

Time-space patterns of traffic accidents: what we learn from comparing Brussels with QingDao City 'Traffic accident patterns' - BL/01/030

(Geographic) study area (country/region) : Brussels (Belgium) and QingDao (China)

OSTC test site (if applicable) : /

Data used:

- Brussels : URBIS (road network), accident data 97-99
- QingDao: road network model, accident data 02-05

Satellite imagery used (if applicable): /

Context and objectives

Traffic accidents tend to cluster together, both in time and space. Some time periods are more hazardous than other, such as morning rushes on weekdays. Also some locations on the road network harvest more accident occurrences than other. This project aims at the identification of these time periods/locations and to detect the causes of the high accident numbers at these periods/locations.

The projects objectives are:

- Identification of locations at which unusually high numbers of accidents occur.
- Detailed functional evaluation of high accident locations to determine contributing causes of accidents at the location
- Development of general statistical measures of various accident-related factors to give insight into general trends, common causal factors and similar information
- Development of procedures that allow the identification of hazards before large numbers of accidents occur.

Methodology

- The accident history of a period of at least 3 years was used to determine black zones, i.e. periods/locations with unusually high traffic numbers. Geostatistical methods were used to determine black zones on the road network. As the existing methods do not take into account the specific nature of networks, a new clustering method was developed that works with distances along the road network instead of Euclidean distances.
- For the identification of black zones in time, econometric methods were used together with other statistical techniques.
- A comparison between two different city networks: Brussels (Belgium) and QingDao (China) was carried out to detect similarities/differences in accident occurrences.
- A combined time-space investigation will reveal black zones on the road network characteristic for certain time periods. For example: accidents in the morning rushes are located elsewhere then locations during weekend nights.

Results

The project is still ongoing at this moment. Results were obtained mainly for the city of Brussels, which was used as a test area during the development of the new clustering technique.

The project results in several maps of Brussels and QingDao showing the dangerous locations (road intersections, roads) on the road network as detected with the newly developed clustering technique. This new technique is described in an extensive report, covering a comparison with existing techniques, mythological and a technical description of the clustering technique. Also a software program that implements this new technique was developed. A scientific publication about the new clustering technique was submitted to an international journal.

The second goal of the project was the identification of temporal clusters. Both for Brussels and QingDao a three year period of accident history was analyzed to find temporal peaks of high accident occurrences.

These two analyses were combined in a spatial-temporal clustering technique. Spatial clusters at certain time periods, such as morning rush accidents were searched. However, there appeared to be no significant clusters for specific periods.

Products and services (if applicable: maps, database, peer reviewed article(s),weblink...)

- Maps showing black zones for Brussels and QingDao for different time periods
- Application to detect spatial clusters of point based events, like traffic accidents, on a network using the newly developed clustering technique.

- Peer reviewed paper: "Spatial Clustering of Events on a Network", submitted for review at the International Journal of Geographical Information Science.

- Preliminary results were presented at 3 international conferences with conference papers in proceedings:

Steenberghen T., C. Aerts, J. Wijnants, (2007) Accident clustering, theory and practice. ICTCT. Oct. 25-26 2007 (accepted). Valencia, Spain. (accepted)

Aerts K., C. Lathuy, T. Steenberghen and I. Thomas, (2006). Spatial Clustering of traffic accidents using distances along the network. ICTCT. October 26 2006. 10pp. www.ictct.org.

Steenberghen T. and I. Thomas, (2005). Spatial analysis of road accidents in Belgium. A synthesis of recent results. *BIVEC-GIBET Transport Research Day 2005*. Hasselt Nov. 30, 2005. pp. 45-49.

Execution

Period: May 2005 – October 2007

Laboratory/network:

- Spatial Application Division Leuven (SADL), Katholieke Universiteit Leuven, Leuven, Belgium
- Département de Géographie, Université catholique de Louvain, Louvain-La-Neuve, Belgium
- The Digital City and GIS Application Division, Ocean University of China, QingDao, China

Discipline

Transport & navigation
Social & cultural activities
Information & communication technology