



Università degli
Studi di Firenze

Road Safety and
Accident Reconstruction
Laboratory



University of Florence

LaSIS

Road Safety and Accident Reconstruction Laboratory

DICEA

Dipartimento di Ingegneria
Civile e Ambientale

DIEF

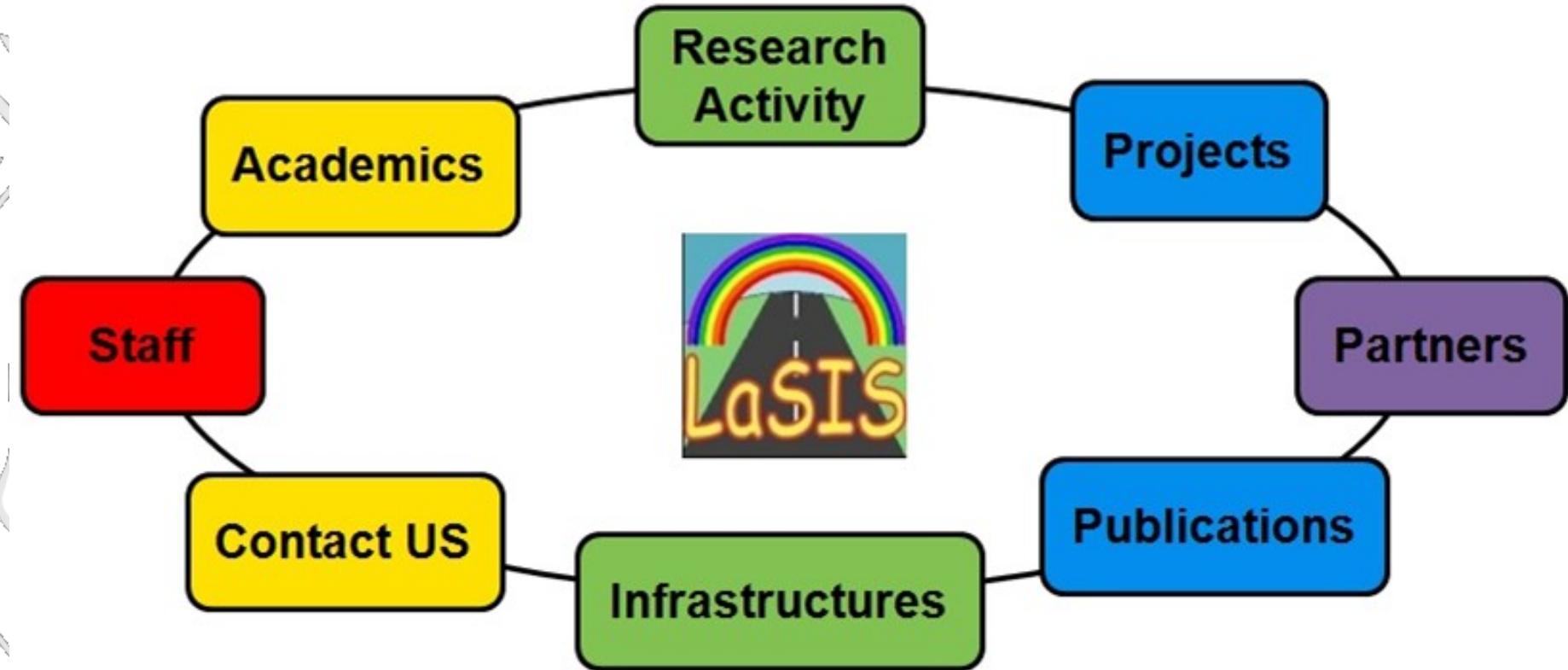
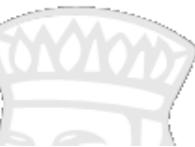
Dipartimento di
Ingegneria Industriale



UNIFI LaSIS - Competences

LaSIS is a research unit of the University of Florence in which two departments cooperate:

- *Civil and Environmental Engineering (DICEA):*
Road Design, Road Safety, Crash Analysis,
Risk Assessment
- *Department of Industrial Engineering (DIEF):*
Vehicle Design, Vehicle Safety, Crash
Reconstruction, Powered Two Wheelers Safety



Staff



Team leaders

Prof. Lorenzo Domenichini (DICeA)

Prof. Dario Vangi (DIEF)

4 Professors

1 Researcher

1 Postdoc students

2 PhD Students

2 Research assistant

2 Laboratory technicians





Academics

Basics academic courses

Master's degree courses (1 year)

- Legal Engineering
- Road Safety

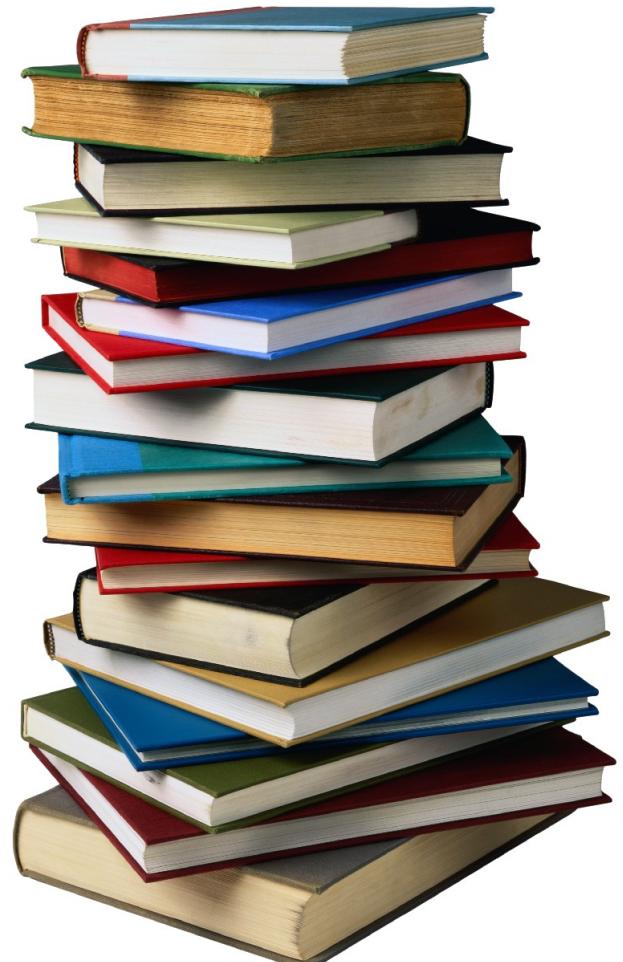
Post-graduated Training / Researcher

- Accident reconstruction
- Road restrain systems design
- Road Safety Management

Software tools users' training courses

Workshops and seminars on practical subjects

Master Thesis



Infrastructures

LaSIS Driving Simulator

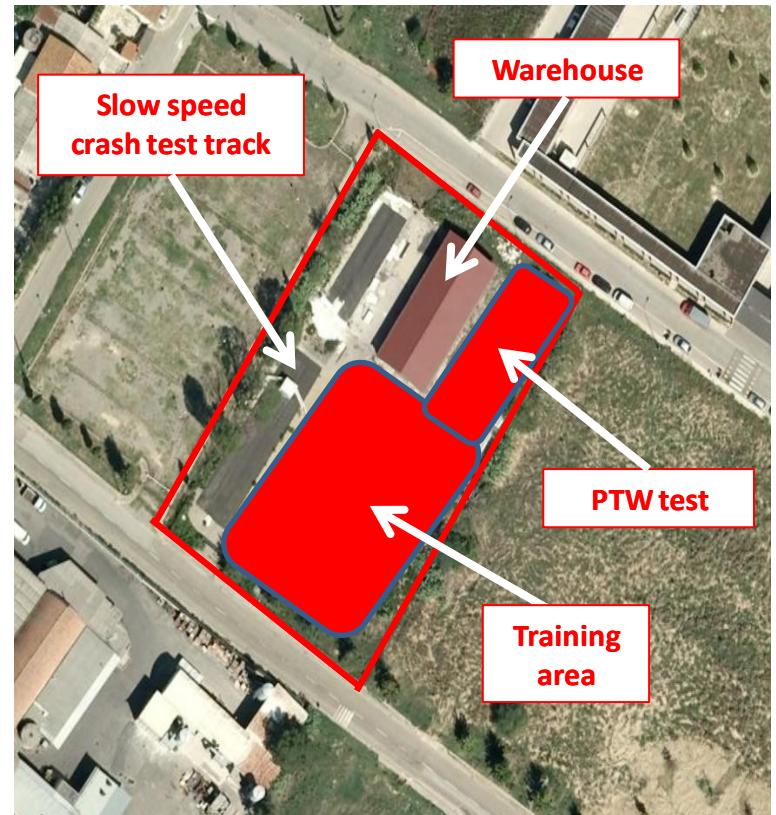
- **6 degrees of freedom**
- **200° cylindrical frontal screen**
- **Rear vision with LCD screens**
- **Multichannel sound**
- **Commands force feedback**
- **Full visual database
(urban, highway, extra-urban)**
- **Custom built terrains and
scenarios**



Infrastructures

Crash Test Facility

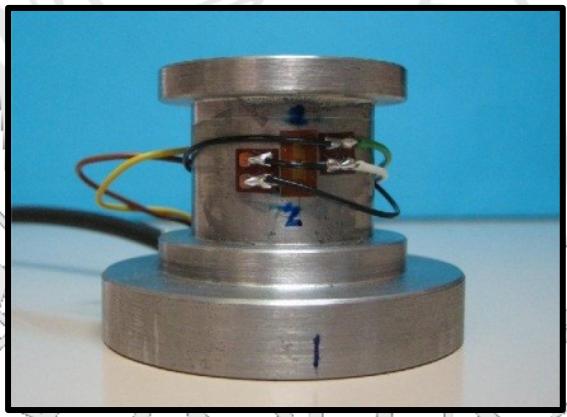
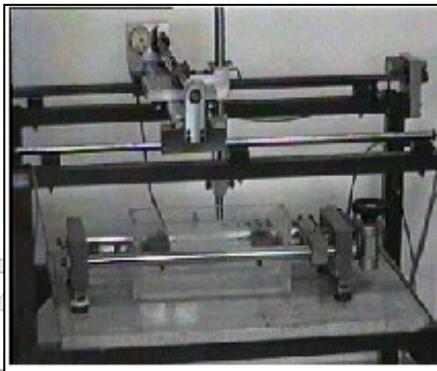
- Low speed tests of vehicle impacting against rigid bodies
- Crash tests on safety barriers elements
- PTW tests
- Testing of urban traffic calming elements
- PTW training area



Infrastructures

Laboratories

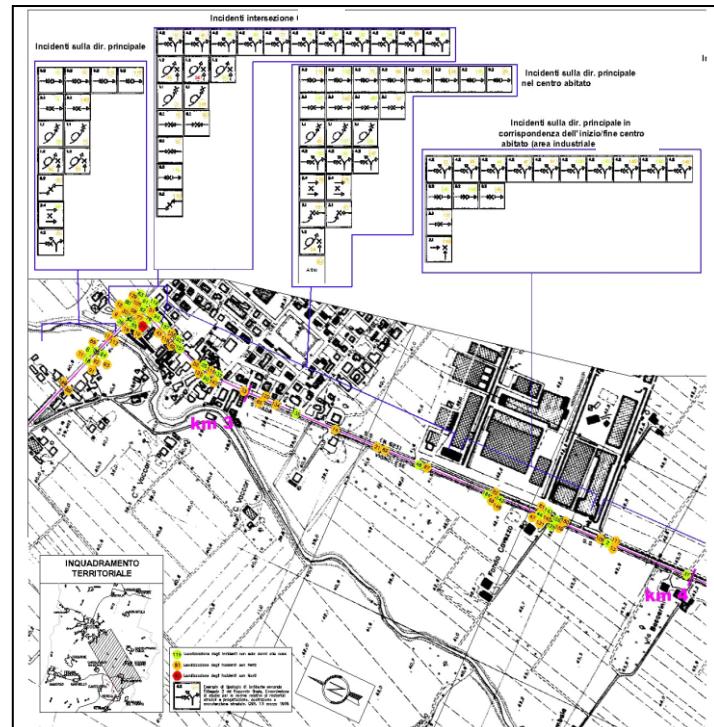
- Material testing
- Non Destructive Testing
- Road surface characteristics testing



Research - Activity

Accident Investigation

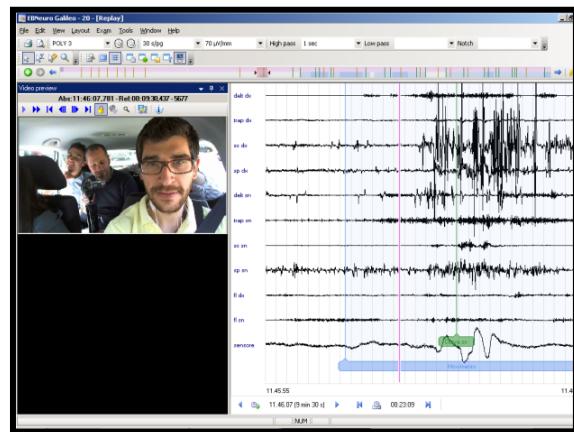
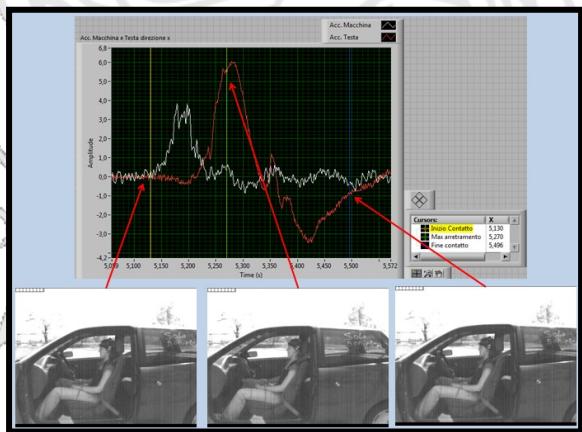
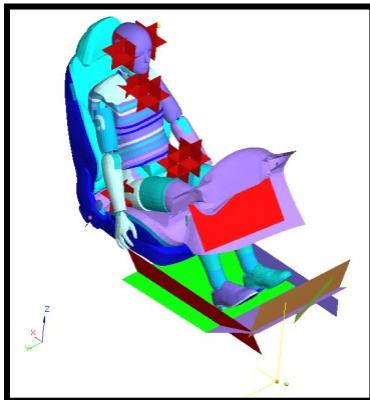
- Accident data collection and standardization
- Accident reconstruction and analysis
- Data Event Recorder
- Energy loss modeling
- Photogrammetric analysis
- Numerical simulation of crash dynamics
- Safety Performance Functions and crash modification factors development
- Vehicle and Infrastructure safety assessment
- Materials' testing



Research - Activity

Biomechanics

- Whiplash mechanisms study
- Electromyography
- Systems to minimize whiplash injuries



Research - Activity

Human Factor

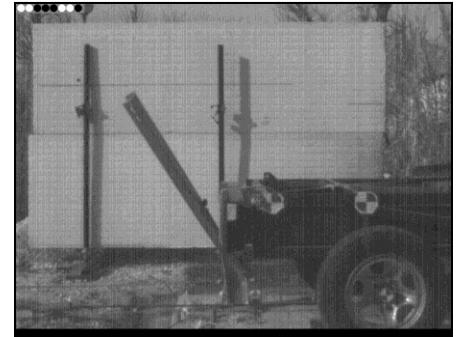
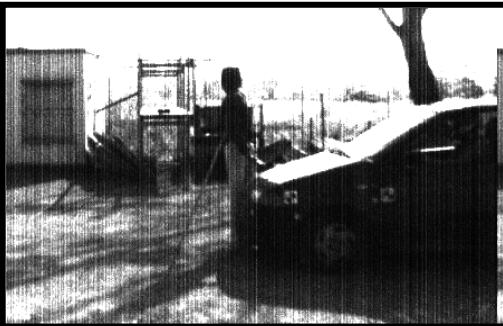
- ICT technologies influence on drivers
- Perception and reaction time analysis
- Visualization and roadway design
- Human Factors and road safety
- Human Factors contributing effects on accidents
- Naturalistic driving
- Eco-driving assessment
- Professional drivers training
- Fatigue and distraction assessment



Research - Activity

Crash Testing

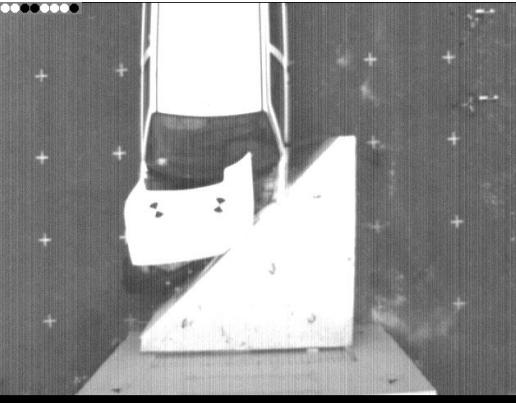
- Low speed rear-end testing
- Motorcycles to vehicle testing
- Vehicle to vehicle testing
- Pedestrian
- Motorcycles sliding



Research - Activity

Crash Testing

- Rigid barriers crash testing:
 - Vehicles with barrier
 - Vehicles with offset
 - Vehicles with 45° barrier
 - Motorcycles with instrumented barrier



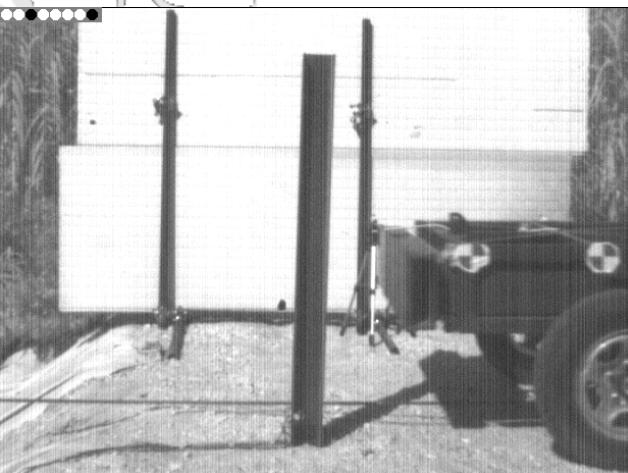
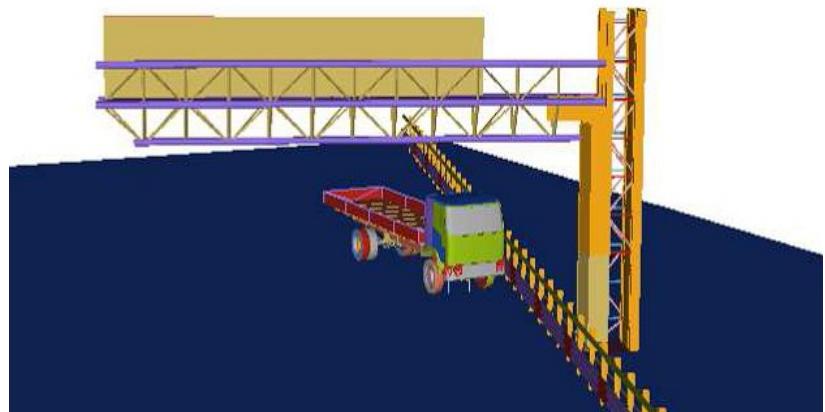
Impact Testing



Research - Activity

Road Restraint Systems

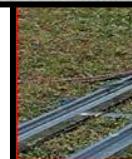
- Safety barrier installation design and testing
- Roadside hazard analysis
- Crash tests numerical simulation



Research - Activity

Vehicle and Infrastructures Testing

- Braking tests with cars and heavy vehicles
- Road surface characteristics
- Traffic and speed monitoring



Projects

EU founded Projects

- **SAVeRS**: Selection of Appropriate Vehicle Restraint Systems
- **ASAP**: Appropriate Speed saves All People
- **IRDES**: Improving Roadside DESign to forgive human errors
- **VERTEC**: Vehicle, road, tyre and electronic control systems interaction
- **TROWS**: Tyre and road wear and slip assessment

Italian founded projects

- **TESEO**: analysis of drivers' behaviour in highway tunnels with sodium vapour lighting and tunnels with LED lighting.
- **DAVID**: road safety in the city of Florence
- **PRIN** : Diagnostic tools for identifying road risk conditions, arising from a non proper relationship between vehicle motion conditions and driver's level of attention

Projects

Private founded researches

- **Vemar Helmets** : analysis and design of innovative solutions for motorbike helmets
- **Ducati Corse**: Development of methods and instrumentation for the measurement of torque to the wheel in motorcycle racing
- **Ducati Corse** : Analysis of stress in components of the desmodromic engine racing
- **Centro Ricerche Fiat**: NDT monitoring of structural failures in car bodies
- **LLOYD Adriatico**: Development of a software tool for the analysis of pedestrian accidents
- **Betamotor**: Computation and numerical verification for a flywheel counter rotating
- **Betamotor**: optimization of motorcycle frames
- **AISICO**: Homologation and use of road safety barriers
- **Menci Software**: photogrammetric methods for the evaluation of the deformation energy of damaged vehicles

National Partners



Regione Toscana



Allianz
Lloyd Adriatico



ELASIS



autostrade per l'italia



CENTRO
RICERCHE
FIAT

International Partners



vti

ZAG

TRL

Balfour Beatty
Civil Engineering



BRRC



Publications

- F. La Torre, M. Meocci (2012). "Calibration of the M-E PDG model for non conventional asphalt concrete materials", Proceedings of the 91st Transportation Research Board Meeting, Washington USA, Jan 2012
- F. La Torre, P. Saleh, E. Cesolini, Y. Goyat (2012). "*Improving roadside design to forgive human errors*", Procedia Social And Behavioral Science, N. 53/2012 Elsevier
- L. Domenichini, G. Salerno, F. Fanfani, M. Bacchi, A. Giaccherini , L. Costalli, C. Baroncelli (2012). "*Travel time in case of accident prediction model*", Procedia - Social and Behavioral Sciences, vol 53/2012, pp 1079 – 1088, ISBN 1877-0428
- L. Domenichini, F. Fanfani, M. Bacchi, A. Braccini (2013). "*Prediction of incident resolution time on motorways*", Advances in Transportation Studies – An international Journal, Aracne Ed, 2013, ISBN 88-7999-600-2
- D. Vangi, F. Begani (2013). Energy loss in vehicle collisions from permanent deformation: an extension of the "Triangle Method" Vehicle System Dynamics. <http://dx.doi.org/10.1080/00423114.2013.770538>
- D. Vangi (2013). "A simplified model for analysis of the post-impact motion of vehicles" Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering 0954407012470353, first published on January 31, as doi:10.1177/095440701247035.
- L. Domenichini, F. La Torre, D. Vangi, V. Branzi, C. Cialdai, M. Meocci, A. Virga (2013). "Driving simulator analysis of drivers' behaviour in tunnels with obstacles", Proc. EVU 2013 Annual Meeting, 17–19 October 2013, Florence (IT)
- L. Domenichini, F. La Torre, D. Vangi, V. Branzi, C. Cialdai, M. Meocci, A. Virga (2013). "Driver behavior approaching road tunnels and safety impact of LED lighting", Proc. Road Safety and Simulation Int. Conference - RSS2013, October 22-25, 2013, Rome (IT)
- F. La Torre, L. Domenichini, A. Nocentini, M. Meocci, S. G. Morano (2013). "Evaluation of the vehicle/safety barrier/fixed object interaction by means of FEM simulations", Proc. Road Safety and Simulation Int. Conference - RSS2013, October 22-25, 2013, Rome (IT)

Publications

- F. La Torre, L. Domenichini, F. Corsi, F. Fanfani (2014). "Transferability of the Highway Safety Manual Freeway Model to the Italian Motorway Network", Transportation Research Meeting 2014, Washington D.C.
- F. La Torre, L. Domenichini, M. Meocci, A. Nocentini, S.G. Morano (2014). "Evaluation of the vehicle/safety barrier/sign support interaction by means of FEM simulations". INTERNATIONAL JOURNAL OF CRASHWORTHINESS, pp. 123-133, ISSN:1358-8265
- L. Domenichini, F. La Torre, V. Tartaglia, V. Branzi, F. Fanfani (2014). "Safety improvements in Urban Areas based on Human Factors principles - A case study: Via Pistoiese". Ageing and Safe Mobility Conference 27-28 November 2014, Bergisch Gladbach, Germany.
- Domenichini, L. & Branzi, V. (2014). "Il progetto T.E.S.E.O.: Influenza dei sistemi di illuminazione in galleria sulla sicurezza stradale". Road Safety News Magazine, n°4 – Settembre 2014, ISSN: 2282-6726.
- A. Grilli, M. Meocci, M. Bocci, F. La Torre(2015), Comprehensive evaluation on the mechanical behaviour of cement-bitumen treated materials. In: 3rd International Symposium on Asphalt Pavement & Environment, Sun City - South Africa, 16-19 August 2015, pp. 1-15.
- L. Domenichini, V. Branzi (2016). Controllo e verifica in realtà virtuale di progetti per la sicurezza stradale. Il caso di Via Pistoiese a Firenze (I Parte). STRADE & AUTOSTRADE, n°118 Luglio/Agosto - EDI-CEM Srl.
- L. Domenichini, V. Branzi (2016). Controllo e verifica in realtà virtuale di progetti per la sicurezza stradale. Il caso di Via Pistoiese a Firenze (II Parte). STRADE & AUTOSTRADE, n°119 Settembre/Ottobre - EDI-CEM Srl.
- L. Domenichini, F. La Torre, D. Vangi, A. Virga, V. Branzi. (being printed). "Influence of the lighting system on the driver's behavior in road tunnels. A driving simulator study". JOURNAL OF TRANSPORTATION SAFETY & SECURITY, ISSN:1943-9962.
- Vangi, D., Virga, A., Conigliaro, M., Steffan, H., Tomasch, E. (being printed). ADAS-assisted driver behaviour in near missing car-pedestrian accidents. AA. VV.. Autonomous Vehicle, pp. 1-20, ISBN:978-953-51-4805-0
- L. Domenichini, F. La Torre, V. Branzi, A. Nocentini (being printed). "Speed behaviour in work zone crossovers. A driving simulator study". Accident Analysis and Prevention.



Contact Us

DICEA

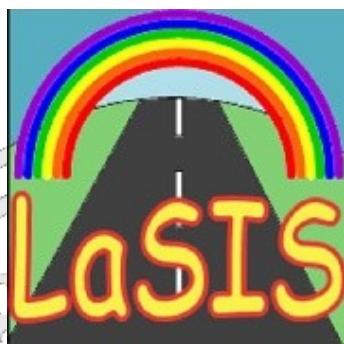
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