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Predicting Road ACcidents – a Transferable methodology across Europe

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Imperial College London

The PRACT Project

Predicting road accidents - A transferable methodology across Europe http://www.practproject.eu/

funded by the National Road Authorities of Germany, Ireland, UK and the Netherlands within the Conference of European Directors of Roads (CEDR) 2013 Transnational Research Programme - Safety.



PRACT objectives

- The PRACT project aimed at developing a practical guideline and a user friendly tool that will allow the different road administrations to:
- adapt the basic Accident Prediction Model (APM) function to local conditions based on historical data;
- identify the Crash Modification Factors (CMFs) that could be relevant for the specific application;
- verify if the selected CMFs are transferable to the specific condition;
- apply the calibrated model to the specific location to be analysed.



Accident Prediction Basics

Accident Prediction Model (APM) = a full model that allows an evaluation of the predicted number of crashes in a given condition

Safety performance function (full APM)

- Safety Performance Functions (SPFs) are developed for specific facility types and "base conditions".
- Crash Modification Factors (CMFs) account for differences between the base conditions and local conditions of the considered site.
- Calibration Factor (C) accounts for differences between the road network for which the models were developed and the one for which the predictive method is applied.

SPF (base APM) x CMFs x C



PRACT Questionnaire Survey

- Brief introductory part,
- Part A regarding the **Decision Making Process**,
- Part B regarding **Data Sources**,
- Part C regarding information on CMFs and road safety measures assessment,
- Part D, aimed at gathering a summary of experience on road safety measures / CMFs

Responses received from **23 countries**: Austria, Belgium, Cyprus, Denmark, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Slovenia, Spain, Switzerland, UK, USA, Australia



Survey Results

- There is high data availability for accident prediction, particularly for motorways,
- Most National Road Administrations (NRAs) do not systematically use accident prediction methods during decision making,
- Highly desirable, missing CMFs were identified, to be developed within PRACT project.



Use of APMs and CMFs for road safety measures assessment



In-depth CMF and APM Review

- CMFs and APMs were grouped into six roadway element categories for the subsequent review:
 - 1. Freeway segments
 - 2. Speed change lanes
 - 3. Ramp segments
 - 4. Crossroad ramp terminals
 - 5. Rural road segments (2-way 2-lane)
 - 6. Rural road intersections.
- 92 "High Priority" CMF types selected for in-depth review CMFs included in AASHTO's HSM, and CMFs that more than 50% of NRAs considered as highly desirable according to the questionnaire survey
- All APMs included in in-depth review



CMF Review Results & CMF Inventory

- For each of the 92 CMF types a one-page summary was developed, presenting the most important information of the review.
- The review resulted in a comprehensive CMF Inventory that includes a total of 1,526 CMFs (Factors and Functions), with data (for each CMF), such as:
 - Basic information.
 - CMF development information.
 - Information about the study from which the CMF was retrieved.
 - Information on the considered road elements.
 - Basic accident information
 - Information about the relevant safety deficiency and the corresponding countermeasures.

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APM Review Results & APM Inventory

- For each of the 6 roadway element categories a one-page summary was developed, presenting the most important information of the review.
- The review resulted in a comprehensive APM Inventory that includes a total of **146 models** (85 Regression Equation models and 61 SPF & CMF models), compiled as 273 inventory entries, with data such as:
 - Basic information.
 - APM development information.
 - Information about the study from the APM was retrieved.
 - Information on the considered road elements.
 - Basic accident information

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CMF Development

Missing CMFs that were identified as highly desirable according to the survey and for which suitable data for estimation were available:

- > Italy, rural motorways
 - Work zones
 - Speed enforcement (section control)
 - High friction wearing course
- Germany, two-way two-lane rural roads
 - Traffic composition (% HGV)
 - Lane width
 - Horizontal curvature
 - Vertical gradient
- England, two-way two-lane rural roads
 - Traffic composition (% HGV, % PTWs)
 - Horizontal curvature
 - Vertical gradient



Online Repository Development

- The repository has two parts: the **CMF part** and the **APM part**.
- Both parts **are based on the respective inventories** developed within PRACT review process.
- All reviewed APMs were included in the repository, whereas only high quality CMFs were included in the repository, on the basis of specific **quality criteria**, referring to:
 - statistical design,
 - testing for statistical significance, and
 - sample size.
- **889 CMFs** (out of 1,526) were found to satisfy all the quality criteria and were included in the repository.



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Main Features of PRACT Repository

CMF

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www.pract-repository.eu

Five basic sections:

- HOME: basic information about the repository and about PRACT project,
- SEARCH FOR APMs: search the database for APMs with specific characteristics,
- SEARCH FOR CMFs: search the database for CMFs with specific characteristics,
- GLOSSARY: definitions of the most commonly used terms
- CONTACT: allows the user to send email to the partners responsible for the operation and maintenance of the website.

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Value of PRACT Repository

Existing online databases:

- Stand-alone Regression Equation APMs are not available.
- SPFs are available only in SPF Clearinghouse (to subscribers only), without provision of adequate background information.
- Existing Databases include mostly data from USA and Australia. Results from European studies are very uncommon.

PRACT repository:

- All types of data required in accident prediction are available (CMFs, SPFs, and Regression Equation APMs).
- The quality of included CMFs has been verified through an evaluation process.
- User is provided with additional information to verify the quality and the transferability of CMFs and APMs.
 Data from European studies are included www.pract-repository.eu
- Data from European studies are included.





PRACT Model Development and Calibration - Tool

- Within PRACT project, a set of base SPF models were estimated for:
 - fatal and injury accidents in freeway segments, both for single vehicle and multi vehicle accidents (two models), using data from Germany, Italy and the Netherlands.
 - fatal and injury accidents in two-lane two-way rural roads, for single vehicle and multi vehicle accidents (one model), using data from Germany, Italy and the United Kingdom.
- A **user-friendly tool** allows practitioners to easily implement them.
- The tool includes the freeway and two-lane twoway models, a set of commonly used CMFs and a set of transferability checks.



Future Challenges

- The **quantification of the impact** of various road safety measures and interventions is a valuable tool for the Decision Makers (Public Authorities and private stakeholders).
- Rigorous **scientific modelling** is critical for reliable and transferable results.
- There is need for **continuous update** of APM and CMF databases and the related Decision Support Systems.
- National Road Administrations should be encouraged to use Accident Prediction Models in decision making.



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ABOUT PRACT - PREDICTING ROAD ACCIDENTS - A TRANSFERABLE METHODOLOGY ACROSS EUROPE

Uniterpretary contains the most meant Academ Production Models and Early ModelStation Lattices, highlighting offers and safety-missionly workbodies. For use by road safety decision makers and practitioners worldwide.

His Reposition has been developed within the framework of the project PWACT. (Predicting Read Additions a Transforable methodology across surger control out, by the University of Florence, the National Technical University of Athens, the Technical University of Benin and the Imperial College London, commissioned by the Cartering of European Directors of Reads.

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