Traffic analysis using big data on freight vehicles

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화물차 빅데이터를 활용한 교통 분석

ICT technology has made many advances in recent years. One of these advances is the use of big data, such as the latitude and longitude coordinate data of vehicles. This service uses the location information (latitude and longitude information) of approximately 10,000 freight vehicles nationwide stored on servers in cooperation with companies that provide in-vehicle operation control terminals for freight vehicles and operation control assistance services. It makes the information anonymous to ensure that individual company names are not disclosed, and provides analysis services that satisfy the needs of customers.

About Truck Probe Data

Outline of Data

Truck probe data is obtained from companies that supply in-vehicle operation control terminals such as digital tachographs. It can be used to ascertain the state of freight vehicle operations. Data is obtained at regular intervals while in-vehicle terminals are running and when special incidents occur, such as when a vehicle brakes suddenly (Figure 1).

Characteristics and Advantages of Data

Below are the characteristics and advantages of the data that is handled by this service:

■Nationwide Coverage ······The data of approximately 10,000 cars all over Japan (equivalent to about 1% of the vehicles which must be equipped with a tachograph) is recorded, covering roads nationwide.

■Stable Data Acquisition ······This service has run continuously, 24 hours a day, 365 days a year, for the last 12 years. It has not stopped for a single second, and continued to accumulate data even when the Great East Japan Earthquake hit Japan. This continuity makes the data ideal for use in developing disaster prevention plans based on the traffic movements observed when major disasters occurred in the past.

■Coverage of Diverse Business Types ······The data comes from more than 20 companies representing all different fields. The numerous and varied data sources make it possible to conduct analysis free of bias.

■Coverage of Diverse Vehicle Types ······The service covers a wide range of freight vehicles, from small to large (small vehicles: up to 3 tons, mid-size vehicles: 3 tons to 8 tons, large vehicles: 10 tons and up).

■Handling CAN Data
(The only service of its kind that covers all of Japan *1) ······In addition to location information, the service also provides data used to monitor the state of vehicles (CAN data). While only test calculations were possible in the past, fuel consumption (fuel efficiency) analysis based on verification tests can now be performed (the only service to offer commercial data from all over Japan *1)

*1: As of May, 2015 (according to our research)

Handling of Corporate Information

The truck probe data used for this service is made anonymous to ensure that the names of individual transport companies are not disclosed.
This anonymity provides a sense of security when using data for applications that help to maintain roads, alleviate traffic congestion, and improve traffic safety. *2
*2: To provide data, a license agreement that specifies the purpose of use and other requirements must be concluded. In addition, when you disclose the analysis results, we will review the details in advance.
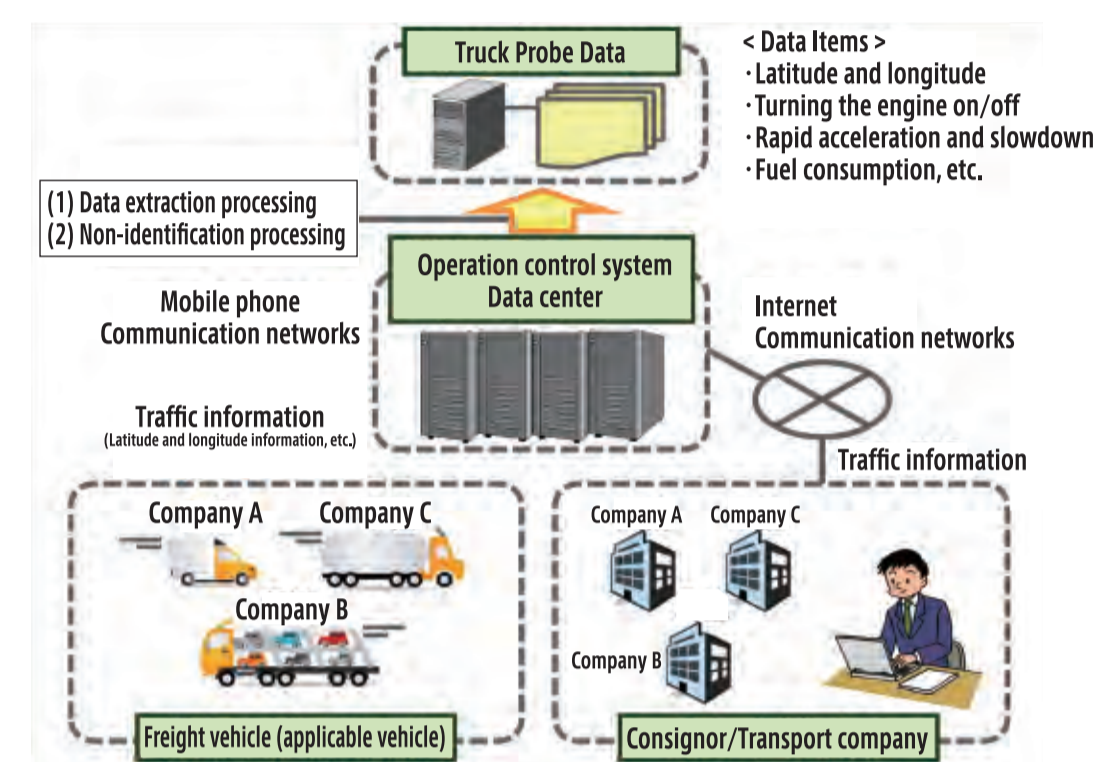

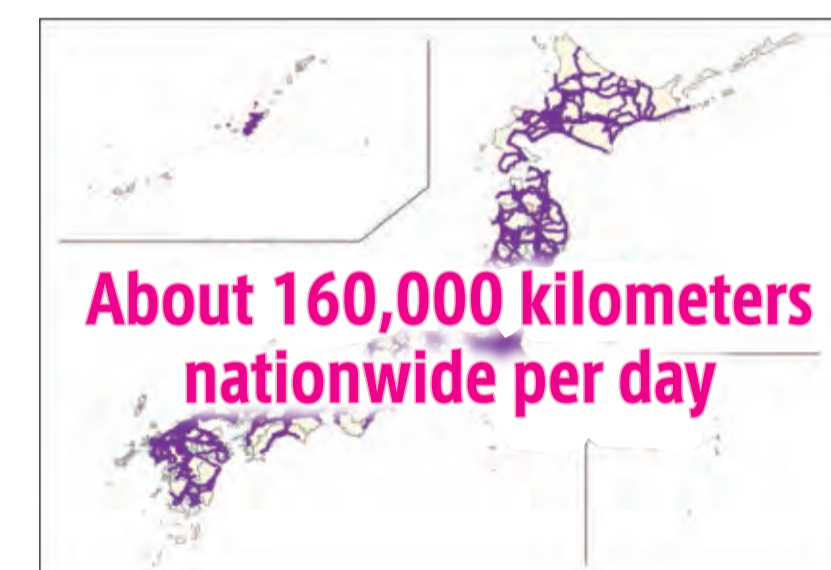Figure 1: Outline of Truck Probe Data Acquisition

About 160,000 kilometers nationwide per day

Figure 2: State of Daily Location Measurements Nationwide, Feb. 20, 2015 (Fri.)

Service Menu

Data Handled

The following data packages are available. Select the type that best fits your analysis needs or the issues you would like to solve.

Data handled

(1) Standard Package

① Link column data (reveals routes)
⇒ Data to bundle pass-through link information per freight vehicle, per trip

② Link aggregation data (reveals speeds)
⇒ Data to aggregate the link column data in ② by DRM (average travel speed per 15 minutes, etc.)

③ OD data (reveals departure points and destinations)
⇒ Data to aggregate both the origin and destination (OD) of the link column data in ② by area *3

④ Rapid acceleration and rapid slowdown data (reveals dangerous points)
⇒ Points where the freight vehicle accelerates/slows down suddenly (latitude and longitude) and strength data

(2) Optional Data

⑤ Dot data (reveals routes)
⇒ Data of longitude and latitude per freight vehicle, per trip

⑥ CAN data (reveals fuel efficiency)
⇒ Data to monitor the state of the vehicle, such as the fuel consumption of the freight vehicle
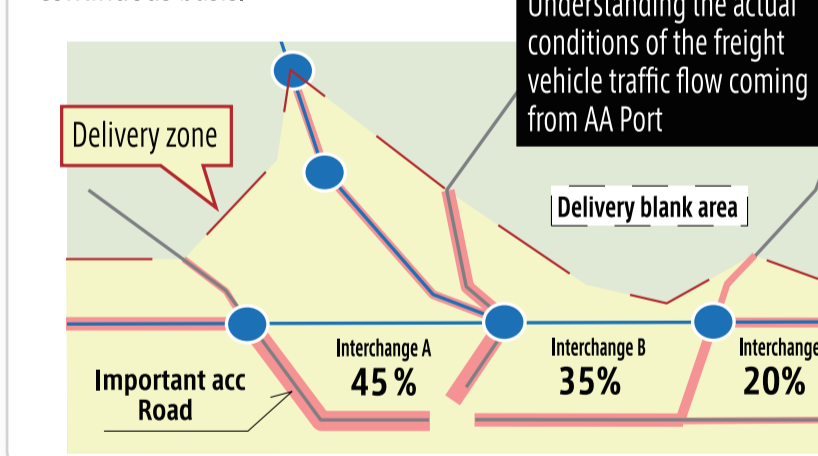
*3: Area divided by municipality

Consulting Menu

We will propose a plan of improvement for data aggregation/analysis and issues to be solved.

Examples of Analysis Menus

① **Analysis of freight vehicle driving routes**⇒Analysis of freight vehicle driving routes in urban areas, analysis of the outlying areas of ports, and analysis of route and IC selection orientation, etc.

② **Analysis of the impact when traffic regulations are applied or when a disaster occurs**⇒Analysis of detour actions and economic loss when traffic regulations are applied, and analysis of goods supply routes in the event of disasters, etc.

③ **Analysis of the impact of maintenance**⇒Analysis of changes in driving routes, required time, and transport areas when road maintenance is performed, etc.

④ **Analysis of close calls/traffic accidents**⇒Analysis of places where close calls occur frequently, and the evaluation and analysis of the effect of traffic safety measures, etc.

⑤ **Analysis of fuel consumption and fuel efficiency**⇒Analysis of fuel consumption, environmental quality, and emissions in urban areas, analysis of improvement in fuel efficiency as a result of road maintenance, etc.
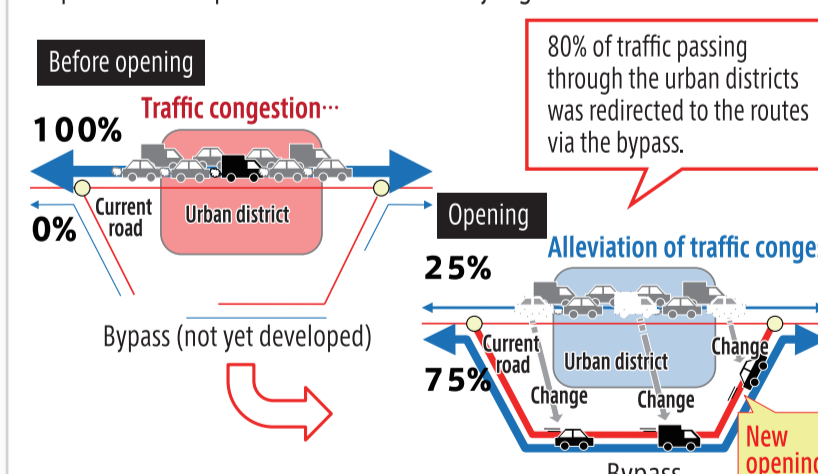

①**Analysis of freight vehicle driving routes**
Advantage of this data: In the past, there was no data available for identifying the actual conditions of freight vehicle operations. This data makes it possible to identify operation conditions by region on a continuous basis.
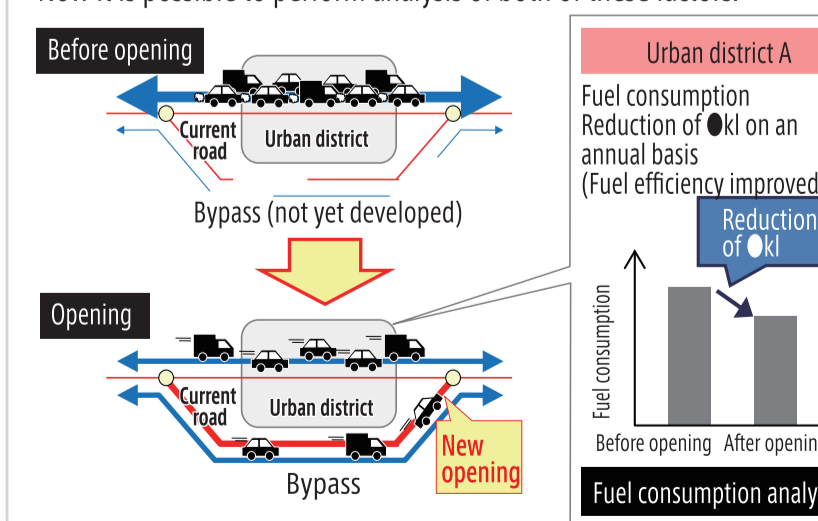
Delivery zone

Understanding the actual conditions of the freight vehicle traffic flow coming from AA Port

Delivery blank area

Important acc Road | Interchange A 45% | Interchange B 35% | Interchange C 20%

②**Analysis of the impact when traffic regulations are applied or when a disaster occurs**
Advantage of this data: In the past, the only means available for determining the traffic conditions when a unique incident occurred was to interview the people who witnessed it. Now it is possible to identify these conditions by region, as well as changes in these conditions with the passage of time.

Before severing

At the time traffic is cut off
Traffic cut off
Traffic reduced to 40%

After recovery

Detour traffic

Traffic Recovered to 80%
Recovery

Cut off roads affect freight vehicle traffic for ● 0000 unit kilometers
(Loss as a result of detours and suspended operation is ●00 million yen)

③**Analysis of the impact of maintenance**
Advantage of this data: Previously questionnaires and large-scaled license plate surveys were required to get a clear picture of the driving routes. Now it is possible to acquire route information by region on a continuous basis.
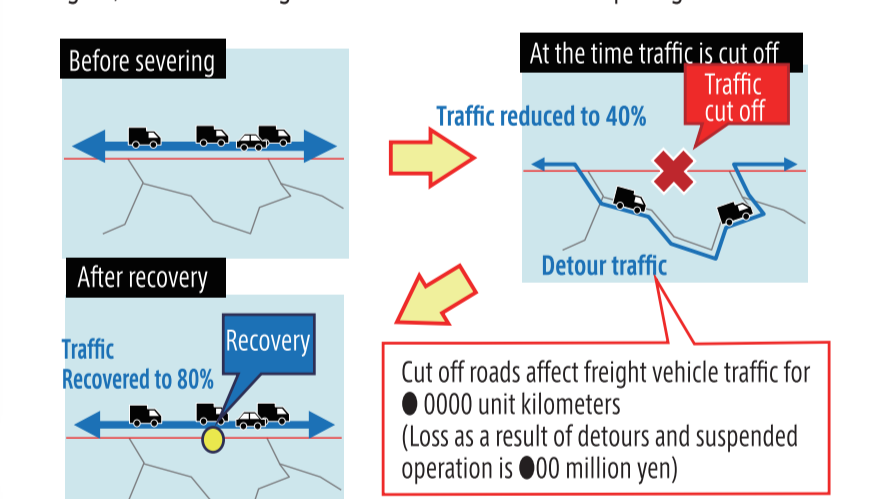
Before opening

80% of traffic passing through the urban districts was redirected to the routes via the bypass.

100%
Traffic congestion
Current road | Urban district
0%

Opening
25%
Alleviation of traffic congestion ♪

Bypass (not yet developed)

Current road | Urban district Change Change
75%
Bypass
New opening

④**Analysis of close calls/traffic accidents**
Advantage of this data: In the past, only information about locations where the accidents occurred was extracted. Now it is possible to extract and analyze dangerous locations regardless of whether an accident actually occurred.

Extraction of locations where close calls occur frequently

Crossing A
After the crossing was improved, the number of close calls was reduced by half.
Reduced by half

Number of close calls
Before measures After measures

● High level of occurrence of close calls
● Middle level of occurrence of close calls
● Low level of occurrence of close call

Analysis of change in the number of times people braked suddenly

⑤**Analysis of fuel consumption and fuel efficiency**
Advantage of this data: The large amount of work involved in conducting surveys made it difficult to analyze fuel consumption and efficiency. Now it is possible to perform analysis of both of these factors.

Before opening

Urban district A
Fuel consumption
Reduction of ●kl on an annual basis
(Fuel efficiency improved 3%)
Reduction of ●kl

Current road | Urban district

Bypass (not yet developed)

Opening

Current road | Urban district
New opening

Bypass

Fuel consumption
Before opening After opening

Fuel consumption analysis

CTI Engineering Co., Ltd.