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Purpose

**Proceedings of the Conference on European guidelines for the application of new technologies for driver training and education
 Madrid, April 25-26, 2006**

**Task Force G:
 Use of ITS to train and to educate drivers**

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Summary:

The Conference on European guidelines for the application of new technologies for driver training and education was held in Madrid (Spain) on April 24 - 25 2006. The event was organized by Humanist Task Force G and hosted by the Technical University of Madrid (UPM).

During the Conference, researchers in human factors, driving simulators technology, and e-learning from the Humanist partners, shared their experiences with experts from other European research centres, public institutions and private companies with interests in the different aspects of drivers training. In total, 42 researchers representing 23 institutions and companies from Austria, the Czech Republic, Denmark, France, Germany, Greece, the Netherlands, Norway, Spain, Sweden, and the UK took part in the Conference.

Relevant issues for the preparation of Guidelines for the application of the new technologies to driver education were discussed in the following sessions:

- 1: State of the art on driver training methodologies and curricula
- 2: Recent advances and development needs in driver simulators technology
- 3: E-learning applications to driver training
- 4: Novice drivers training
- 5: Training of older drivers and drivers with disabilities
- 6: Validation of simulators and training methodologies
- 7: Functional and methodological requirements
- 8: Final debate and conference conclusions

The conclusions that were drawn as a result of the discussions during the Conference will provide the base for the preparation of guidelines for the application of the new technologies to driver education.

List of Participants:

Centrum Dopravního Výzkumu (CDV), Czech Republic:	Iva Hanzlíková Vratislav Kelnar
Chemnitz University of Technology (CUT), Germany:	Anke Mogilca Bettina Kämpfe Matthias Henning
Danish Transport Research Institute (DTF), Denmark:	Anu Siren Thomas Troglauer
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Indra, Spain:	Alexandra Suoy
INRETS, France:	Annie Pauzié Max Duraz Stéphane Espié
Institute for Transport Studies, University of Leeds, UK :	Samantha Jamson
Institute of Transport Economics, Norway :	Fridulv Sagberg
Norwegian Public Road Administration, Norway:	Rolf Robertsen
Swedish National Road and Transport Research Institute (VTI), Sweden:	Björn Peters Per Henriksson Sixten Nolen
SWOV, The Netherlands:	Willem Vlakveld
Technical University of Lisbon, Portugal:	Marta Pereira
TNO, The Netherlands:	Bart Kappé
TUR, Denmark:	Kjeldgaard Christiansen Tove From Jorgensen
TÜV DEKRA arge tp 21 / University of Potsdam, Germany	Karen Kammler
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Conference Agenda

Monday, April 24

Opening session

- 9:00–9:15 Welcome and opening address. Gonzalo León, Vice-Dean, Madrid Polytechnic University (UPM), Spain
- 9:15–9:30 Introduction of Humanist TFG activities and objectives. José M. Pardillo –UPM, Spain

Session 1: State of the art on driver training methodologies and curricula

Moderator: Anke Mogilka - Technische Universität Chemnitz (CUT), Germany

- 9:30-10:00 "Computerbased training in driving education and current developments on computer assisted driving tests in Europe and in the world" Dr. Kathrin Schlemmer & Karen Kammler - TÜV | DEKRA arge tp 21 / University of Potsdam, Germany
- 10:00-10:30 "Computerbased training in driving education and current developments on a computer assisted driving test in Germany" Franz Prücher - Bundesanstalt Fuer Strassenwesen (BASt), Germany
- 10:30-11: 00 Discussion

Session 2: Recent advances and development needs in driver simulators technology

Moderator: Jose M. Pardillo - Madrid Polytechnic University, Spain

- 11:30–12:00 "Simulation for Driver Training: customer requirements and R&D answers by CITEF-UPM" Jose M. Mera – UPM, Spain
- 12:00–12:30 "The advanced driving simulators at VTI as tools in driver training - technology development driven by applied research issues and requirements" Björn Peters - Statens Vag- och Transportforsknings Institutet (VTI), Sweden
- 12:30–13:00 Discussion

Session 3: E-learning applications to driver training

Moderator: Thomas Trogaluer - Danmarks TransportForskning (DTF), Denmark

- 14:30-15:00 "E-learning -the stepchild of transportation research. A state of the art review." T. Trogaluer - DTF , Denmark

15:00-15:30 "Electronic driver testing and e-learning support of education in the Czech Republic: Methodological requirements" Vladimir Kelnar - Centrum Dopravního Výzkumu (CDV), Czech Republic

15:30-16:00 " Didactical and pedagogical aspects of e-learning tools" Yvonne Bernard –Eurisco International, France

16:00-16:30 Discussion

Session 4: Novice drivers training

Moderator: Willem Vlakoveld - Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV) , The Netherlands

16:30 – 17:00: "Training novice driver: toward cognitive training" Stéphane Espié – Institut National de Recherche sur les Transports et leur Sécurité (INRETS), France

17:00 – 17:30 "Potentials and Risks of New Technologies in the Training of young drivers" Christine Turetschek - FACTUM Ohg, Austria

17:30 – 18:00 "Driving simulators for novice driver training in the Netherlands: state of the art" Bart Kappé, Netherlands Organisation For Applied Scientific Research (TNO), The Netherlands

18:00-18:30 "What does educational psychology tell us and what are the implications for simulator training?" Willem Vlakoveld - SWOV, The Netherlands

Tuesday, April 25

Session 5: Training of older drivers and drivers with disabilities

Moderator: Björn Peters - Statens Vag- och Transportforsknings Institutet (VTI), Sweden

9:00 - 9:30 "Needs and implication of using ITS in the training of older women drivers" Anu Siren - DTF, Denmark

9:30 - 10:00 "Driver behaviour and abilities assessment of Greek elderly drivers" Stella Nikolaou - Centre For Research And Technology Hellas (CERTH), Greece

10:00 - 10:30 "IDEA - a training package for personnel assessing driving ability of elderly and disabled" P. Henriksson - VTI, Sweden

10:30 -11:00 "Beyond the CONSENSUS project – a vision for ITS applications to promote mobility for drivers with disabilities" Björn Peters - VTI, Sweden

11:00 - 11:15 Discussion

Session 6 Validation of simulators and training methodologies

Moderator: Stéphane Espié - Institut National de Recherche sur les Transports et Leur Sécurité (INRETS), France

11:30 -12:00 “Validation of driving simulators for training” Max Duraz - INRETS, France

12:00-12:30 “Performance measurement for driver training and driver assessment” Bart Kappé - TNO, The Netherlands

12:30 - 13:00 “Intelligent tutor: concepts and feasibility “ Stéphane Espié - INRETS, France

13:00 - 13:30 Discussion on Validation of simulators and training methodologies

Session 7: Functional and methodological requirements

Moderator: Iva Hanzlíková - Centrum Dopravního Výzkumu (CDV), Czech Republic

15:00 -15:30 “Pedagogic aspects of simulator training process” Iva Hanzlíková - CDV, Czech Republic

15:30-16:00 “Functional and methodological requirements of public transport drivers training simulators” Madrid Public Transport Company (EMT), Spain

Session 8: Final debate and conference conclusions

Moderator: Sascha Sommer - Institute for Occupational Physiology at the University of Dortmund (IFADO), Germany

16:00–17:00 General debate on the development of a European driver training and education tool

17:00– 17:15 Conference conclusions. José M. Pardillo - UPM, Spain

Conference minutes

Monday, April 24

Opening session

On behalf of Technical University Madrid (*Universidad Politécnica de Madrid, UPM*) its Vice Dean Dr. Gonzalo León, welcomed all the participants. He introduced UPM research activities, stressing its involvement in European research initiatives, and wished the participants a fruitful Conference and a pleasant stay in Madrid.

J. Pardillo (UPM) presented the objectives of Humanist Task ForceG (TFG) and summarized its previous activities and results (*Annex 1*). TFG seeks to identify the areas of training where simulation can be brought in to help provide the necessary skills to drivers. The objectives of the task force are:

- The application of new ITS technologies for the driving education of novice drivers to facilitate the development of safety behaviour and the risky situations awareness.
- The application of new ITS technologies for the training of elderly and disabled people in the aim of functional awareness.
- To explore the potential of applying e-learning techniques to driver training and to conduct an analytical review of driver training and education to use in formulating guidelines and goals for future development of learning tools.

Previous TFG work resulted in the assessment of the state of the art in the application of driver simulators to driver training, and the identification of additional R&D effort that is needed to achieve the potential effectiveness in using simulators to improve the driver training process. A variety of driving simulators is available nowadays covering a wide range of specifications. It is thus possible to implement different driver training applications with a growing level of complexity and fidelity to real driving conditions. Nevertheless, there is a lack of common technical specifications both at national level and at European level that define the minimum conditions that a simulator should have to be suitable for use in the different levels of driver training applications. The next step in TFG work plan is to elaborate Guidelines for the development of a European driver training and education tools.

Session 1: State of the art on driver training methodologies and curricula

Moderator: Anke Mogilka - Technische Universität Chemnitz (CUT), Germany

Karen Kammler (TÜV | DEKRA arge tp 21 / University of Potsdam) presented her paper "Computer based training in driving education and current developments on computer assisted driving tests in Europe and in the world", coauthored by Dr. Kathrin Schlemme (*Annex 2*). This paper summarizes the results of a recently completed study on driving tests in 30 European countries and follow-up research in selected other countries, concentrating on the use of computers in theoretical driving tests. Besides presenting an overview of where computers are used in theoretical examination we discuss different ways of using them, ranging from the mere transposition of questionnaires on a computer screen to the development of new question formats. Those question formats using multimedia techniques were analyzed in more detail in the follow-up study which included question formats from theoretical driving tests as well as from selected learner driver training CD-ROMs of different countries. The starting point for this analysis was a model of information processing in traffic situations, derived from a social information-processing model. The model was used to classify the different types of learning items by the level of information processing necessary to solve them. It was found that many items focus on the assessment of processes related to the perception of and memory for situational cues showed in a film (e.g. "eye scanning" items). Other – typically more complex items – focus on the assessment of anticipation processes, in particular on response planning and response decision in hazardous situations. Examples of typical items used to assess the different levels of information processing in traffic situations were described and discussed.

Dr. Frank Prücher (BASt) presented his paper "Computer based training in driver education and current developments on a computer assisted driving test in Germany" (*Annex 3*). This paper addresses the issue of computer based training (cbt) programs used in preparation for the German theoretical driving exam. A descriptive review on current cbt programs (CD-ROM and internet applications) is given and they are compared regarding several criteria. The survey arrives at the conclusion that further research is needed on the effects of computer based training compared to traditional exam preparation with pen and paper. The author argues that full potential of cbt for learning drivers is not yet tapped. A special focus is laid on the potential improvement of perceptive and cognitive skills of novice drivers

which could be trained with the help of appropriate cbt programs. Opportunities for improved cbt programs in future driver preparation are expected with the introduction of a computer based theoretical driving exam in Germany. Some current developments and prospects on German theoretical driving test were presented.

Session 2: Recent advances and development needs in driver simulators technology

Moderator: Jose M. Pardillo - Madrid Polytechnic University, Spain

José Manuel Mera (UPM) delivered a presentation on "Simulation for Driver Training: customer requirements and R&D answers by CITEF-UPM" (*Annex 4*). He summarized the state of the art in modelling urban traffic and a traffic model in urban environments for its implementation in simulators, specially in professional drivers training. The models include different degrees of aggressiveness of simulated drivers and different types of vehicles..

Björn Peters (VTI) presented "Advanced driving simulators at VTI as tools in driver training - technology development driven by applied research issues and requirements" (*Annex 5*).

Session 3: E-learning applications to driver training

Moderator: Thomas Trogaluer - Danmarks TransportForskning (DTF), Denmark

Thomas Trogaluer (DTF) presented his paper "E-learning –the stepchild of transportation research. A state of the art review". (*Annex 6*) in which current and potential utilisation of e-learning applications as training and learning tools within the spheres of driver training are explored. Compared to existing driver training based on text books and classroom teachings, e-learning offers new possibilities such as a higher level of interactivity, individual control of learning pace, design and instructional methods. Similarly, the utilisation of multimedia technologies can blur the traditional distinction between learning of abstract traffic rules and principles and real world driving. Based on an internal survey conducted within the HUMANIST network it was found that in practise the majority of applications are aimed at existing driver training curriculum. Within the domain of the GDE-matrix most applications are aimed at control or manoeuvring tasks though a few applications also attempt to address higher order skills such as hazard perception and situation awareness. The majority of applications explored in this study are used to train novice drivers or as in-service of professional drivers, whereas potential user groups such elderly and disabled drivers are not addressed. E-learning applications covered within this survey probably do not reflect the amount of commercial e-learning applications, which can be purchased privately or which is used among driving schools. In general only little research have been done on the effect of e-learning compared to traditional learning methods both with respect to understanding of training curriculum and actual driving performance. It was suggested that future research should concentrate on specification of training needs of different target groups (e.g. elderly drivers, novice drivers, disabled drivers), criteria for selection of suitable training media for different training activities, exploration of suitable didactical content and learning processes in the utilisation of e-learning applications and the assessment of the transfer processes of skills acquired through e-learning into real world driving. Finally it was proposed that the utilisation of e-learning should be adapted to existing practises of driver training rules within different European countries.

Vratislav Kelnar (CDV) delivered his presentation on "Electronic driver testing and e-learning support in driver education in the Czech Republic" (*Annex 7*). The paper deals with preparation of electronic support of training applicants for driving license, called "eTests", and outlines the key technical conditions of electronic support application. The electronic tests will provide an effective testing of drivers. E-learning system is prepared by the Ministry of Transport and CDV (Transport Research Centre), the technical support is provided by Microsoft and AutoCont. Data collection in the central database of Ministry of Transport allows other analytical processing of data on drivers' knowledge. Application "eTests" allows performing the theoretical exam in compliance with the annex II of Directive 56/2000 ES. Tests are randomly generated and the system allows compiling the lectures, so the set of questions is different every time. Server part at Ministry of Transport provides a distribution of actual tests and collection of their results. The logical part is in the client's application. Solution of „eTests“ complies with modern standards for data security. A big advantage is a high-secured connection due to Internet, which allows actual interaction between clients and applications of the systems. The activities are made in the real time. The electronic testing of drivers in the Czech Republic will start in April 2006.

Yvonne F. Barnard (EURISCO International) addressed e-learning from point of view of the learner in her paper "Didactical and Pedagogical Aspects of e-Learning Tools". (*Annex 8*). Learning activities require mental effort of the learner. The e-learning environment may support the learner in making this effort by providing a variety of support

functions. A way of modelling these functions is presented, which may be used in the development of e-learning environments. The support functions identified in an e-learning environment consist of the Tutor, Monitor, Fellow Learners, Learning Materials, Information Sources, and Tools. Learning does not take place in isolation; there is also the learner's social-cultural environment. Interactive forms of e-learning, such as with computer-based training programs and simulations, provide the means to realise interactive learning, in which the learner is stimulated to take an active role in the learning process.

Session 4: Novice drivers training

Moderator: Willem Vlakveld - Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV) , The Netherlands

Stéphane Espié (INRETS) delivered his presentation on "Training novice driver: toward cognitive training" (*Annex 9*).

Christine Turetschek (FACTUM) presented her paper "Potentials and Risks of New Technologies in the Training of young drivers" (*Annex 10*). In most countries young drivers are the group of road users with the most accidents. Reasons for this are both their lack of experience on the one hand and their typical characteristics because of their youth on the other hand; they tend to drive more risky, for instance. Mostly, accidents happen because of badly adapted speed, mistakes in giving right of way, and erroneous distance keeping, but also due to problems with turning. It seems plausible that different ITS can help young drivers to perform better and to reduce their accident risk. In this context ADAS (Advanced Driver Assistance Systems) like collision warning, ISA (Intelligent Speed Adaptation) lateral control systems, and similar systems, have definitely to be mentioned. Maybe IVIS systems like navigation or travel- and traffic-information-services systems can support novice drivers, as well, since they can provide them with information to avoid difficult situations like traffic jams. Especially for these kinds of systems, but also for ADAS we must not forget that problems may arise in the driving performance of novice drivers because of distraction or overload, and additional information by ADAS or IVIS-systems could enhance these phenomena. Furthermore, we have to bear in mind that all drivers are human beings who, e.g., tend to delegate their responsibility to the system, to misjudge the objective risk in different situations, etc.

Therefore, we always have to look for both the positive effects of new technologies and possible problems that could result. It is not impossible that the negative outcomes are even more relevant in connection with drivers who are young and do not have much routine, yet.

Bart Kappé (TNO) presented the state of the art of driving simulators for novice driver training in the Netherlands (*Annex 11*)

Willem Vlakveld (SWOV) in his paper "What does educational psychology tells us and what are the implications for simulator training" (*Annex 12*) claims that driving is among the most complex skills people ever acquire. The death rates for 18-24 year old drivers (number of driver fatalities per million age group) in industrialized countries is about double those of older drivers (25-54 years of age). In the first months after having passed the driving test, the accident risk declines sharply. It takes however about 7 years of driving experience before the accident risk reaches acceptable low level. Three main causes are mentioned in the literature why young drivers are greatly over-represented in crash and fatality statistics. These causes are lack of experience, biological, sociological and psychological aspects of being young and gender (even after adjusting for exposure, the accident risk of young male drivers is still is much higher than that of young female drivers). Can simulator training help to reduce the accident risk of young novice drivers? In the Netherlands about 100 driving simulators are in use at different driving schools. There effects on the accident risk haven't been subject of study yet. There are however some indications that simulator training helps to speed up the learning process. When students take simulator lessons, fewer hours behind the wheel in real traffic situations with a driving instructor are required in order to pass the driving test. Of what is known about transfer and retention of skills and of what is known about how skills are acquired during simulator training, one can argue that simulator training to help students to pass the driving test quickly, will only lead to an increase of the accident risk. However it is also possible to argue that simulator training will result in improved skills as it helps to improve the transition from "the declarative stage" through "the knowledge compilation stage" to "the procedural stage" (Anderson, 1982). At first (the declarative stage), performance is relatively unstable, as possible strategies are tested and rejected. In case of distraction, task performance deteriorates considerably. After enough practice, one reaches the knowledge compilation stage, during which verbal mediation of performance is far less then previously, and associations between action patterns in familiar conditions become stronger. However, in this intermediate phase, a dual task will still interfere with the primary task. Finally, after more practice and experience, one reaches the procedural stage, at which verbal mediation does not exist, and the task performance is highly consistent and requires almost no effort. More study is

required to determine whether simulator training during initial driver education has a positive or a negative effect on accident liability after the driving test. In depth accident analysis of crashes in which young novice drivers are involved, has revealed that it is not so much a lack of basic driving skills that has caused the accident, but a lack of so called higher order skills. These skills deal with risk perception, risk acceptance, self assessment, the motivation to drive safely, etc. Can simulator training help to speed up the process of the acquisition of higher order skills? Very little is known about this subject, but based on the only evaluation study that is available on this subject and the quality of the simulators used for driver training, one should be not too optimistic about improved acquisition of higher order skills with the aid of simulator training.

Tuesday, April 25

Session 5: Training of older drivers and drivers with disabilities

Moderator: Björn Peters - Statens Vag- och Transportforsknings Institutet (VTI), Sweden

Anu Siren (DTF) talked about “Older women driver’s needs and special features: implications for using ITS in the training” (*Annex 13*). As drivers, older women are a group that differs from other drivers with certain special features. Older women drive less than other driver groups, have less driving experience, and develop ”old age typical” driving and accident patterns at earlier age than men, for example. Older women are also more prone to give up driving while still fit to drive and are in risk of having mobility problems. These features set certain requirements to the ways ITS and any new technologies are and can be used for training older women drivers. The aim of this presentation is to describe of older women drivers’ special features from different perspectives. Also, the presentation will discuss the challenges, possibilities and requirements these features have on the implementation of new technologies, especially in the context of training.

Björn Peters (VTI) delivered a presentation prepared by Stella Nikolaou , Evangelos Bekiaris, Maria Panou and Vassilis Papakostopoulos (CERTH) on “ Driver behaviour and abilities assessment of Greek elderly drivers” (*Annex 14*). The lack of standardised systematic procedures for assessing the fitness to drive of elderly drivers, which is due to the need for basic information, based on which rational policies can be developed for deciding who is, or not, qualified for licensure among the elderly population (Waller P.F., 1991), lead to the conception of AGILE project, which ended in March 2005. This project aimed, among other issues, at developing a new set of training and driving ability assessment tools for the elderly drivers, evaluating their full range of physical, cognitive, behavioural and international abilities, and not just checking a few sensory and motor functions. One of the tools that were developed within AGILE, are appropriate simulator scenarios, as part of elderly drivers driving ability assessment. In total, 13 priority scenarios were elaborated and tested in three countries, namely Belgium, Greece and Sweden, with 234 elderly drivers in total. They focus on the main problems and traffic risks of elderly drivers, as identified by relevant literature, accidents and experts reviews (covering such traffic scenarios as T-junctions negotiation, merging into highway traffic, lane change, etc.). Here, the main results from the Greek pilots are presented, where 98 users were tested in a semi-dynamic driving simulator, based on a Smart vehicle cabin. The tests were carried out, based on a specific assessment scheme (protocol). During the tests, there was a high occurrence level of simulator sickness, with an increasing factor with time. More specifically, the 27% of the participants stopped driving after 6-7 minutes of pure simulator driving, as they reported motion sickness. Furthermore, motion sickness was stronger when the scenario included tuning into vertical roads or driving on roads with curves. Most of the errors that were performed, as they were observed by the instructor and were recorded by the simulator, were about disregarding the stop sign (29 persons), setting the light indicator to the wrong direction (37 persons out of 74 as the remaining did not perform the specific scenario due to motion sickness), causing accident due to the omission in checking the side mirror when entering the traffic (12 persons), and exceeding the road borders (30 persons out of 74). Finally, a general hesitation and anxiety of the users before driving the simulator was noticed by the instructor, probably caused by the unknown, new technology factor.. The tests revealed that clustering the simulator scenarios and using several driver behavioural parameters can be a useful tool for analysing deeply relevant elderly drivers’ problems and guiding their subsequent on-the-road evaluation; but not a valid stand-alone assessment tool for judging their overall driving ability. Furthermore, the choice of appropriate assessment parameters and their thresholds, for their simulator assessment, requires still further research.

P. Henriksson (VTI) made a presentation on “IDEA – a training package for personnel assessing driving ability of elderly and disabled” (*Annex 15*). IDEA aimed to develop a standardised vocational training scheme for the different categories of personnel assessing the fitness to drive of elderly and/or disabled drivers. Target groups can be medical

doctors, psychologists and occupational or physical therapists. By providing driving the assessment personnel with resources, information sources, and guidelines such as database decision aids and multimedia tools, intention was increase knowledge about driving assessment procedures and assessment tools. At four sites, Belgium, Greece, Spain and Sweden, the IDEA training scheme and tools were evaluated. Performance and knowledge in the field of driving assessment was compared between Pilots, who had undergone training with the IDEA package during about three months, and Controls (assessors who did not undergo training with IDEA package). Three pairs of pilot-controls were engaged at each site and they were matched by background variables. At several stages during the training period, activities and opinions about the IDEA package were captured among the pilots by questionnaires while the controls described their on-the-job progress. The final examination consisted of a written test with multiple-choice questions, a physical examination of a volunteer and case discussions with an expert evaluator who also provided a global opinion of the performance. For two Pilot-Control pairs at the Belgian site, an alternative evaluation method was implemented including "real" clients who were assessed twice, both by the Pilot and by the Control. Effects on knowledge level and ability to perform assessments were moderate according to the Pilots' self-estimates. In comparison with how the Controls rated their progress concerning on-the-job training, the Pilots, however, felt significant more competent to perform driving evaluations after training with IDEA then before. In addition, on more objective measures, such as a written knowledge test and a practical assessment, evaluated by the expert, there were tendencies that Pilots performed better. For those two Belgian pairs that underwent a more extensive examination, performance of the Pilots stood out to be more positive, both from the clients' and the Expert's view. On the other hand, Controls believed more in their knowledge and competence than the Pilots, indicating that working with the IDEA package might lead to greater awareness of the complexity of issues related to driving assessments. The IDEA project was co-funded by the European Commission and involved nine institutes/universities from six countries.

Björn Peters (VTI) made a presentation titled "Beyond the CONSENSUS project – a vision for ITS applications to promote mobility for drivers with disabilities" (*Annex 16*). CONSENSUS was an IST (Information Society Technology) project within the 5FP Programme. The overall aim of CONSENSUS was to promote a harmonisation in fitness to drive assessment of PSN (People with Special Needs) and thereby promote the mobility of people with disabilities. The goal was to be achieved by building a network of excellence. The EC directives 91/439/EEC and 2000/56/EC provide a legal foundation for driver licensing and assessment of fitness to drive. However, the implementation of licensing and assessment procedures, methods and tools varies greatly between different member states, e.g. there are over 80 driving license models used in Europe today. CONSENSUS aimed at a European standardisation of the fitness to drive assessment in order to ensure an equal treatment across Europe of people with disabilities who want to become a licensed driver. The precondition for licensing drivers with physical disabilities is that their disabilities are compensated by prosthesis or vehicle adaptations according to the directive. However, practically no member state has a mandatory standardised check-up to confirm that the compensatory requirements are fulfilled. This inadequacy might impair both safety and mobility. ITS applications can contribute to improved vehicle adaptations but also introduce new barriers for drivers with disabilities if not applied correct. Thus, it becomes even more critical that the vehicle adaptation is evaluated together with the driver. IST applications as control-by-wire systems e.g. electronic joystick controlled vehicles require also extensive training for the driver. It also calls for new training tools and methods in order utilise the technology efficiently. The ultimate goal should be to enhance safe and independent mobility for drivers and potential drivers with disabilities.

Session 6 Validation of simulators and training methodologies

Moderator: Stéphane Espié - Institut National de Recherche sur les Transports et Leur Sécurité (INRETS), France

M. Duraz, (INRETS/ MSIS) presented the paper titled "Validation of driving simulators for training", co-authored by Stéphane Espié (*Annex 17*). He described two kinds of methods for the validation of driving simulators for training. The first one, named global method, which has already been used, aims at globally assess the transfer of the learning to the real world, the retention of what was learned and the long term effects of the training. The second method is more analytical and focuses on the requirements of the main components of a driving simulator taking account of the skills and knowledge, which have to be trained. Introducing the use of a driving simulator in a whole training curriculum changes the organization and the pedagogy, new requirements appear, from the trainee's point of view and from the instructor's point of view.

Bart Kappé (TNO) made a presentation on "Performance measurement for driver training and driver assessment" (*Annex 18*).

Stéphane Espié (INRETS) closed the session with his presentation on “Intelligent tutor: concepts and feasibility“ (Annex 19). He first describes the ARCHISIM project: aim, methodology, conceptual model and validation. The second part deals with the use perspectives of ARCHISIM related to driver's training and evaluation.

Session 7: Functional and methodological requirements

Moderator: Iva Hanzliková - Centrum Dopravního Výzkumu (CDV), Czech Republic

Iva Hanzlikova (CDV) presented her paper “Towards the effective usage of driver simulator” (*Annex 20*). Increased application of driving simulators in the domain of driver training is desirable for ecological, economical and didactic reasons. Among the benefits are low physical risks for a trainee, possibility to repeat a wide range of situations, high controllability of situation and possibility to train for situations that occur rarely in the real life. However, simply experiencing a simulated environment does not mean an effective training. Simulation must be used in a thoughtful, well-planned manner that includes identification of training needs, proper design of scenarios, appropriate performance measurement and feedback to the learner. After reviewing the literature regarding simulation for driver training, some general knowledge has become apparent. The paper deals with best practices in driver simulator training (both basic training and enhanced education). Focus of the author is on specific driver tasks (defensive driving, basic controls, braking, driving in bad weather, using telematic aids etc.), and how to train and improve these tasks by simulator use. The paper also outlines for which driving tasks we should not use the driving simulator. Some main conclusions are delineated, based on knowledge coming from European projects on driving simulators, and other available literature concerning the use of simulators in practical driver training and education.

Antonio Crespo, Human Resources Development Director at the Madrid Public Transport Company (EMT) delivered a presentation on “Functional and methodological requirements of public transport drivers training simulators” in which he summarized the experience of EMT in applying driving simulators to train bus drivers.

Session 8: Final debate and conference conclusions

Moderator: Sascha Sommer - Institute for Occupational Physiology at the University of Dortmund (IFADO), Germany

In the closing session the central themes of the conference were critically discussed. The outcome of the discussion was the list of conclusions that is included in the following section.

Conclusions

1. The role of training methodologies making use of new technologies (multimedia, simulation etc.) in the training process needs to be clarified. It should be clearly defined for which cells of the GDE / GADGET – Matrix new technologies are appropriate and what technologies should be used in each case.
2. E-learning applications can be considered as a cost effective training tool that may be used to increase knowledge on specific aspects during the training process, to raise awareness or simply to illustrate certain traffic situations.
3. The central research gap is the lack of evaluation (transfer of training) studies with sufficient scientific credibility. Further research needed in this field.
4. Physical fidelity (realism) and functional fidelity (training effects) are often confounded when the role of simulation in the driver training process is discussed. Physical fidelity is, for its own sake, the wrong goal. Physical fidelity is not a sufficient precondition for optimal training effects. For the training of certain skills (e.g. hazard perception) simulations with lower fidelity (e.g. video scenes) can be efficient training tools.
5. The core of training programs is not the technology, but the didactics of the curriculum. New technologies offer new training opportunities that require as well new didactical approaches. There is still large space for improving simulator-based driver training by enhanced didactics using options like replay of critical situations, group discussions at the end of training sessions, presentations of scenes from the perspectives of other road users etc.
6. New technologies offer a wide range of new assessing and testing methods, but further research is still needed to specify the optimal role of new technologies for driver assessment and testing.
7. Simulation could be a useful tool, in particular, for the assessment of drivers with disabilities. Driving aids could be simulated so that drivers could test them together with the assessor in a safe artificial environment.
8. The second main research topic is the psycho- / physiological basis for simulator sickness. Vection / sensory – cognitive mismatch seems to be not the only issue. Research activities are ongoing, but further investigations are required.
9. Current simulation technologies do not offer enough possibilities to simulate the crucial role of communication between road users. Traffic / driver models are required that allow to simulate interactions between traffic participants (driver-driver communication, but also e.g. drivers and pedestrians approaching zebra crossings).
10. More research is needed to tailor simulations /simulator scenarios to the training needs of different driver groups. Specific training programs for e.g. emergency driving exist. Other training programs should focus on the specific needs of driver groups like professional drivers of heavy vehicles, older drivers (male and female) etc. Later in 2006, the European Project TRAIN-ALL will develop simulator-based training approaches for different driver groups. Several HUMANIST partners participate in the project (INRETS, HIT, IFADO, TNO, ICCS, VTI).
11. Different countries employ different driver training models both in relation to content of the education and requirements of the driving instructor and this fact needs to be considered when implementing the guidelines of new technologies for driver training.

The order of the list is arbitrary, and does not reflect priority. Specific references and recommendations on these issues can be found in the papers that were presented during the Conference.

List of Annexes

- Annex 1: “Introduction of Humanist TFG activities and objectives” (PPT Presentation). José M. Pardillo (UPM)
- Annex 2: “Computerbased training in driving education and current developments on computer assisted driving tests in Europe and in the world”. Karen Kammler & Dr. Kathrin Schlemmer
- Annex 3: “Computerbased training in driving education and current developments on a computer assisted driving test in Germany”. Franz Prücher (BAST)
- Annex 4: “Simulation for Driver Training: customer requirements and R&D answers by CITEF-UPM” (PPT Presentation). José Manuel Mera (UPM)
- Annex 5: “The advanced driving simulators at VTI as tools in driver training - technology development driven by applied research issues and requirements” (PPT Presentation). Björn Peters (VTI)
- Annex 6: “E-learning -the stepchild of transportation research. A state of the art review”. Thomas Trogaluer (DTF)
- Annex 7: “Electronic driver testing and e-learning support of education in the Czech Republic: Methodological requirements” (PPT Presentation). Vladimír Kelnar (CDV)
- Annex 8: “Didactical and pedagogical aspects of e-learning tools”. Yvonne Bernard (Eurisco)
- Annex 9: “Training novice driver: toward cognitive training”. Stéphane Espié (INRETS)
- Annex 10: “Potentials and Risks of New Technologies in the Training of young drivers”. Christine Turetschek (FACTUM)
- Annex 11: “Driving simulators for novice driver training in the Netherlands: state of the art” (PPT Presentation) Bart Kappé (TNO)
- Annex 12: “What does educational psychology tells us and what are the implications for simulator training?”. Willem Vlakoveld (SWOV)
- Annex 13: “Needs and implication of using ITS in the training of older women drivers” (Abstract). Anu Siren (DTF)
- Annex 14 “Driver behaviour and abilities assessment of Greek elderly drivers (PPT Presentation) Stella Nikolaou (CERTH)
- Annex 15 “IDEA - a training package for personnel assessing driving ability of elderly and disabled” (Abstract). Per Henriksson (VTI)
- Annex 16 “Beyond the CONSENSUS project – a vision for ITS applications to promote mobility for drivers with disabilities” (Abstract). Björn Peters (VTI)
- Annex 17 “Validation of driving simulators for training” . Max Duraz & Stéphane Espié (INRETS)
- Annex 18: “Performance measurement for driver training and driver assessment” (PPT Presentation). Bart Kappé (TNO).
- Annex 19: “Intelligent tutor: concepts and feasibility” (PPT Presentation). Stéphane Espié (INRETS)
- Annex 20: Pedagogic aspects of simulator training process”. Iva Hanzlíková (CDV)