a metropolitan area. The number of participants in 2012 survey was only 97 because we could not prepare the reward due to some governmental constraints. However, we conducted visitor's behavior survey in downtown Kumamoto using smartphone-based method with JPY 500 incentive and successfully collected 1,086 samples in 2013.

We also conducted the truck floating car survey with driver's smartphone and collected 21 samples from seven truck companies.

3. Study Results

Smartphone-survey participants in 2012 are mainly male, aged 30 to 40 and single, workers related to public services. Average number of trips by smartphone-survey participants is larger than that by household travel survey participants.

We also estimated the participation choice models of travel surveys explaining the choice of participation or non-participation in the PT survey and survey type (paper,

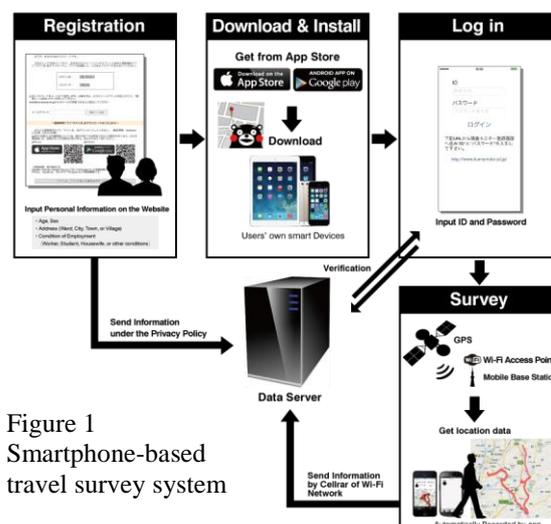


Figure 1
Smartphone-based
travel survey system

web, and smartphone).

We demonstrated several analysis featuring data by smartphone-based survey such as visualizing visitors' activity area using Kernel density map and detecting stopping points.

We prepared a (tentative) guideline for smartphone-based travel survey based on our experiences during three years of research-period. This guideline will be useful for future surveys and it describes design, development, deployment and publication of application, treatment of battery issues and participants who are not familiar with smartphone, privacy, machine-dependence, and rewards, among others.

4. Papers for Presentation

Nohara, K., Matsuda, K. and **Maruyama, T.**: Development of Smartphone-based Travel Survey Method: Preliminary results in Kumamoto, Japan, Selected Proceedings of the 13th World Conference on Transport Research (WCTR 2013), #3242, 2013.

Maruyama, T., **Mizokami, S.**, and **Hato, E.**: A smartphone-based travel survey trial conducted in Kumamoto, Japan: an examination of voluntary participants' attributes, Transportation Research Board 93rd Annual Meeting Compendium of Papers, #14-0997, Washington D.C. 2014.

Asakura, Y. **Hato, E.**, **Maruyama, T.**: Behavioural Data Collection using Mobile Phones, in Soora Rasouli & Harry Timmermans (eds.) Mobile Technologies for Activity-Travel Data Collection and Analysis, Chapter 2, pp. 17-35. IGI Global, 2014.6

Maruyama, T., Sato, Y., Nohara, K., and Imura, S.: Increasing smartphone-based travel survey participants, presented at The 10th International Conference on Transport Survey Methods in Leura, Australia, 2014.11.

Maruyama, T.: Participation choice model for household travel survey methods: Comparison of paper, web, and smartphone-based method, Proceedings of the 19th International Conference of Hong Kong Society for Transportation Studies, pp.501-508, 2014.12.

5. Study Development and Future Issues

Future development may include technical improvement of application such as auto detection of travel mode, trip purposes, and modification of record in smartphone. These topics, however, are competitive targets of many researchers around the world and several commercial life-log applications have already existed. Then, as research in transportation planning, it would be more useful and beneficial to develop the analysis method of tracking data and adjustment method of non-random participants.

For example, the estimated participation choice model will be useful to make the response rate of travel surveys increase. We plan to estimate these models in other cities in Japan.

In addition, we plan to conduct similar surveys. One of our international students plan to conduct smartphone-based survey in his home country. These are examples of extension of our research projects.

6. Contribution to Road Policy Quality Improvement

Large-scale surveys such as Road traffic survey and person trip survey collected basic data for road policy. This research project provided several findings and issues for improving these surveys as economical and precise ones. Travel surveys in worldwide cities have changing its method from paper-based to web-based and smartphone-based. Professionals can utilize our survey-participation choice models describing the sampling bias in order to integrate the data by several survey methods. We also summarize the measures to increase the participants including reward policy. Several cities have already applied our guideline of smartphone-bases survey method in survey planning. These are good example of practical contributions of our research project.

7. References, Websites, etc.

<http://www.cps.kumamoto-u.ac.jp/smart-pt/>