Career development

Konstantinos Gkoumas, PhD, PE

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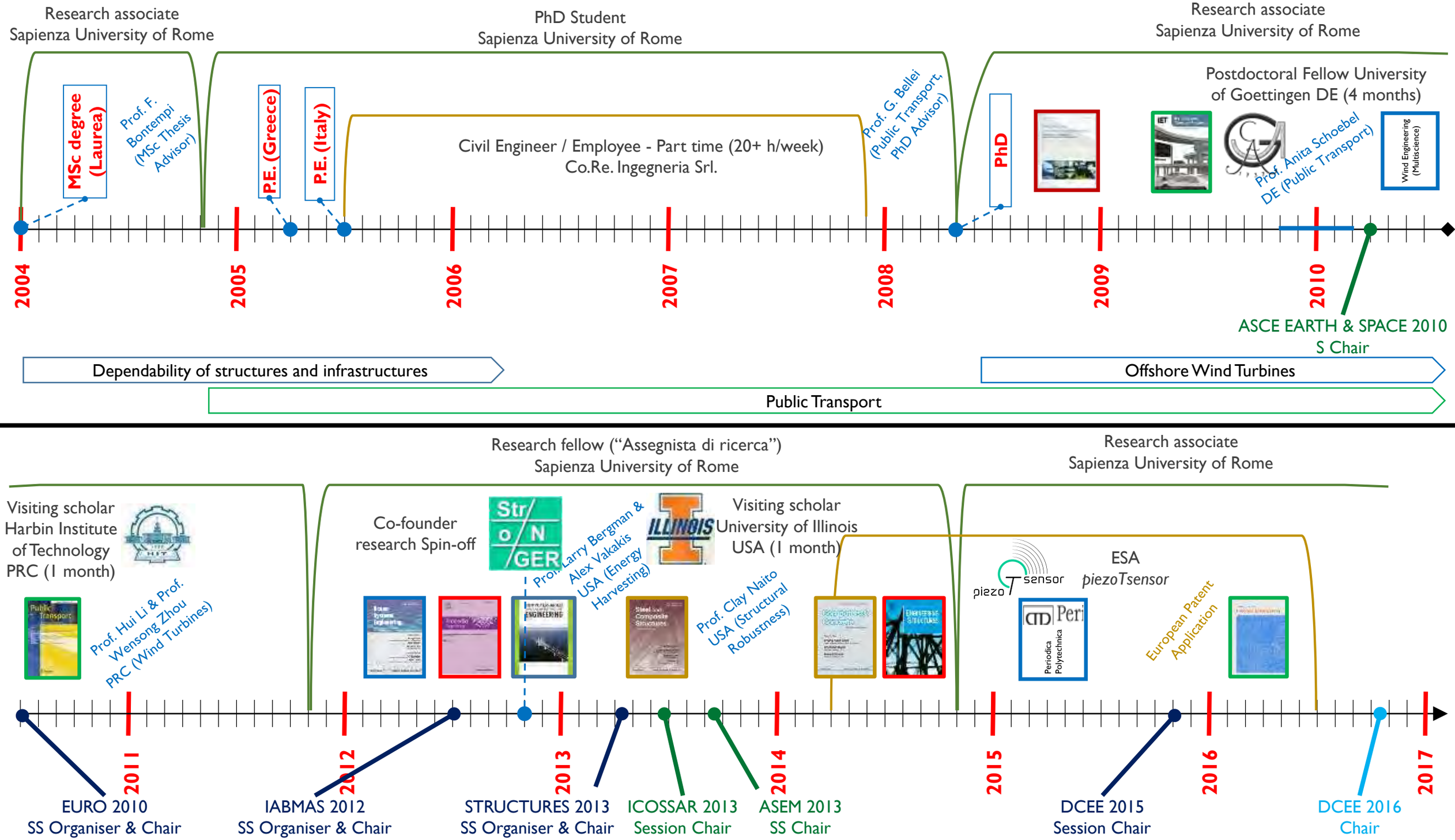
konstantinos@gkoumas.eu

Education and Milestones - Principal research topics and journal publications - People networking and events



October 2016

Konstantinos Gkoumas, Ph.D., P.E.

Overview of selected research topics

Sectors and topics	Details
Transportation systems engineering	**Public transport operation control**
Civil and structural engineering	
Offshore wind turbines	**Preliminary study of support structures for an offshore wind farm**
Dependability of structures and infrastructures	**Conceptual framework, application in bridges**
Structural robustness	**Conceptual framework, applications in bridges and high rise buildings**
Sustainability and resilience in the urban environment	**Academic research, space technology transfer, entrepreneurship**
Energy harvesting	**Case studies: tunnel and steel structures**
Risk Analysis and Fire Safety Engineering	

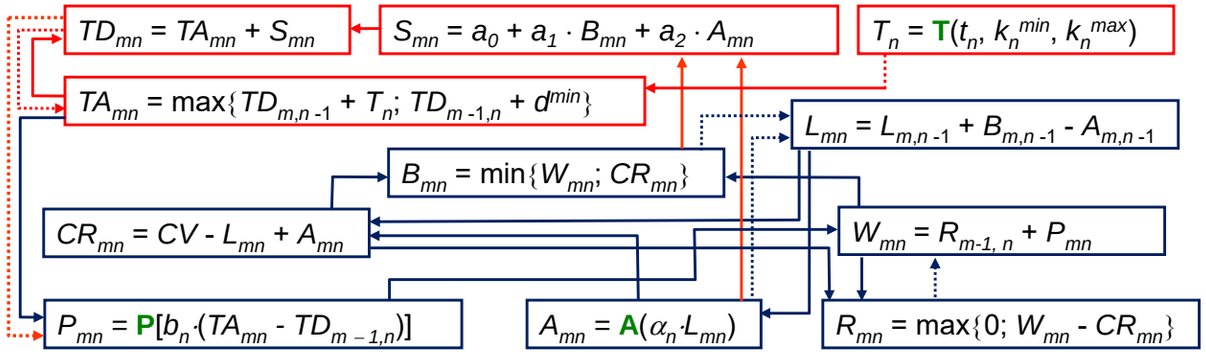




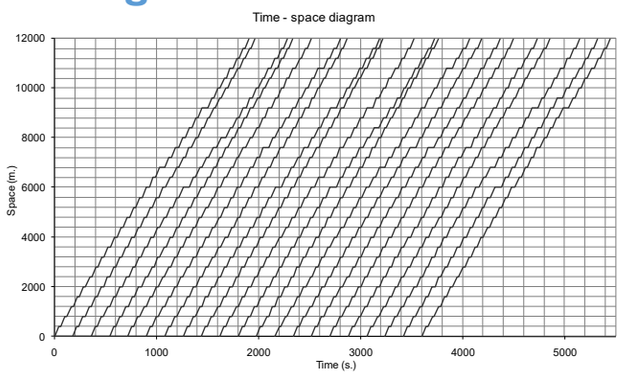
Transportation systems engineering

- **Education background**
  - Civil engineering degree (5ys) with transportation systems specialization
  - PhD in Transportation and Infrastructure Engineering
  - Post doc in applied optimisation
- **PhD Thesis research**
  - Thesis Title: Real time control of public transit
  - Conception and implementation in VBA of a stochastic public transit simulation model for the investigation of real time control strategies
- **Main objectives**
  - Improvement in transit speed and regularity with specific reference to intermediate capacity transit systems
  - Definition and implementation of a transit line operation model for a single transit line
    - Observation of some of the common phenomena in presence of service irregularity
    - Implementation of control strategies:
      - Threshold and information based vehicle holding
      - Conditional priority strategy
      - Multiclass priority strategy
- **Principal results**
  - Headway patterns at stops that can be useful in traffic assignment
  - Holding leads to significant reductions in waiting time, while not increasing travel time, but its integration with conditional and multiclass priority has a minor effect on regularity improvement
  - Sensitivity analyses substantiate the performance gain
- **Scientific outcomes**
  - Bellei, G., Gkoumas, K. (2010). "Transit vehicles' headway distribution and service irregularity", Public Transport, 2(4): 269-289
  - Bellei, G., Gkoumas, K. (2009). "Threshold- and information-based holding at multiple stops", IET Intelligent Transport Systems journal, 3(3): 304-313
  - More than 10 conference publications in national and international conferences

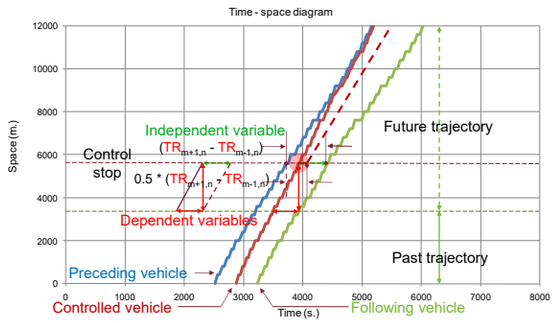
Base simulation model with capacity constraint



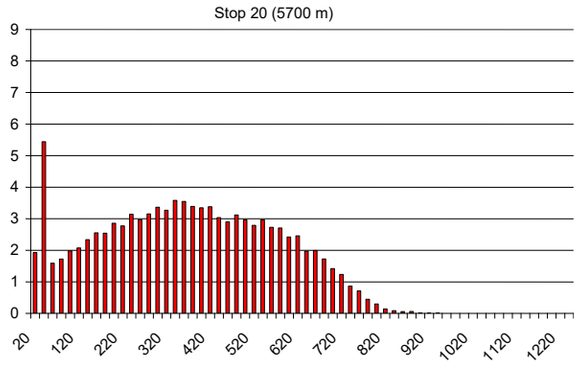
A single simulation outcome

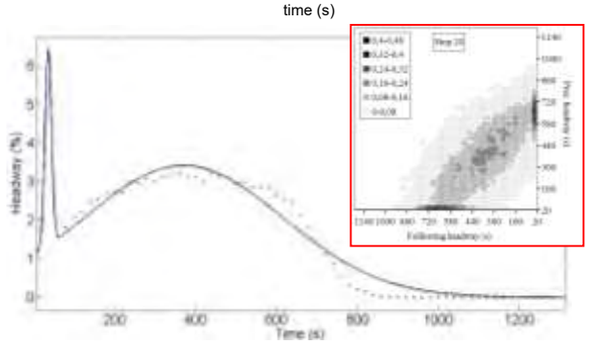


Information based holding

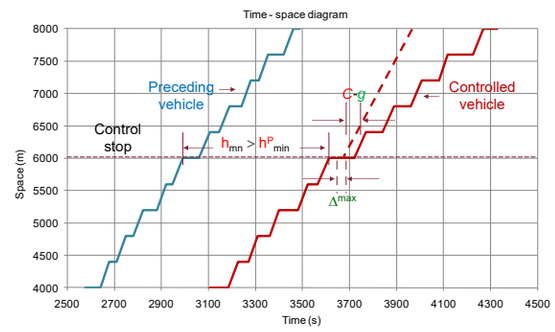


Headway distribution at stops





Conditional priority at stops

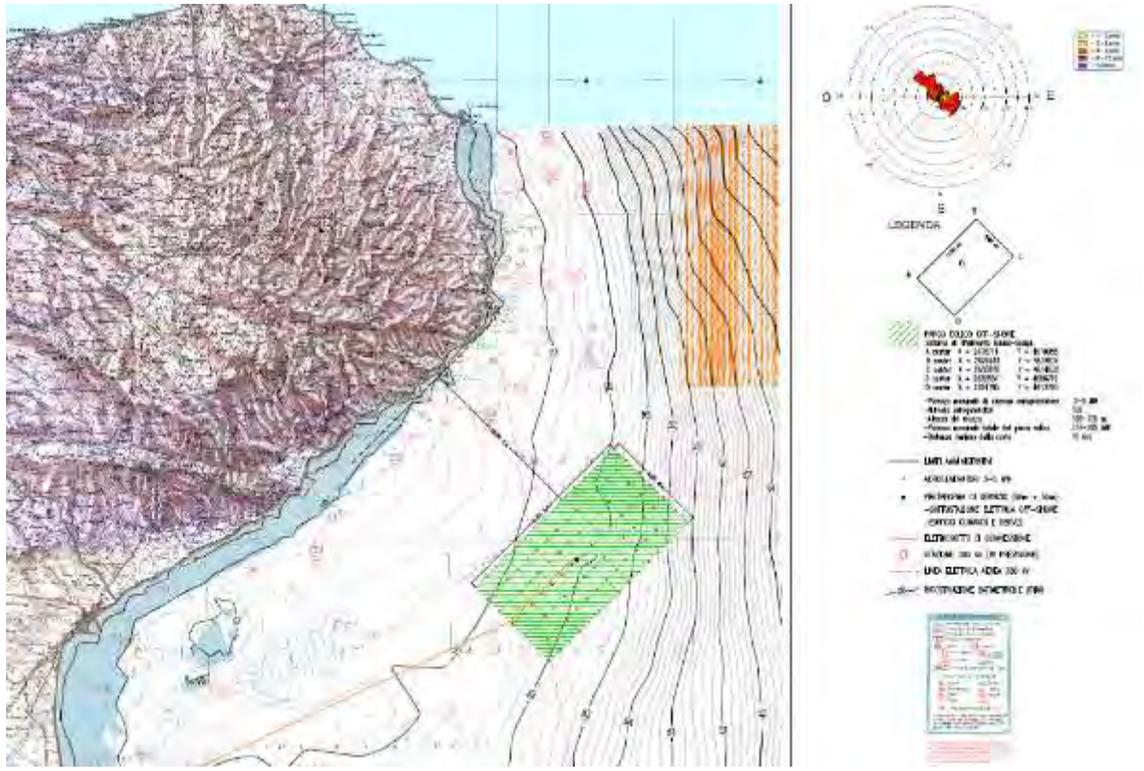


Evaluation parameters

- total system time (ST)
  - total transit passenger time
    - transit total waiting time (WT)
    - transit total travel time (TT)
  - transversal traffic delay (TD) – possibly underestimated
    - Deterministic calculation
    - Principal line traffic not affected – uncompensated green extensions
  - *transit total potential travel time* (PT) –
    - (95th percentile – mean arrival time), approximated by 1,65σ
    - Excess waiting depending on departure time dispersion otherwise not considered, since passenger arrivals at stops is assumed not to depend on schedule

Offshore wind turbines

An offshore wind farm in the Mediterranean sea



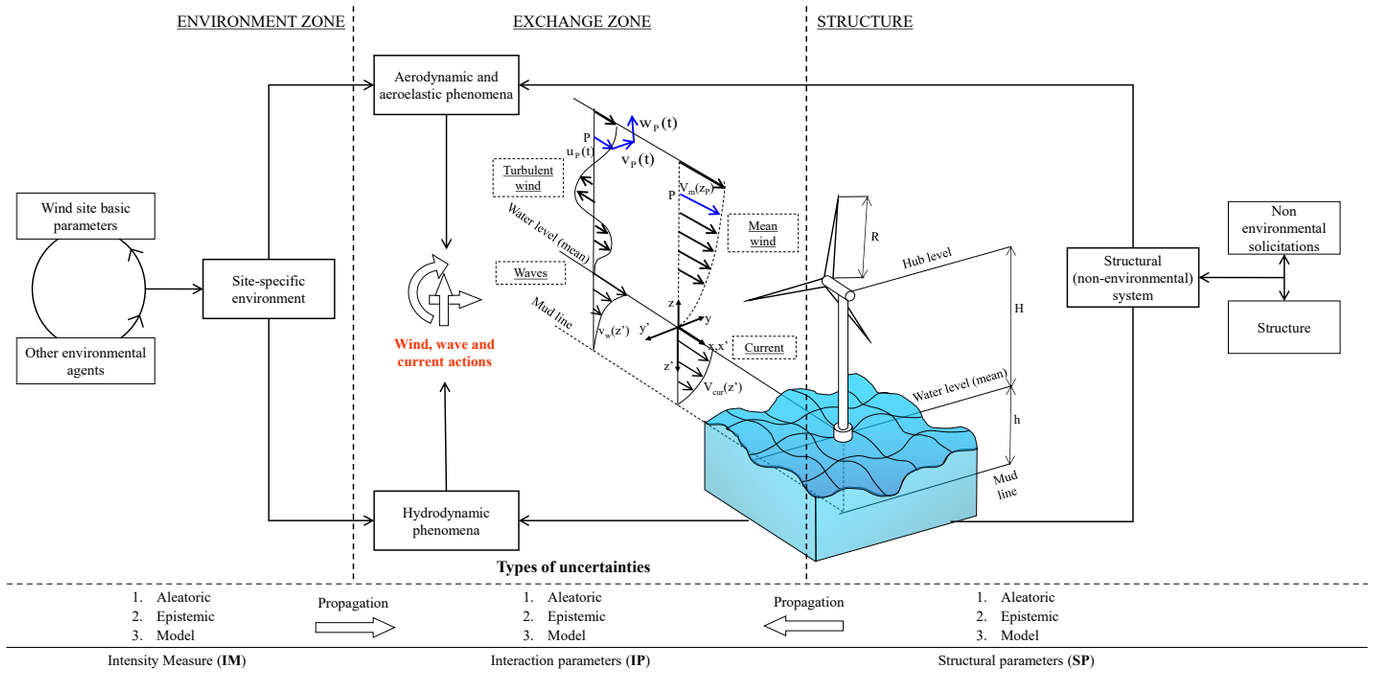
Offshore wind farm: key facts

Nominal power of a single turbine	3.0÷5.0 MW
Number of turbines	105
Hub height	100 ÷ a.s.l.
Nominal power of a the farm	315 ÷ 525 MW
Minimum distance from the shore	10 Km
Surface of the wind farm area	67.20 Km^2
Water depth	20-35 m
Life span	29 years

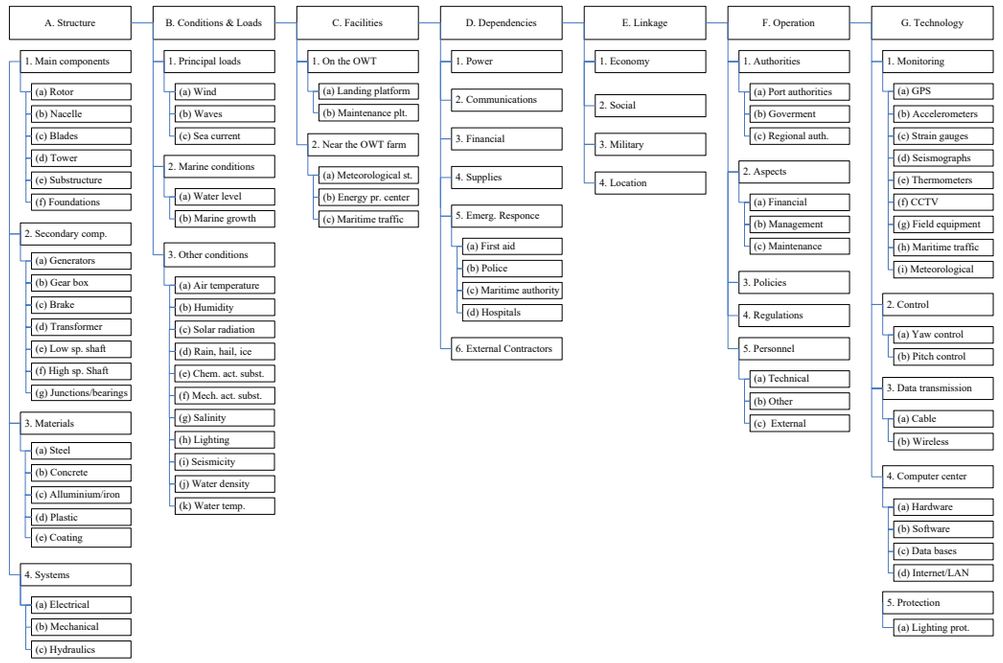
Petrini, F., Gkoumas, K., Zhou, W. and Li, H. (2012). Multi-level structural modeling of an offshore wind turbine, Ocean Systems Engineering, 2(1): 1-16

Petrini F., Manenti S., Gkoumas K., Bontempi F. (2010). Structural design and analysis of offshore wind turbines from a system point of view, Wind Engineering, 34(1): 85-108

Wind-wave-structure interaction

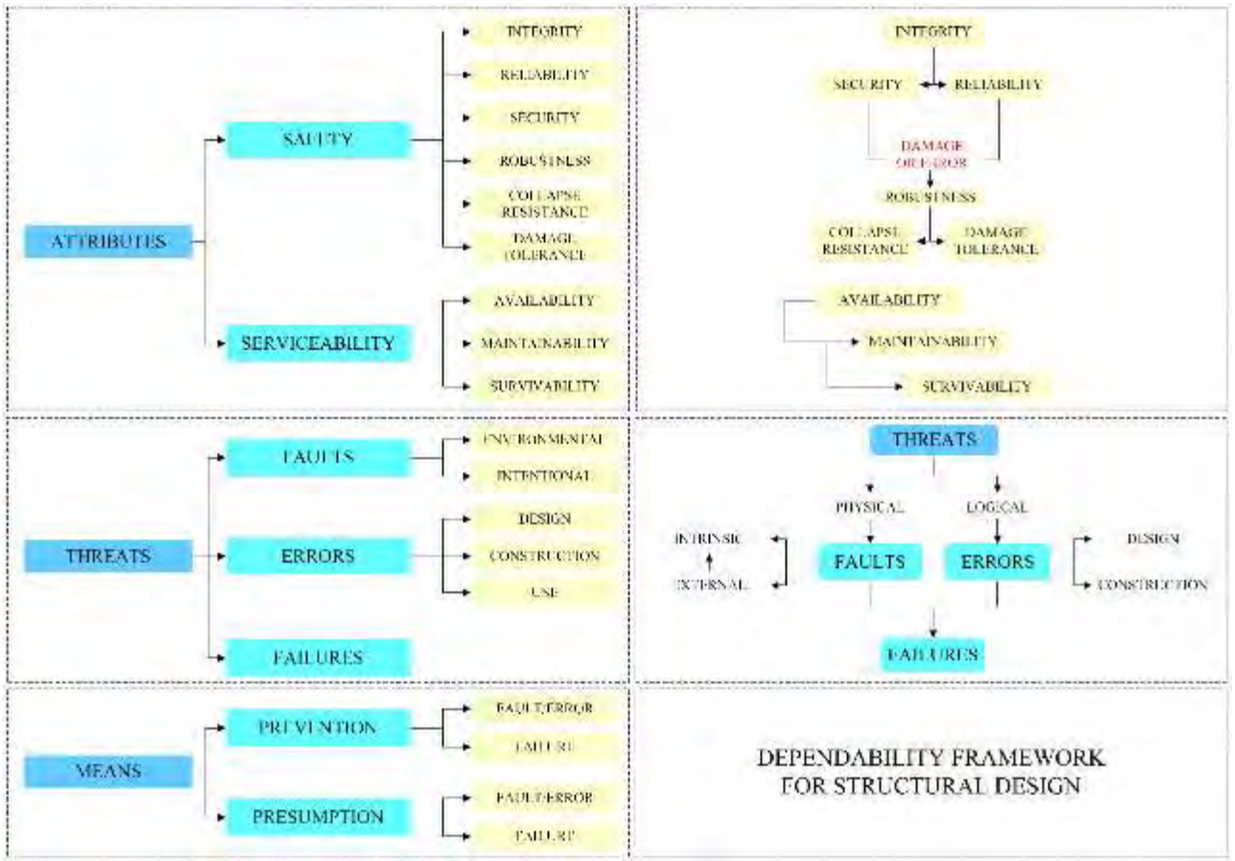


Risk Analysis - Hierarchical Holographic Modeling (HHM)



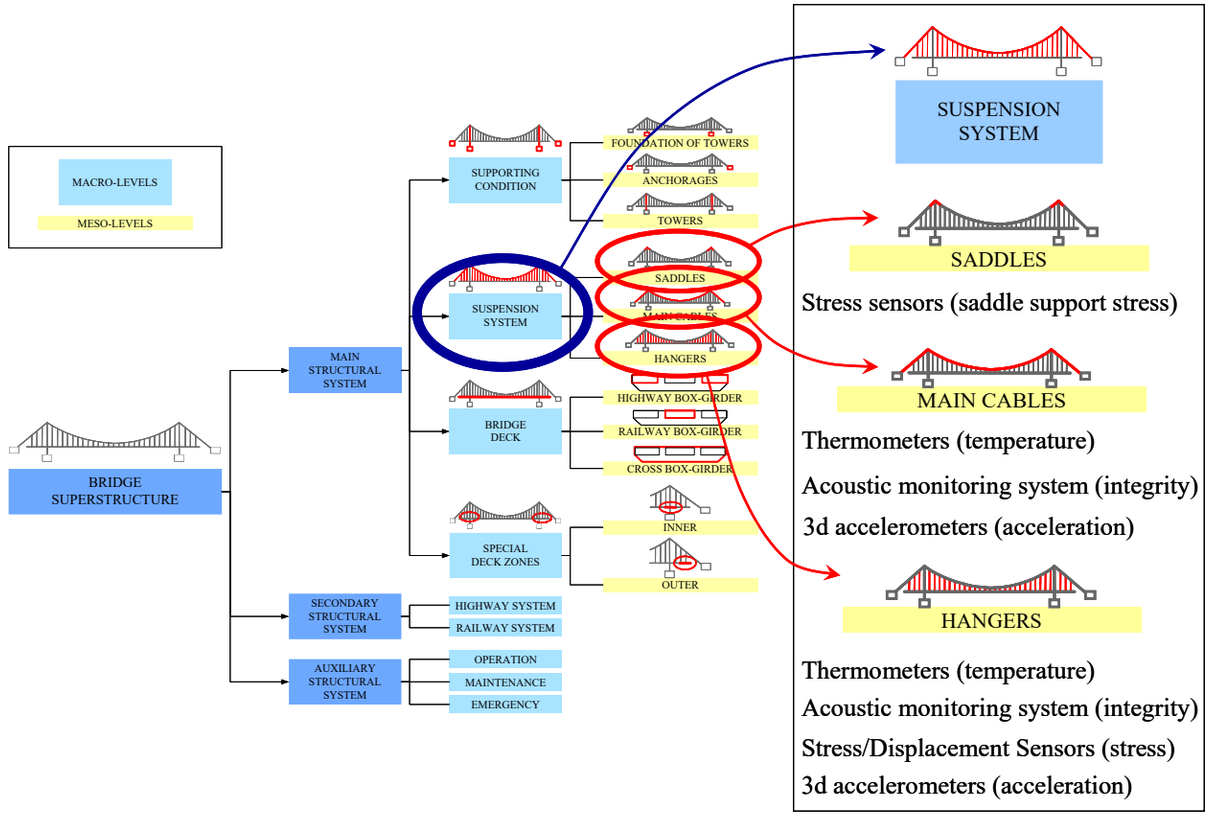
Dependability and robustness of structures

Dependability attributes, threats and means



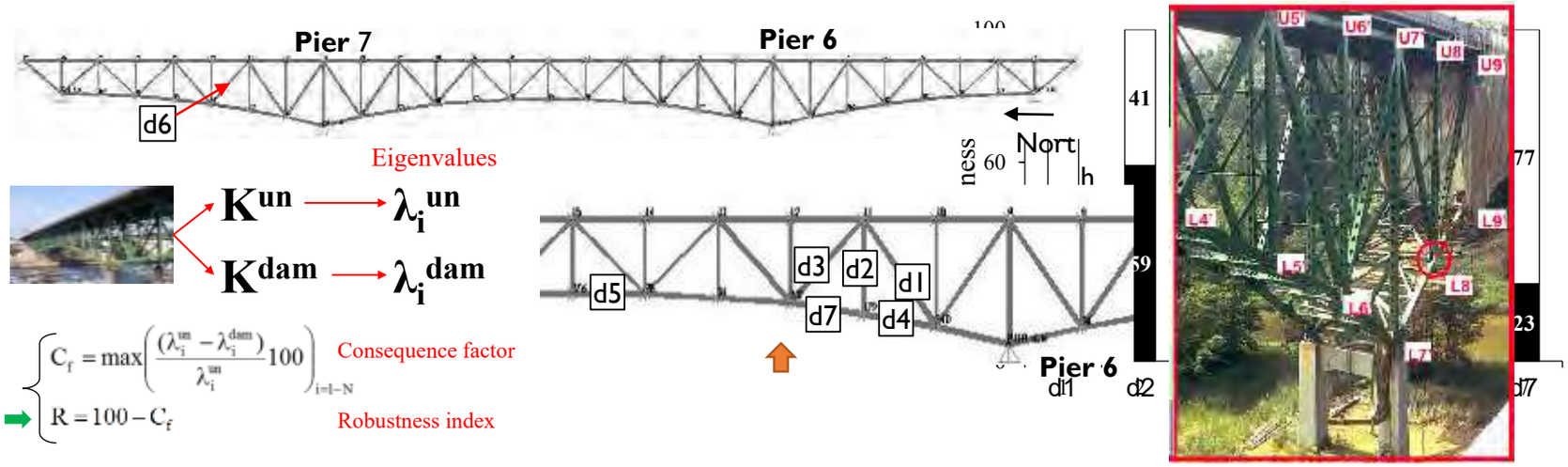
Sgambi, L., Gkoumas, K., Bontempi, F. (2012). Genetic Algorithms for the Dependability Assurance in the Design of a Long Span Suspension Bridge, Computer-Aided Civil and Infrastructure Engineering, 27(9): 655-675

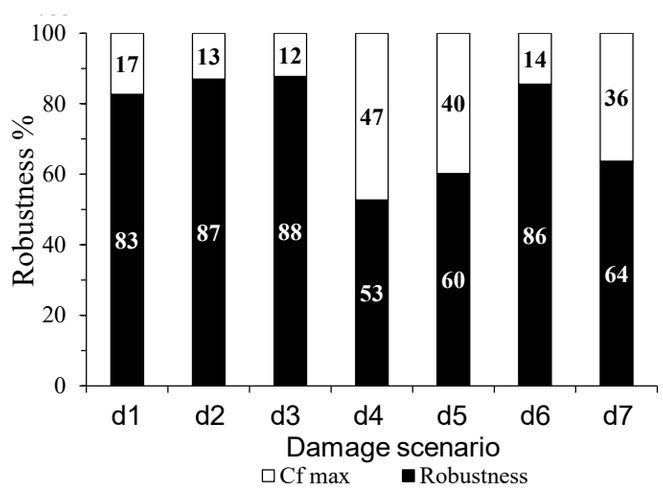
System Decomposition - Structural Health Monitoring



Gkoumas, K. (2005). Requirements and main aspects of an intelligent Monitoring System for Long Span Bridges, Proceedings of the 10th Int. Conf. on Civil, Structural and Environmental Engineering Computing, Rome, Italy, August 28- September 2

Structural robustness of a steel truss bridge - Evaluation of a consequence factor





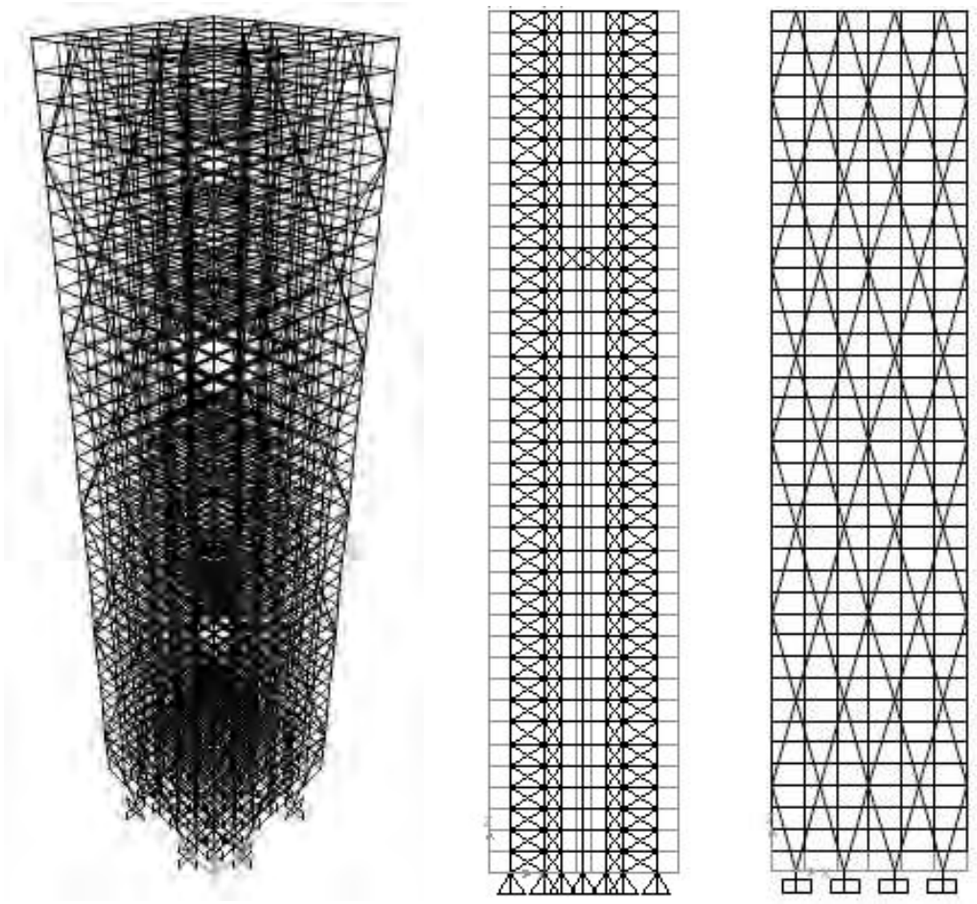
Olmati, P., Gkoumas, K., Brando, F., Cao, L. (2013). "Consequence-based robustness assessment of a steel truss bridge", Steel and Composite Structures, An International Journal, 14(4): 379-395

Special Session organiser: *Progressive Collapse and Structural Robustness: An International Perspective*. Chairs: Dr. Konstantinos Gkoumas, Prof. Clay Naito, ASCE/SEI Structures Congress, Pittsburgh, May 2-4, 2013

Sustainability and resilience

Sustainable development - diagrid structures

- Numerical modelling
- Sustainability assessment in terms of structural steel weight saving
- Comparison with ordinary tall buildings
- Structural behaviour and robustness



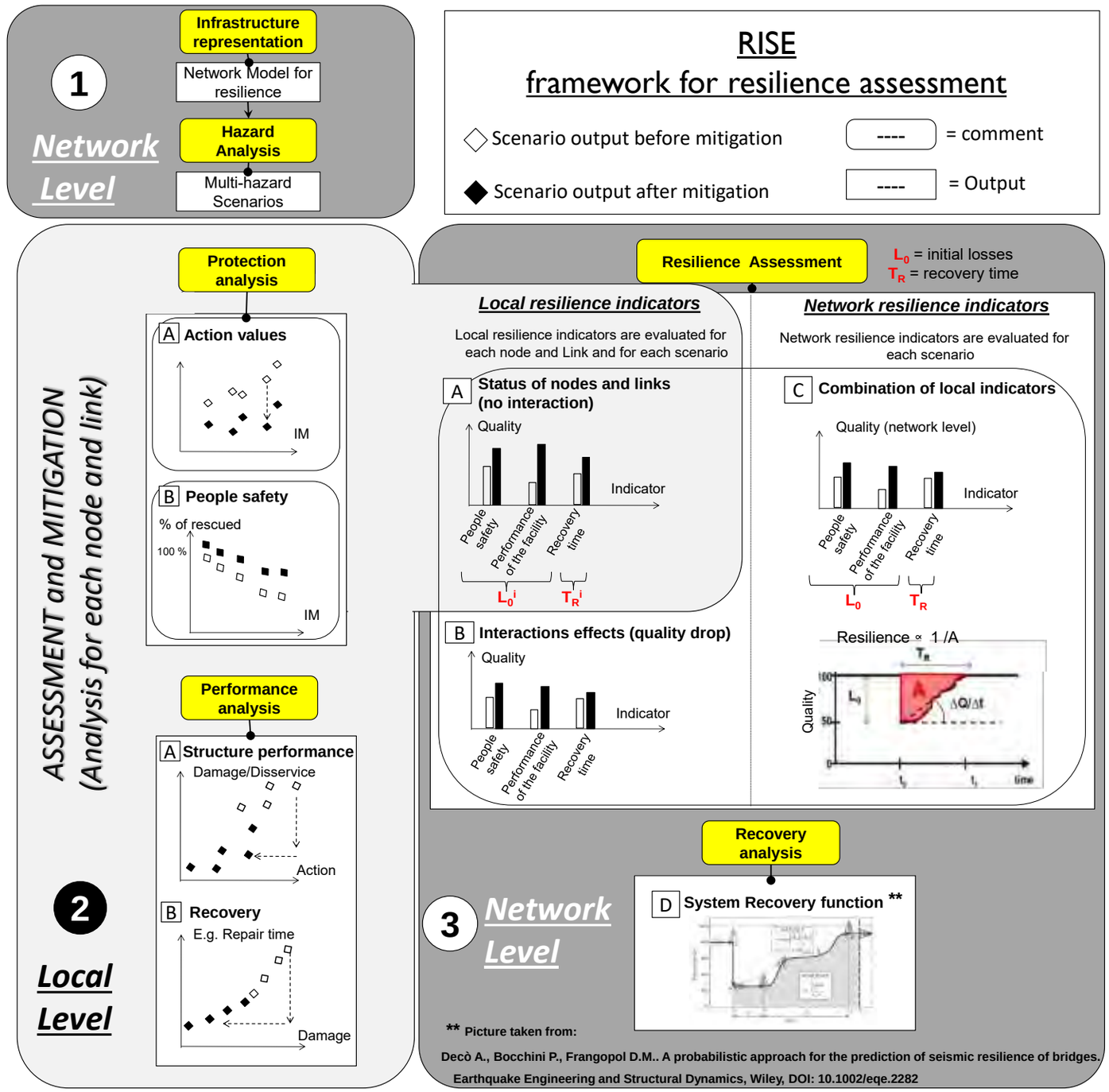
Structural Models (3D view of the Diagrid Structure, Outrigger Structure and Diagrid Structure α=75°)

Milana, G., Olmati, P., Gkoumas, K., Bontempi, F. (2015) "Ultimate capacity of diagrid systems for tall buildings in the nominal configuration and the damaged state", Periodica Polytechnica Civil Engineering, Vol.59, No. 3, pp. 381 – 391

"**Sustainability Concepts in the Design of High-Rise buildings: the case of Diagrid Systems**". "Laurea Magistrale" (M.Sc.) Thesis at the Sapienza University of Rome, Faculty of Civil and Industrial Engineering. Candidate: Giulia Milana. Final grade: **110/110 "Summa cum Laude"**. Advisor: Prof. Franco Bontempi, co-advisor: Konstantinos Gkoumas, PhD. Defended in March 2014

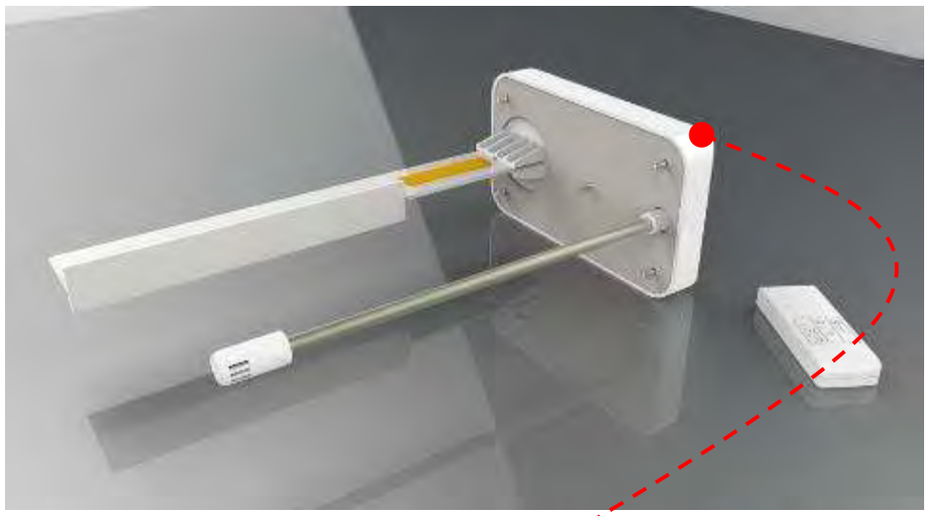
R.I.S.E. Resilient Infrastructures and Structures against Emergencies

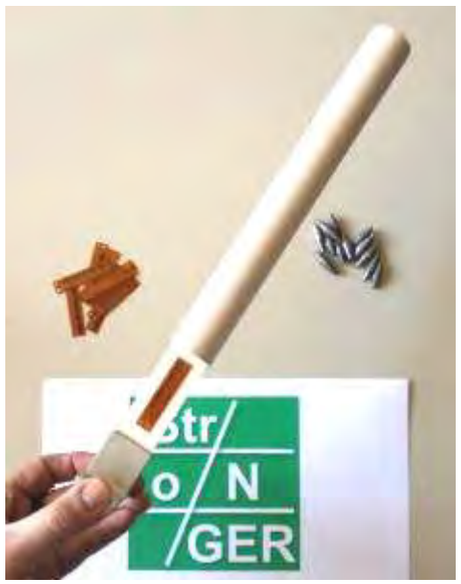
Basis: EU 7th FP proposal (Not financed) ~ 12 groups; 7 WPs
Involvement: Dissemination W.P. (with Uniroma 1)
Objectives:
- improved design of urban areas and increase of security
- system approach to resilience enhancements for large urban built infrastructures



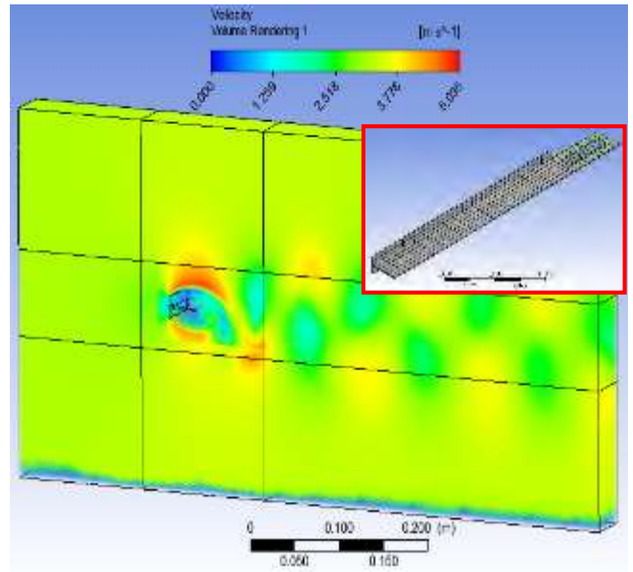
Energy harvesting

- **Space technology transfer** for the **design**, **testing**, **production** and **commercialization** of a **self-powered piezoelectric temperature and humidity sensor** (***piezoTsensor*** ***www.piezotsensor.eu***), for the optimum energy management in building HVAC (Heating, Ventilation and Air Condition) systems
- **Energy Harvesting** (EH) device that uses a **piezoelectric bender** and an appropriate customizable **aerodynamic fin** that takes advantage of specific air flow effects (principally **Vortex Shedding**) for producing energy
- **Principal entrepreneur** together with Francesco Petrini, PhD for StroNGER srl
- **European Patent Application**: 09.12.2015 Bulletin 2015/50 Application number: 15170907.8





Numerical modeling



Wind-tunnel testing

Academic activity

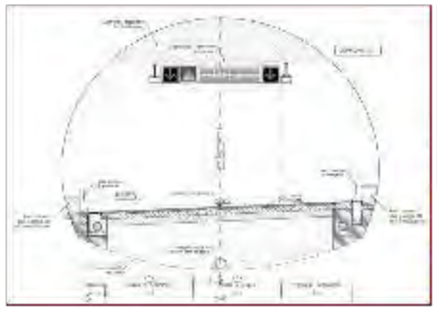
MSc Thesis co-advisor

"**Flow-Induced Energy Harvesting for Smart Buildings: Conceptual Design of an Innovative Piezoelectric Bender**". "Laurea Magistrale" (M.Sc.) Thesis at the Sapienza University of Rome, Faculty of Civil and Industrial Engineering. Candidate: Sara Ferri. Final grade: **110/110 "Summa cum Laude"**.

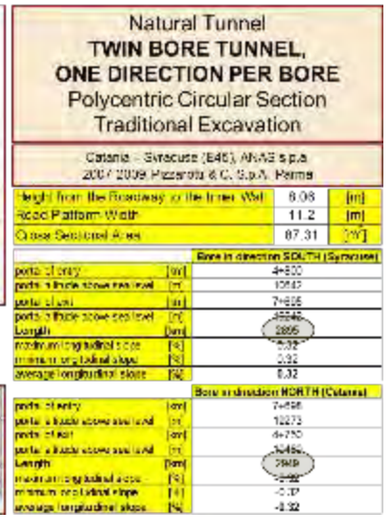
"**Energy Harvesting in Civil Structures under Wind Action: Application of Piezoelectric Devices**". "Laurea Specialistica" (M.Sc.) Thesis at the Sapienza University of Rome, Faculty of Civil and Industrial Engineering. Candidate: Oriana De Gaudenzi. Final grade: **110/110**.

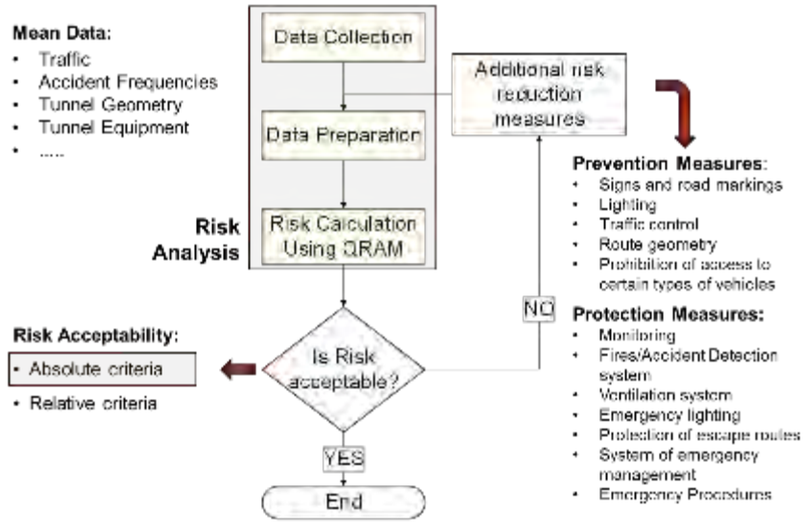
Risk Analysis and Fire Safety Engineering

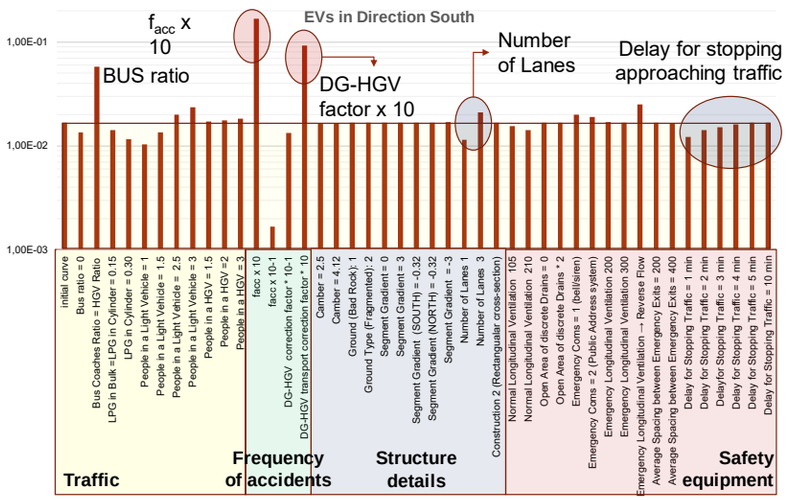
- **Risk analysis for road tunnels**
- **Implementation of the OECD/PIARC QRAM software**
- **Application on a long road tunnel in Southern Italy**

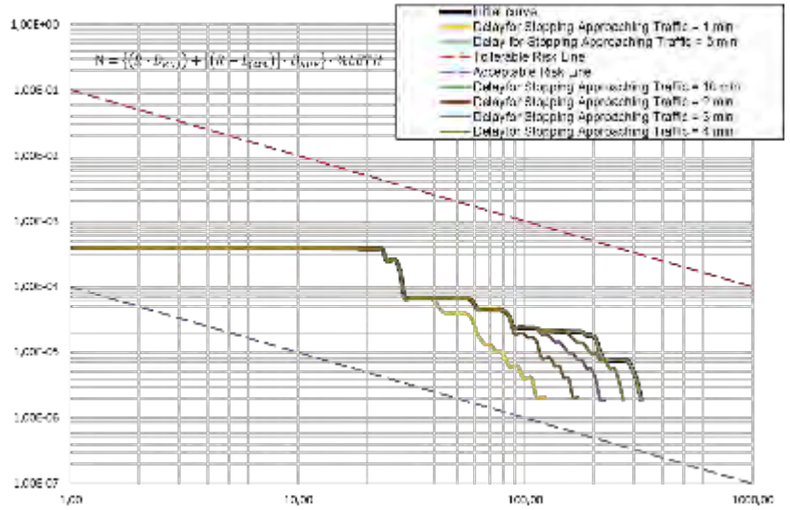


(Central Design Management ANAS S.p.A.)





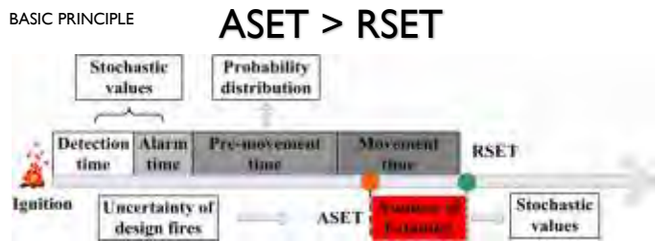




Gkoumas, K., Di Santo, C., Bontempi, F. (2016) "Risk analysis for severe traffic accidents in long road tunnels", International Journal of Forensic Engineering, Vol. 3, No. 1-2, pp. 106-126

"**Risk analysis for severe traffic accidents in road tunnels**". "Laurea Magistrale" (M.Sc.) Thesis at the Sapienza University of Rome, Faculty of Civil and Industrial Engineering. Candidate: Carmine Di Santo. Final grade: **110/110 "Summa cum Laude"**. Advisor: Prof. Franco Bontempi, co-advisor: Konstantinos Gkoumas, PhD. Defended in January 2015

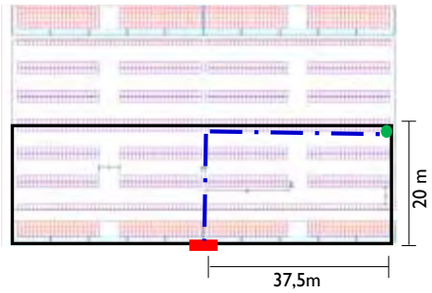
Human behavior and evacuation in fire



ASET : *Available safe escape time* by a fire model or similar tools

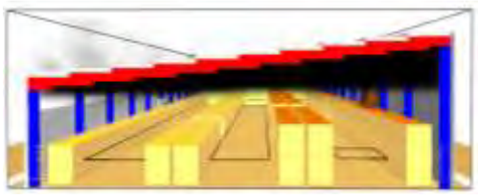
RSET : *Required safe escape time* $t_{RSET} = \Delta t_{DET} + \Delta t_A + (\Delta t_{PRE} + \Delta t_{TRAV})$

MILLING



- Evacuation starts after 190,01s
- The last occupant leaves the compartment after 228s

- The fire is still in the development phase
- HRR(t= 228s) = 3,24 MW



"**The human behavior from «bit player» to «key player»: fire and evacuation simulation in an industrial building**". "Laurea Magistrale" (M.Sc.) Thesis at the Sapienza University of Rome, Faculty of Civil and Industrial Engineering. Candidate: Monica Capobelli. Final grade: **110/110**. Advisor: Prof. Franco Bontempi, co-advisors: Chiara Crosti, PhD, Konstantinos Gkoumas, PhD. Defended in January 2016

DCEE workshops

Workshop chair

The 5th International Workshop on Design in Civil and Environmental Engineering

October 6-8th Sapienza University of Rome, ITALY

DCEE 2016 - www.dcee2016.eu

Constant commitment and synergistic activities in the last three editions of the DCEE series of workshops

Session Chairman at the 4th International Workshop on Design in Civil and Environmental Engineering (DCEE4), National Taiwan University, Taipei, Taiwan, October 30-31, 2015.

Papers:

Gkoumas, K., Petrini, F., Arangio, S., Crosti, C., Bontempi, F. "Development of a piezoelectric energy harvesting sensor: from concept to reality", 5th International Workshop on Design in Civil and Environmental Engineering, Sapienza University of Rome, Italy, October 6-8, 20

Bontempi, F., Gkoumas, K., Arangio, S., Petrini, F., Crosti, C. "The long way towards a sound framework for structural design: 10 years of experience in Rome", 4th International Workshop on Design in Civil and Environmental Engineering, National Taiwan University, Taipei, Taiwan, October 30-31, 2015

Gkoumas, K., Petrini, F., Bontempi, F. "Design for robustness, resilience and anti-fragility in the built and urban environment: considerations from a civil engineering point of view", 4th International Workshop on Design in Civil and Environmental Engineering, National Taiwan University, Taipei, Taiwan, October 30-31, 2015

Milana, G., Gkoumas, K., Bontempi, F. "Sustainability Concepts in the Design of High-Rise buildings: the case of Diagrid Systems", Proceedings of the 3rd International Workshop on Design in Civil and Environmental Engineering, Technical University of Denmark, Denmark, August 21-23, 2014 Lotte Bjerregaard Jensen & Mary Kathryn Thompson Editors, pp. 170-179, ISBN 978-0-9894658-3-0

Ferri, S., Gkoumas, K., Petrini, F. and Bontempi, F. "Flow-induced energy harvesting: conceptual design and numerical analyses of a piezoelectric bender for smart building applications", Proceedings of the 3rd International Workshop on Design in Civil and Environmental Engineering, Technical University of Denmark, Denmark, August 21-23, 2014 Lotte Bjerregaard Jensen & Mary Kathryn Thompson Editors, pp. 146-156, ISBN 978-0-9894658-3-0

October 2016

5th International Workshop on
Design in Civil and Environmental Engineering
October 6-8th Sapienza University of Rome, ITALY
DCEE 2016 - www.dcee2016.eu

Introduction

In his 1969 book "The Sciences of the Artificial" (MIT Press), Herbert A. Simon, argues that design is the central activity that defines engineering and distinguishes it from the natural sciences. In fact, design is much more than engineering: it encompasses many different skills and disciplines.

In Civil and Environmental Engineering (CEE) in particular, design has typically been housed within each of the civil domains, shrouded by analysis, replaced by standards and building codes, and unable to cross the disciplinary boundaries as it was meant to do.

Yet, many of the greatest challenges that humanity will face in the 21st century will require civil and environmental engineers and architects to develop creative and innovative solutions that will radically alter our infrastructure and the built environment.

The DCEE series of workshops explore what it would mean for design to be a discipline within CEE, what it means for design to be a discipline in other areas of engineering, and the implication for interdisciplinary design in cooperation with other fields such as architecture, urban planning, industrial design, product design and more.

It is a great pleasure to welcome you to Rome for the 5th International Workshop on Design for Civil and Environmental Engineering where we will explore the nature of design in civil and environmental engineering and establish the foundation for civil design research.

The workshop scientific program is divided in 6 sessions on design methodology and education, and on the role of the interdisciplinarity in the design process, with 18 presentations and 2 plenary lectures.

The workshop includes two guided tours. The first tour is at the *Palazzo della Civiltà* Italiana known also as the *Colosseo Quadrato* (Square Colosseum), an icon of Modern Architecture, nowadays housing the luxury fashion label Fendi. The second tour will focus on ancient Rome, and on recent and extraordinary findings in the north-eastern area of the Palatine Hill archaeological site.

We hope you will enjoy your staying in Rome and we look forward to fruitful discussions during the meetings and the other activities.

The Workshop Chairs
Prof. Franco Bontempi, Sapienza Università di Roma
Dr. Konstantinos Gkoumas, StroNGER srl

Workshop program

The workshop will include two guided tours and invited lectures.

You can download the up-to-date program from the workshop website.

Invited plenary lectures:

Prof. Pier Giorgio Malerba, Department of Civil and Environmental Engineering, Politecnico di Milano
Conceptual design: from abstract reasoning to consistent details.

Prof. Charis Gantes, School of Civil Engineering, National Technical University of Athens.
Interaction between education, research and practice in structural steel design.

Topics

Topics include but are not limited to:

Interdisciplinary challenges in engineering design
- Structure (Heritage structures, Civil/structural, Optimization, new materials)
- Systems (Indoor climate/energy, District and urban scale, Resilience, Energy Harvesting)
- Construction (BIM, drones, Surveying...)
- Life Cycle Assessment in engineering design
- Environmental Engineering (Flood risk and climate change design challenges)

Design methodology
- Integration and interdisciplinarity
- Philosophy
- Aesthetics
- Form finding/Parametric Design
- Influence from other sciences (e.g. biology, neuroscience)
- Innovation
- Economic challenges/governance

Design Education in engineering design

Committees

Workshop Chairs
Prof. Franco Bontempi, Sapienza Università di Roma
Dr. Konstantinos Gkoumas, StroNGER srl

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Prof. Charis Gantes, National Technical University of Athens
Prof. Timo Hartmann, TU Berlin
Prof. Shang-Hsien "Patrick" Hsieh, National Taiwan University
Prof. Lotte Bjerregaard Jensen, Technical University of Denmark
Prof. Adib Kanafani, University of California Berkeley
Prof. Yoshiaki Kubota, Kyoto University
Prof. H.K. Lee, Korea Advanced Institute of Science and Technology
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Giovanni Dimase, Civil Engineer, MSc
Giuseppe Galiano, MSc, Sapienza University of Rome
Marco Lucidi, Civil Engineer, MSc
Dr. Francesco Petrini, Sapienza University of Rome

Deadlines

August 15, 2016: Abstract submission
August 30, 2016: Abstract peer review
September 15, 2016: Paper submission
September 30, 2016: Paper peer review

Review and publication

All papers will be peer reviewed and authors will be notified of the results via e-mail.
All accepted papers will be published in the conference proceedings and will be available in electronic form after the workshop.
At least one author of each accepted paper is expected to register.

Workshop venue

The workshop will be held at the School of Engineering of the Sapienza University of Rome.

Participation cost

Early (by September 15) / student: 300 €
Normal: 350 €
Extra paper: 100 €

Contact

For more information, please contact
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