【様式４】

"Technical Research and Development for Road Policy Quality Improvement" Study Summary

No.	Title	Principal Researcher
No. 25-3	R & D of an integrated traffic accidents analysis system using their longitude and latitude	YAMADA Harutoshi UTokyo, Project Professor

This study has developed an integrated traffic accidents analysis system using their longitude and latitude. This system can control the quality of positional data and analyze traffic accidents data in relation to various geospatial information like land uses along a road, the location of POIs, and weather condition when an accident occurred. The developed system is already used by road administrators to make and evaluate road safety plans. In addition, the influential factors and clustering of accidents have been analyzed using the data tallied up based on tertiary geographical grid cells.

1. Backgrounds and Objects

The longitude and latitude of traffic accidents have been measured and added to the accidents database since 2012 in Japan. This has enabled us to make a detailed analysis of accidents occurred on any road and in any area, in principle. However, conventional systems used for analysis could not deal with the locational information. In addition, they were almost unable to control or improve the accuracy of the information. Accordingly, this research has been launched to develop an integrated accidents analysis system that is capable of quality control and detailed analyses including land use characteristics along the road, weather conditions, floating car data, *etc.* The results of these analyses will be reflected to safety measures to improve traffic safety.

2. Activities in Research Period

The research activities are as follows:

(1) To develop a system to verify the accuracy of longitude and latitude of accidents and to correct the location if inaccurate;
(2) To develop a system to tally the number of accidents based on a road link called an ITARDA link;
(3) To develop an accidents analysis system that uses tallied data as an input;
(4) To collect various socioeconomic and geospatial data required in analyzing traffic accidents;
(5) To analyze the influential factors of accidents and their clustering; and
(6) To disseminate the results of the above analyses to enlighten safety consciousness and improve traffic safety.

3. Study Results

(1) We have checked the accuracy of longitude and latitude of the accidents data provided annually and rectified the incorrect positional data using the developed correction system so that accidents are placed on a DRM link.
(2) A system to tally traffic accidents including those occurred in the past based on ITARDA links that have an average length of 300 m has been developed. Accidents data for subsequent analyses have been prepared by this system.
(3) A system for accidents analysis devoted to road administrators has been developed and provided to them with tallied data. This system is capable of calculation of the number of accidents per vehicle mileage and the prioritization of ITARDA links.
(4) Various data required for accidents analysis have been collected and stored.
(5) Influential factors in traffic accidents have been analyzed using Generalized Linear Models (GLMs), Zero Inflated Models (ZIMs) and Conditional Autoregression (CAR) Models. In addition, the spatial clustering of accidents has been investing and hot spots have been identified.

(6) Hot spots data have been provided to car navigation makers and auto manufactures; and they are used on car navigation systems. Furthermore, accidents on residential and community roads have been tallied based on tertiary grid cells and the results have been revealed on the Internet.

4. Papers for Presentation

1) **Yamada H**: A fundamental analysis of traffic accidents of the elderly, *Proceedings of the traffic engineering research,* v33, pp. 23-27, 2013, The Japan Society of Traffic Engineers (in Japanese).
2) **Yamada H**, Horanont T, Tanaka Y & Shibasaki R: The verification of locational accuracy of the longitude and latitude of traffic accidents and the development of an accident analysis system, *Proceedings of infrastructure planning,* v49, 9 pages, 2014, The Japan Society of Civil Engineers (in Japanese).
3) Songpatanaslip P, **Yamada H**, Horanont T & Shibasaki R: Traffic accidents risk analysis based on road and land use factors using GLMs and zerjo-inflated models, Paper #320, 26 pages, *Proceedings of CUPUM 2015*, 2015.
4) Chen Q, Song X, **Yamada H** & Shibasaki R: Learning deep representation from big and heterogeneous data for traffic accident inference, *Proceedings of AAAI 2016*, The Association for the Advancement of Artificial Intelligence, 2016.
5) **Yamada H**, Shimomura S, Tanaka Y and Shibasaki R: Traffic accidents analysis using their longitude and latitude, *Proceedings of infrastructure planning,* v53, 4 pages, 2016, The Japan Society of Civil Engineers (in Japanese).

5. Study Development and Future Issues

The positional information of accidents is indispensable to their analysis. Its accuracy is becoming better annually. However, it is required to check the accuracy continuously and warn if accuracy becomes worse. In addition, updating of data used for analysis is also necessary. We are going to continue these activities consistently in the future.

Some of data used in accidents analysis are not allowed to be made public to protect privacy and intellectual property rights. Therefore, only results of totaling without privacy information will be disseminated through, for example, the Internet.

Traffic accidents on arterial roads have been the main focus thus far. Recently, however, traffic accidents on residential and community roads are attracting more and more attention. It is required, thus, to analyze the relationship between those accidents and regional / geospatial characteristics. We have just stared these analyses and will intend to expand the activity.

6. Contribution to Road Policy Quality Improvement

The traffic accident analysis system developed in this study is now widely used by traffic administrators to make and evaluate safety plans. In addition, the other systems developed in this study are utilized in preparing related data.

These systems contribute to reducing the costs and time to make accidents database because the locational information of accidents is automatically obtained from longitude and latitude. Previously, the locations of accidents were drawn from paper maps / drawings. This work has become unnecessary.

With respect to the accidents on residential / community roads, the number of accidents were tallied based on geographical grid cells. The results are sent to prefectures to help them devise a traffic safety plan. Moreover, the results have been laid open to public on the Internet. These activities surpass traditional ones.

7. References, Websites, *etc.*

Traffic accidents occurred on residential and community roads have been tallied up based on quaternary grid cells and the results are shown at http://www.itarda.or.jp/service/webmap.php. In addition, the number of casualties of traffic accidents broken down into municipalities, age groups and transport modes are also shown at http://www.itarda.or.jp/materials/publications_local.php.