



SUCCESSFUL INTERNATIONAL COOPERATION

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In this paper the mutually beneficial relationship which will enhance academic life between University of Transport in Sofia and Institute for Traffic Safety and Automation Engineering, Technical University of Braunschweig in Germany is considered.

1. CO-OPERATION AGREEMENT

In September 2005 the co-operation agreement between these two institutions was concluded. Based upon the principles of respect for each other's independence and of mutual benefit the two universities will carry out the following **activities**:

1. Exchange of students
2. Exchange of faculty members and staff
3. Exchange of scientific materials, publications and information
4. Joint research and research meetings.

In September 2005 **Prof. Dr.-Ing. Eckehard Schnieder** who is a Head of the Institute for Traffic Safety and Automation Engineering in Braunschweig **received the title „Doctor Honoris Causa”** of the University of Transport for his contribution in the bilateral relations.

2. BILATERAL SCIENTIFIC PROJECT

The beginning of this beneficial initiative was put in 2004 when a bilateral project was approved and financed from DAAD (Division of German Academic Exchange Service) in Germany and the National Science Fund of the Republic of Bulgaria. The

project has been for two-years period 2005 - 2006. The Project Theme is **“Modelling of general stochastic processes by approximation with phase-type distributions”**.

Participants in the project are Prof. Dr.-Ing. Eckehard Schnieder and Dr.-Ing. Roman Slovak from German side and from the Bulgarian side- Assoc. Prof. PhD Ing. Emil Ivanov, Assoc. Prof. PhD Ing. Nelly Stoytcheva and Ing. PhD-student Kiril Kassev from the Department of Telecommunication and Safety Equipment and Systems. .

The aim of the project is creation of new scientific decisions in the area of safety modeling of the railway operation and control systems (ROCS) according European norms CENELEC [6].

A crucial aspect of the safety modeling is the necessity of description of non deterministic behavior in the system, which is caused by the stochastic character of the system environment and system degradation process. The aim of a safety analysis is to evaluate the safety level during the functional and technical design of the ROCS. The nowadays valid European standards require even a quantification of potential human fatalities and injuries caused by the future system operation.

A reasonable prediction of undesired system behaviour can be obtained only by a true description of stochastic processes influencing the correct functionality of the system. Here belongs on one hand the description of stochastic character of the controlled traffic process which directly influences the frequency of hazardous situations leading to fatal consequences. On the other hand a possible malfunction of technical system components must be taken into account as well as probability of a wrong human decision which can result into a hazardous system state.

To reach its aim, the project intends to use the wide practical application of Markovian Chain modeling in railway safety modeling with powerful mathematical background of the formal description language of Petri Nets.

The benefits of the project are many-sided.

On the one side the project have allowed **realization of the mobility** of teachers and researchers. Assoc. Prof. PhD Ing. Nelly Stoytcheva had has a possibility to be twice on a working visit in the Institute for Traffic Safety and Automation Engineering. Ing. PhD-student Kiril Kassev was in Germany for 3 months. Dr.-Ing. Roman Slovak has realized two working visits in the University of Transport in Sofia.

Prof. Dr.-Ing. Eckehard Schnieder held **lecturers** in University of Transport, Sofia concerning Safety Quantitative Evaluation according new European Standards, Satellite Positioning for ground Transportation, Formal methods, Theory of Petri Nets and Railway Application of Petri Nets.

On the other side were carried out investigations on the project and **were published 3 papers**, two of them on the prestige international conferences in Slovak Republic and one in the scientific journal.

During the time of working visits were realized different contacts with peoples from all Europe working in the area of railway safety systems.

3. PARTICIPATION IN THE INTERNATIONAL SCIENTIFIC 6th FRAMEWORK PROGRAM PROJECT OF THE EUROPEAN COMMISSION

As naturally continuation of the collaboration the including of University of Transport has come in a large international project “**Safer European Level Crossing Appraisal and Technology” (SELCAT) during 2006-2008 leaded by the Institute for Traffic Safety and Automation Engineering at the Technical University of Braunschweig**

The Coordination Action “SELCAT” (Safer European Level Crossing Appraisal and Technology), is responding to the call of 6th Framework Programme (FP) of European Commission in the area of “Sustainable Surface Transport Coordination Actions” towards the objective “Increasing road, rail and waterborne safety and avoiding traffic congestion”. It aims actively to contribute to the reduction of level crossing accidents by the:

- collection, analysis and dissemination of existing research results and the stimulation of new knowledge exchange in the area of level crossing safety
- creation of circumstances whereby European partners, in the rail and road sectors, can make a significant contribution to the reduction of accidents, injuries and fatalities at level crossings.
- understanding and codifying of existing and planned research,
- comparison and harmonisation of data sources,
- exploring new technologies and harnessing appraisal techniques to optimise these.

The Consortium of SELCAT comprises 19 partners from the rail and road sectors, and academic and scientific areas. According their background the partners can be divided into 4 groups:

- **Universities:**
 - TUBS - Technical University of Braunschweig, Institute for Traffic Safety and Automation Engineering (D)
 - DITS – University of Rome, Department of Department of Hydraulic, Transport and Road (I)
 - UNIZA – University of Zilina, Department of Control & Information Systems (SK)
 - UB – University of Birmingham (GB)
 - VTU – University of Transport Sofia (BG)
- **Railway and Road Research Institutes:**
 - INRETS - French National Institute for Transportation Safety Research (F)
 - RSSB – Railway Safety and Standards Board (GB)
 - CNTK - Railway Scientific and Technical Centre (PL)
 - DLR – German Aerospace Center, Institute of Transportation Systems (D)
 - VTT - Technical Research Centre of Finland (SF)
 - MULT – Applied signal processing and telecoms research centre (B)
 - RTRI - Railway Technical Research Institute (JP)
- **Road and Railway Organisations**
 - UIC – International Union of Railways (F)

- ADAC – General German Automobile Association (D)
- **Infrastructure Managers:**
 - DB – German railways (D)
 - NR – Network Rail (GB)
 - RFI – Italian national railways (I)
 - NRIC – Bulgarian national railways (BG)
 - VPE – Railway Allocation Office (H)

On 1st January 2007 are joining the project further partners from Russia, Morocco, China and India.

In accordance with the Commission White Paper on European Transport Policy [1] SELCAT will contribute to the investigation of new technologies for improved road and rail safety and to the implementation of the objectives of the Strategic Rail Research Agenda (SRRA) of the European Rail Research Advisory Council (ERRAC) [2] by focusing on the reduction of fatalities, the methodology of common risk assessment and the process of cost benefit analysis.

Addressing safety methods, safety targets and indicators in connection with cost benefit analysis SELCAT will also harmonise with the aims of the work programme of the European Railway Agency (ERA) [3]. The objective of SELCAT is to evaluate the safety performance of European level crossings and to make recommendations to the common safety targets for this particular subsystem of railway transport. In addition the level crossing as a practical example will be used as a benchmarking exercise for the application of evaluation methodology and can be used as important contribution to the adoption of Common Safety Methods advised by ERA for the year 2008.

In order to reach the above stated scientific and technological objectives taking into account the current problems described SELCAT intends to carry out the following coordination activities:

- To provide a knowledge base for the improvement of the level crossing safety by carrying out an analysis of results of safety-related projects from FP5 and FP6 with regard to Railway and Road Transport
- To provide an overview of existing and planned level crossing research and improvement activities in European countries and in Japan
- To analyse incident and accident data and databases related to level crossings in Europe and Japan
- To propose a standard for reporting level crossing accidents in European countries
- To set up a common level crossing accident information system
- To examine the potential for, and practicability of, existing and new technologies to improve the safety and the performance of level crossing systems.

- To investigate the applicability of available risk and cost-benefit analysis methods for the classification of technological solutions for the safer interface of rail and road traffic at level crossings
- To disseminate the results of in SELCAT investigated projects (FP5, FP6, national research) by the
 - Organisation of three specific workshops
 - Organisation of a special session on existing planned conferences
 - Creation of a thematic Level Crossing web portal

In general the coordinating activities of SELCAT will contribute to the practical implementation of the Safety Directive [7] of the European Parliament which prescribes a wide range of new duties of stakeholders in railway transport. By performing a deep analysis of completed and existing European research SELCAT aims to identify the research needs which can be addressed in FP7.

4. MOBILITY OF STUDENTS AND TEACHERS

The other main direction in the collaboration between two universities is an exchange of students and teachers. A **bilateral Socrat / Erasmus agreement** was concluded covered academic 2006/2007 year. Will be realized 2 students motilities for 10 months, 1 PhD students mobility for 5 months and 2 teachers motilities from Bulgarian side.

In parallel the mobility of MSc degree Bulgarian student for preparation of diploma thesis work in Germany now is in the progress. The student is from Department of Telecommunication and Safety Equipment and System.

[1] http://europa.eu.int/comm/energy_transport/library/lb_com_2001_0370_en.pdf

[2] Strategic Rail Research Agenda – Technical Annex, ERRAC, 2002,
http://www.errac.org/docs/ERRAC_SRRA_Tech_Annex.pdf

[3] <http://europa.eu.int/comm/transport/rail/era/doc/wp2005.pdf>

[4] http://europa.eu.int/comm/transport/road/roadsafety/roadinfra/levelcrossings/index_en.htm

[5] Safety at Level Crossings, EC DG Tren, High Level Group Road Safety, 2003

[6] EN 50126: Railway applications - The specification and demonstration of reliability, availability, maintainability and safety (RAMS). CENELEC, Brussels, 1998

[7] Safety Directive 2004/49/EC of the European Parliament and of the council of 29 April 2004