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Analysis of People's Behavior Using Call Detail Records

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Background and Purpose

Background: It is important for city management to observe people's movement. GPS has high spatial resolution, but there are some problem e.g. consumption of battery. Therefore, CDR (Call Detail Record) which does not require consumption of battery.

Purpose: We try to estimate the car or railway usage as features of the movement pattern at the time of commuting. For the estimation of traffic mode using the GPS log, which is a spatially high resolution, we aim to estimate from the CDR, which is coarse spatial resolution of only base station location information.

CDR (Call Detail Record)

CDR is record of telecommunication between mobile phone and base station, which includes time and location of base station.

Using data

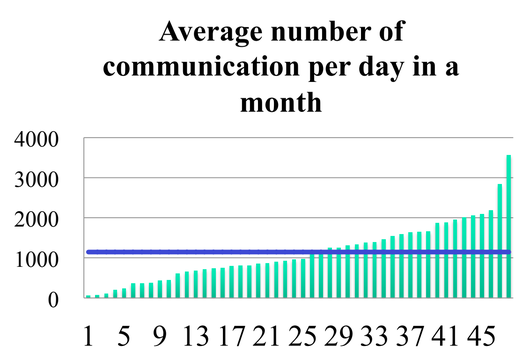
In this study, we use the survey of subjects who consent to the use of CDRs. the distinction between call communication and data communication is not included in the survey.

Format of the data

User ID
Time
Base station Latitude
Base station Longtitude
Time
Base station Latitude
Base station Longtitude

Start of telecommunication

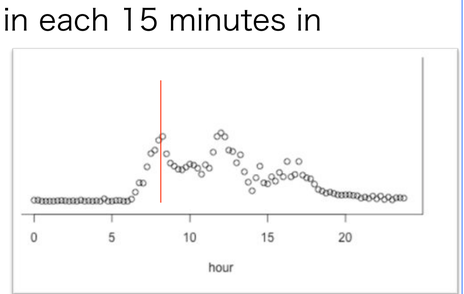
End of telecommunication



It counts respectively at start and end of telecommunication.

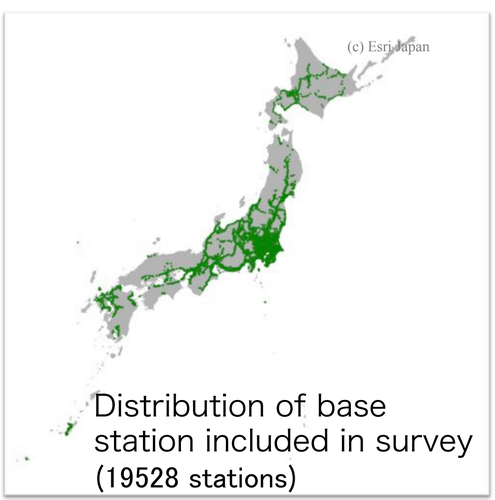
Characteristics of the communication time

Frequency in each 15 minutes in weekdays



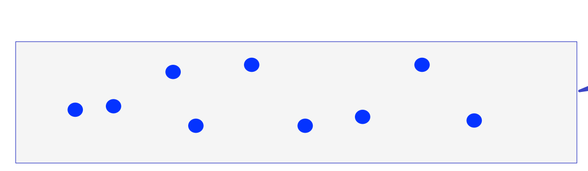
typical histgram

-Peak of mobile phone use is in the morning and evening.



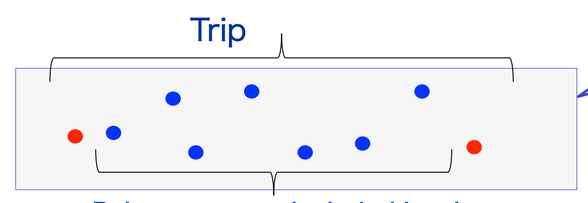
Distribution of base station included in survey (19528 stations)

Analytical method



Row CDR

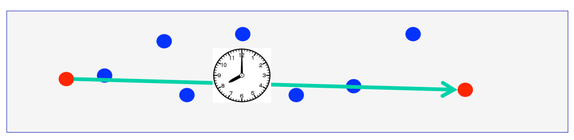
Trip



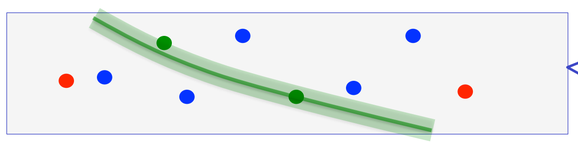
Point sequence Included in trip

Red: Stay point, Trip: During the stay points

Detect trip which intersects 8 am



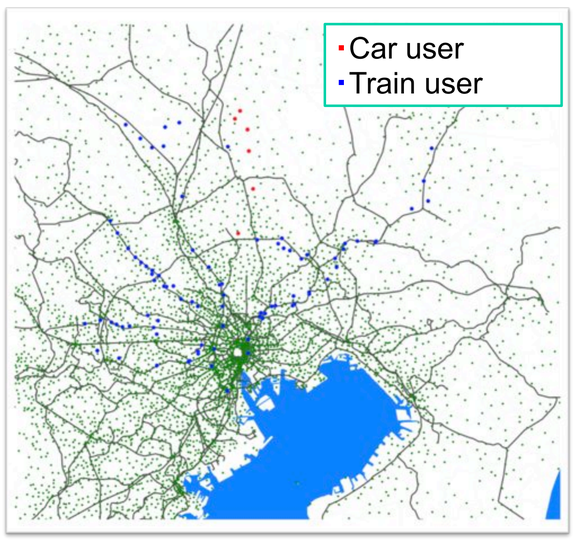
Calculate the percentage of the points sequence that are included buffer from the railway line within 1km

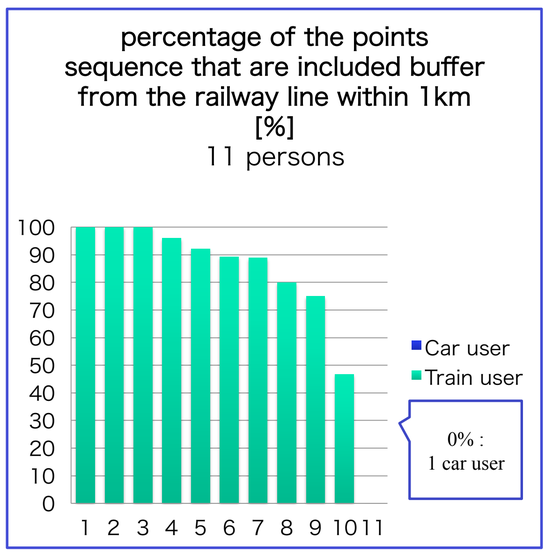


To compare the percentage that was calculated above and transportation mode of questionnaire.

Results

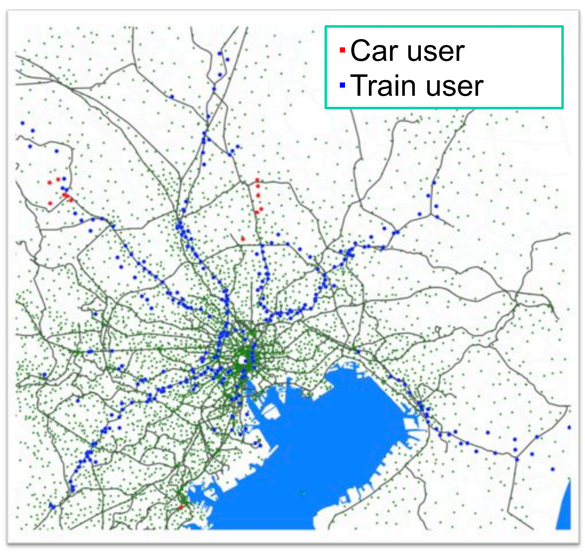
-Target date: February 1st

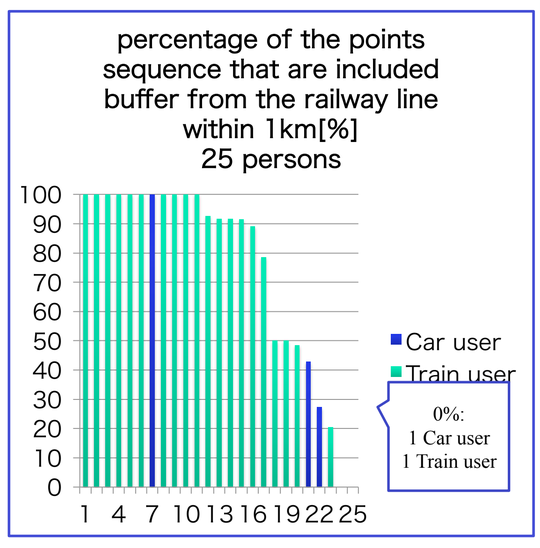




-Target date: February 4th – 8th (5 weekdays)

-number of detected person increase





Conclusions and Future Prospects

Conclusion: Using the CDRs and railway network shape data, taking advantage of the feature that the communication is often in commuting time, part of the commuters' movement is detected. There is the possibility to estimate the railway use in movement.

Future prospects: This time the buffer was 1km. However, It may be possible to determine the optimal buffer distances By using a method such as machine learning. Not only railway use, it may be possible to estimate the available routes and boarding stations.

We use data of joint research with KDDI R&D LABS and National Land Numerical Information's railway data (MLIT).