京都大学教育研究振興財団助成事業
成　果　報　告　書

4 年 4 月 25 日

公益財団法人京都大学教育研究振興財団
会長　藤　　洋作　様

所属部局　工学研究科　都市社会工学専攻
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助成の種類	**令和 3 年度 ・ 研究活動推進助成**
申請時の科研費研究課題名	Improving Public Transport Network Planning with Map and Google Popular Times data
上記以外で助成金を充当した研究内容	
助成金充当に関わる共同研究者	(所属・職名・氏名) Wenzhe Sun, 京都大学 工学研究科 非常勤研究員
発表学会文献等	(この研究成果を発表した学会・文献等) Vongvanich, T., Schmöcker, J.-D., Sun, W., Yamada, T. and Nakao, S. (2022). Explaining station demand patterns using Google Popular Times data. 4th International KEC Conference, Kantipur Engineering College, Nepal, 28 April, online. Sun, W. and Schmöcker, J.-D. (2022). Learning the time-varying relationship between transit stop flows and nearby POI busyness. 15th International Conference on Advanced Systems in Public Transport (CASPT). 3-7 October, Tel Aviv, Israel.
成果の概要	**研究内容・研究成果・今後の見通しなどについて、簡略に、A4版・和文で作成し、添付して下さい。(タイトルは「成果の概要／報告者名」)**

会計報告

交付を受けた助成金額	1,000,000 円	
使用した助成金額	1,000,000 円	
返納すべき助成金額	0 円	
助成金の使途内訳	費　目	金　額
	モバイル空間統計アカデミックパック	957,000
	非常勤職員給与・社会保険料	26,056
	オンライン学会参加費	16,100
	消耗品	844

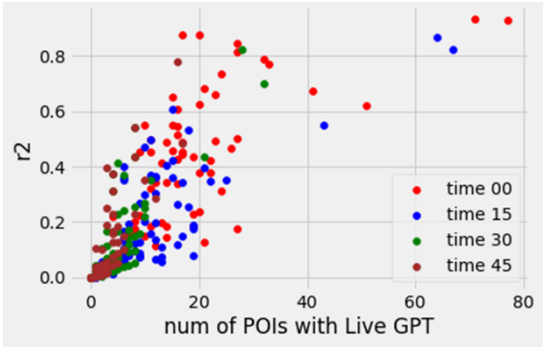
当財団の助成について	(今回の助成に対する感想、今後の助成に望むこと等お書き下さい。助成事業の参考にさせていただきます。) この基金は、今年も研究を続けるために大変役に立ちました。学会への論文投稿の準備や、さらなる研究資金獲得のためにも役立ちました。特に、さまざまな研究の方向性を探ることができる基金の柔軟性に感謝しています。

成果の概要：“Improving Public Transport Network Planning with Map and Google Popular Times data”／Jan-Dirk Schmöcker

Google Popular Times (GTP) data are a novel data source that is open to the public, accessible in real-time and available in areas around the world. The data are available from webpages for “points of interests” (POIs) which can be a wide range of public facilities. Below figure shows a general example of the information (red bar is live information). We have been collecting the information from a wide number of POIs in Kyoto for the whole year. Static information (blue bars) could be obtained from 10121 POIs and both static and live information from 1524 POIs.

The conducted research aimed to explain and predict travel demand patterns for train stations in Kyoto city with this data. In particular, we wanted to understand if it is possible to explain why people travel to a station, by comparing the time series of station GPT data and those of nearby attraction POIs such as shops, restaurants and tourist attractions. Multiple linear regression models are developed using the POI data to analyse the correlation. The first set of our regression models aim to identify POIs and POI types that have the highest impact on the demand at each station. The subsequent models use station live popularity, station historical popularity and POI visitation to predict demand.

The research showed that we are able to identify influential POIs and quantify their impacts given that there is a sufficient number of POIs in the vicinity of the station. The figure shows one example of the results where time indicates the time lag of prediction. For prediction, the station’s historical popularity and live popularity are most significant when compared to its surrounding POIs. POI visitation data are shown to be useful when trying to predict further into the future. Our findings suggest that GPT data can enable transit planners and transit users to predict station demand in real-time. City planners would also gain valuable insights in understanding for what type of activities travellers alight or board from each station. Moreover, the method can be scaled and applied to other types of transit stations in other cities.



In addition to this research we have also been collecting and using GPT data from Shizuoka to understand origin destination patterns in passenger flow. Here also the daily patterns in busyness of specific locations can explain and predict the bus demand. We are using for this regression analysis as well as advanced machine learning methods.

In future research we aim to continue these research directions. For example, there is still a lot to explore based on the initial Kyoto data analysis and to analyse, for example, time of day effects. Furthermore, we aim to fuse the GPT data with other data from Kyoto. Part of the obtained funding we have used to purchase mobile spatial statistics of Kyoto that provide us information as to the distribution of Kyoto’s population within the city. We suggest that together with the GPT data we can obtain “an activity origin-destination matrix. We are further considering specific transport planning applications, such as exploring the tour patterns of tourists using the GPT data and then estimating the demand for new transport schemes such as shared bicycles and scooters. This has been the topic of a new Kaken proposal.