European Safety and Reliability Association

Newsletter

http://www.esrahomepage.eu September 2017

Editorial

Terje Aven
ESRA Chairman
University of Stavanger
Norway

Dear ESRA Colleagues,

The ESREL 2017 conference in Portorož, Slovenia, 18-22 June is over. It was a great success. The scientific program was strong, with many interesting presentations and discussions, and as always, the ESREL conference is an important meeting place. The General Chair of the conference, Marko Cepin and his staff can now relax - an impressive work they have done. We are grateful. We applaud them for all their efforts, ranging from the program content, to wonderful food and scenery, to elegant ESREL design details. For pictures from the conference, see esrel2017.org.

The General Assembly Meeting (GAM) elected the venue for the ESREL 2019 conference. It will be in Hannover, Germany, September 22-26, 2019. Professor Michael Beer will be the General Chair of the conference. Congratulations Hannover and Michael.

At the GAM, Dr. Roger Flage, University of Stavanger, was elected as General Secretary following Professor Coen van Gulijk. Flage is 33 years old and has been part of the ESRA community for over 10 years, attending all ESREL conferences since 2007 and serving as a co-chair of the ESRA technical committee on uncertainty analysis since 2016. His professional career has been spent both in industry/consulting and in academia, two of the key domains of the ESRA member base. Both his education as well as his past and current research interests cover the core of and the main topical pillars on which ESRA is built, namely risk, safety and reliability. He has considerable experience also from administrative positions and activities, ranging from committee work to project management to study programme development.

We welcome Roger to the Board of ESRA. I am confident that he will do a great job, with his strong background and personal qualities. I know he is eager to contribute further to the continued operation and development of ESRA. As the General Secretary he will ensure a smooth transfer of ESRA information and experience to new members of the Board in 2018.

With kind regards,

Terje Aven
Chairman of ESRA

Dr. Roger Flage
ESRA General Secretary
University of Stavanger
Norway

Feature Articles

Improved dynamic dependability assessment through integration with prognostics

Jose Aizpurua Unanue
Research Associate
Institute for Energy
and Environment
University of Strathclyde
Scotland, U.K.

Improved dynamic dependability assessment through integration with prognostics

System dependability is a term that encompasses a range of attributes which include safety, reliability, availability, and maintainability. In the nuclear industry a key tool for dependability assessment is probabilistic safety assessments (PSA). PSA employs a combination of Event Tree Analysis (ETA) and Fault Tree Analysis (FTA) to address reliability and safety. In their traditional forms, both techniques are inadequate and inaccurate when dealing with dynamic failure scenarios and system operation because they treat sequences as combination of events.

To enable a more accurate analysis of dynamic scenarios that include mode and state changes as well as sequencing of failures, several techniques for dynamic dependability analysis have emerged. Dynamic fault trees (DFTs) and Boolean logic Driven Markov Processes (BDMPs) are examples of prominent emerging techniques. Despite the advances made in this field, even recent dynamic techniques only provide a prediction of the dependability that is established a-priori, i.e. before system deployment using average past operational data typically drawn from reliability databases. This prediction, however, leads to inaccurate estimates of system dependability attributes such as system safety and reliability that ignore the operational history and state of components used in the specific system.

With increasing availability of online data, there is room to improve traditional dependability assessment techniques. Namely, prognostics is an emerging field, which provides asset-specific failure prediction information that can be reused to improve the system-level failure estimation by forming a more accurate picture of the health of the system as it evolves during operation.

This paper presents work that develops a state-of-the-art dynamic system dependability analysis technique to improve accuracy of prediction via component-level prognostics. We use the BDMPs for expressing a system dependability prediction model that can be developed by designers and analysts of the system. BDMP is a strong dynamic dependability technique sometimes considered as a generalization of DFTs, but does not currently support the integration of prognostics concepts. To address this need, we connect this framework to the formalism of Stochastic Activity Networks (SAN). In this approach, prognostics results are regularly extracted during the system operation and these are used to update component failure probabilities in the system dependability prediction model. Using new observations of a plant, the dependability estimates for the future trajectory of the system can be updated. This approach provides improved prediction of dependability.

The paper presents and discusses a number of possible connections between dependability and prognostics and proposes the use of SAN for the dynamic update of failure probabilities. Model-transformation rules are also presented to convert BDMP models into SAN models and facilitate the posterior dynamic dependability analysis. A case study from the power generation industry is analysed in detail, with real inspection data and prognostics models for transformers and circuit breakers integrated into a power supply system. Results confirm the validity of the proposed approach for improved near real-time unavailability estimations.

The paper can be freely downloaded from: https://pure.strath.ac.uk/portal/en/publications/improved-dynamic-dependability-assessment-through-integration-with-prognostics(acd9f0f8-9d49-4a81-803f-41d9f519a7d1).html

RESS News

Carlos Guedes Soares
Editor-in-Chief RESS
Instituto Superior Técnico,
Universidade de Lisboa

RESS is continuing an active policy towards having special sections or special issues on specific topics so as to present a more focused view on them.

Volume 167 has published the special issue Applications of Probabilistic Graphical Models in Dependability, Diagnosis and Prognosis, guest edited by Philippe Weber and Luigi Portinale, together with a large number of other papers.

Recently closed special sections, which will be shortly appearing on the web site are:

- Maintenance Modelling
  Guest Editors: Shaomin Wu, Phuc Do
- Games and Decisions in Reliability and Risk
  Guest Editors: Refik Soyer and Suleyman Ozekici

Presently **the following special issues are open**:

Complex Systems RAMS Optimization: Methods and Applications
Guest Editors: David W. Coit, Enrico Zio

- Impact of Prognostics and Health Management in Systems Reliability and Maintenance Planning
  Guest Editors: Joo Ho Choi and Ming Zuo

The **special issue of ESREL 2015** is open for submissions since April 2017:

- Foundations and Novel Domains for Human Reliability Analysis
  Guest Editors: Luca Podofillini and Ali Mosleh

Past Safety and Reliability Events

The 52nd ESReDA Seminar on Critical Infrastructures: Enhancing Preparedness & Resilience for the Security of Citizens and Services Supply Continuity

LEI, Kaunas, Lithuania
30-31 May 2017

Mohamed Eid
Chairperson of ESReDA Project Group CI-PR/MS&A-Data
CEA, France

The 52nd ESReDA Seminar organized by ESReDA Project Group *Critical Infrastructure Preparedness and Resilience: Data for Modelling, Simulation & Analysis* was held on the 30th-31st May, 2017 and hosted by the **Lithuanian Energy Institute** and **Vytautas Magnus University** in Kaunas (Lithuania). The technical programme included plenary presentations by leading academics, scientists and risk managers. Speakers shared their scientific knowledge and experience, stimulating our thoughts and getting across methodologies and applications in different areas of Critical Infrastructures Preparedness and Resilience. **Plenary presentations** were given by representatives of National Security and Crisis Management Unit (Office of the Government, Lithuania), Strategic Analysis Division, NATO Energy Security Centre of Excellence (Lithuania) and Lithuanian Geological Survey, under the Ministry of Environment (Lithuania). Besides, a specific Round Table Discussion on Cyber Security was organised – invited speakers shared their experience in the field leaded by the fruitful discussions. Presentations were given by representatives of NATO Energy Security Centre of Excellence (Lithuania) and the Lithuania Electricity Transmission System Operator LITGRID AB (Lithuania). 18 technical papers were presented covering five sessions: Emergency & Risk Management; CIP & Safety Issues; CIP & System Safety Engineering; MS&A - Natural threats & CI's Resilience; MS&A - Preparedness, Vulnerability & Resilience. Speakers shared their scientific knowledge and experience issued from areas of Critical Infrastructures Preparedness and Resilience. Different sectors were covered, such as: energy, transport, communication, civil protection, maritime-ports and nuclear reactors.

47 participants from 11 EU countries (Cyprus, France, Germany, Greece, Italy, Lithuania, the Netherlands, Poland, Portugal, Romania and United Kingdom) contributed through their presentations, discussions and expertise in establishing the state-of-the-art in the field.

Full programme of the 52nd ESReDA Seminar and **presentations** are already available at ESReDA website. The **final proceedings of the 52nd ESReDA Seminar** will soon be available for public consultation and free downloading in compliance with ESReDA politics of free dissemination of scientific and technical knowledge.

Conference Report: ESREL 2017

Portorož, Slovenia
June 18-22, 2017

Marko Čepin
University of Ljubljana, Faculty of Electrical Engineering,
Slovenia

Introduction

The 27th International European Safety and Reliability Conference, ESREL 2017, esrel2017.org, was organised in Portorož, Slovenia from June 18-22, 2017 by University of Ljubljana, Faculty of Electrical Engineering with the conference chairman prof. Dr. Marko Čepin in the main role.

Slovenia is the smallest European country ever organised ESREL (European Safety and Reliability) conference.

Conference Report

The conference program included five invited plenary lectures given by the world leading experts:

-Dr. Andrej Stritar (Risk, Hazard, Probability, Safety, Reliability - How to Use These Concepts to Assure Nothing Goes Wrong in Nuclear Facilities), Slovenian Nuclear Safety Administration, Slovenia,

-Dr. Stefan Hirschberg (Health Risks of Technologies for Power Generation), Paul Scherrer Institut, Switzerland,

-Prof. Dr. Enrique López Droguett (On the Treatment and Challenges of Model Uncertainty), Universidad de Chile, Chile,

-Prof. Dr. Daniel Straub (Reliability of Smart Systems), Technische Universität München, Germany and

-Prof. Dr. Antoine Rauzy (Model-Based Safety Assessment with Altarica 3.0), Norwegian University of Science and Technology, Norway.

PreESREL2017 workshop was organised on Sunday: Application and use of risk assessments – key challenges and recent advances, given by Willy Røed and Roger Flage, University of Stavanger, Norway.
Two software demonstration workshops were organised by sponsors HBM Prenscia and BQR. A panel discussion: Industrial Challenges in Land Transportation, was organised by Bob Huisman and Pierre Dersin.
Ten parallel sessions were conducted during the conference under the command of 68 session chairs.
The conference organising system includes the data of 700 professionals who showed the interest about the conference. More than 640 abstracts have been submitted, more than 480 papers followed. The technical program committee included 122 members who reviewed them in a way that at least 2 committee members reviewed each paper and 455 papers have been selected for publication and presentation at the conference.
The work described in these papers comes from academia and from industry. Their contents includes established areas, which are covered by the related ESRA (European Safety and Reliability Association) technical committees such as accident and incident modelling, economic analysis in risk management, foundational issues in risk assessment and management, human factors and human reliability, maintenance modelling and applications, mathematical methods in reliability and safety, prognostics and system health management, resilience engineering, risk assessment, risk management, simulation for safety and reliability analysis, structural reliability, system reliability and uncertainty analysis.
Those areas are covered in a wide range of industrial and governmental sectors, including aeronautics and aerospace, chemical and process industry, civil engineering, critical infrastructures, energy, information technology and telecommunications, land transportation, manufacturing, maritime and offshore technology, natural hazards, nuclear industry, occupational safety and security.
In addition, the contemporary themes are dealt with such as the Marie Skłodowska-Curie innovative training network in structural safety, risk approaches in insurance and finance sectors, dynamic reliability and probabilistic safety assessment, Bayesian and statistical methods, reliability data and testing, organizational factors and safety culture, software reliability and safety, probabilistic methods applied to power systems, socio-technical-economic systems, advanced safety assessment methodologies: extended probabilistic safety assessment, reliability, availability, maintainability and safety in railways: theory and practice, big data risk analysis and management, model-based reliability and safety engineering.
Practitioner authored papers provide insights into the challenges faced in real applications and share insights into the impact of the interventions to manage risk, while scientific papers share theoretical, methodological and empirical research contributions.
The program was issued in the paper form and in the electronic form for computers and phones – ESREL 2017 mobile application, which was uploaded before the end of the conference approximately 200 times.
"Images of Risk" competition was organised, where the participants have been invited to submit an original image which they have created to communicate an interesting aspect of their work. The image could be a photograph or a drawing or diagram. Although, we have called the competition Images of "Risk", in this context we consider the term Risk to include safety, reliability, risk, resilience, maintenance and related terms that fall within the scope of ESREL 2017.
22 images were submitted. Conference participants at ESRA technical committee group walk to Piran decided for the best images. The small practical gifts were given: at dinner to Dhruv Pandya (PhD student) getting majority of votes and at the conference closing to the participants from the list of the other winners: Claudia Vivalda, Claudia Morsut and Inga Žutautaite from Academia, and Alessandro Mancuso, Christian Kuran, Jennifer Lynette and Roberto Rochetta (PhD students) - who were present at the closing ceremony.

Acknowledgment
We would like to thank many people for their support and contributions to ESREL 2017.
Firstly, we thank the ESRA leaders and advisors: Terje Aven, Radim Briš, Piero Baraldi, Coen Van Gulijk and Enrico Zio and ESRA assembly for trust of the organisation of the international conference ESREL 2017.
We thank the organisers of previous ESREL conferences for sharing with us their experience with the organisation: Luca Podofillini, Lesley Walls, Tim Bedford.
We gratefully thank the members of the ESREL 2017 Technical Program Committee (122 members), the European Safety and Reliability Association Technical Committee Chairs and Co-Chairs (27 technical committees), for volunteering their time and expertise to provide feedback as part of the contributed paper review process and for chairing the sessions at the conference. Every paper was reviewed by at least two anonymous reviewers.
We thank the colleagues, who organised special sessions of contributed papers (Krzysztof Kołowrocki, Qamar Mahboob, Coen van Gulijk, Arturo González, Emmanuel Raimond, Andrej Prošek), panel discussion (Bob Huisman, Pierre Dersin) and preconference workshop (Willy Røed and Roger Flage).
We thank the ESREL 2017 Plenary Speakers: Andrej Stritar, Stephan Hirschberg, Enrique López Droguett and Antoine Rauzy for offering their unique perspectives on safety and reliability at this conference.
We thank all the authors of contributed papers for their submissions and the participants of the Images of Risk competition. We thank the 68 session chairs, who contribute to the quality of discussions at particular sessions.
The support of the ESREL 2017 sponsors and exhibitors: silver sponsor and exhibitor: HBM Prenscia, sponsor: Gen Energija, sponsor and exhibitor: BQR, sponsor and exhibitor: SATODEV, is gratefully acknowledged. We thank the organisations for supporting the conference: it has been made possible

by the close collaboration of the University of Ljubljana, Faculty of Electrical Engineering and European Safety and Reliability Association and Agencija101.
We thank Dr. Samo Gašperič from Faculty of Electrical Engineering for putting together all the details.
Finally, we would like to thank the ESREL 2017 organizing team from Agencija 101 (Leon Škrilec for web support, Tamara Korat for technical and organisational matters, Maša Pogorevc for administration and director Dino Zupančič for taking the responsibility).

10th International Conference on Mathematical Methods in Reliability (MMR 2017)

Grenoble, France
3-6 July 2017

Olivier Gaudoin
MMR 2017- Conference Chair
Grenoble INP
Université Grenoble Alpes
France

Christophe Bérenguer
MMR 2017- Organization Committee
ESRA TC Maintenance Modelling and Applications Chair
Grenoble INP
Université Grenoble Alpes
France

The 10th international MMR "Mathematical Methods in Reliability" conference was organized this year by Grenoble INP and Université Grenoble Alpes. ESRA was one of the sponsor. MMR celebrated its 20th anniversary. The conference was very successful in view of the presentation of 235 conferences from 38 participating countries, with 5 plenary sessions, 1 panel session, 46 invited sessions and 30 contributed sessions, i.e. 77 sessions (with 3 conferences / session). These 77 sessions addressed a wide range of topics: stochastics orders and reliability, signatures, lifetime data analysis, multi-state systems reliability, deterioration modelling, advanced mathematical methods in system reliability and maintenance, Bayesian inference, sensitivity analysis in reliability, maintenance modelling and decision making, dependence modelling, big data & reliability, dynamic reliability models, censoring methodology.

5 plenary speakers gave didactic and inspiring keynote talks:
Reliability Importance Factors: A Mathematical Point of View, by Emanuele Borgonovo (Bocconi University, Milan, Italy)
Probabilistic Construction and Properties of Gamma Processes and Extensions, by Sophie Mercier (University of Pau and Pays de l'Adour, France)
System Signatures: A 30-Year Retrospective", by Francisco J. Samaniego (University of California, Davis, USA)
Cure Models, by Narayanaswamy Balakrishnan (Mac Master University, Hamilton, Canada)
Risk Quantification from Degradation Data by Zhisheng YE (National University of Singapore, Singapore)

A very interesting Panel Session, on a question of interest for our community "Is Reliability a New Science?", with prestigious panelists (William Q. Meeker, Mark Brown, Regina Liu, Sheldon M. Ross, Nozer D. Singpurwalla) was held on Tuesday, July 4.
Conference Website: http://mmr2017.imag.fr/

The International Conference on Information and Digital Technologies 2017 (IDT 2017)

University of Zilina, Slovakia
5 – 7 July 2017
Author : Elena Zaitseva, co-chair of IDT 2017,

The International Conference on Information and Digital Technologies is organized by the team from University of Zilina (Slovakia) and was supported by ESRA. The Conference (http://idt.fri.uniza.sk/) covers topics within information technologies, reliability, risk and safety, testing and fault-tolerant systems, etc.
Multidisciplinary character of the Conference was conditioned for the organization of some Workshops under the Conference that thematically agree with principal investigate areas and topics of the Conference. There were Workshops on:
- **New Frontier Information Digital Technology: From Logic Design To Real-World Applications** (Chair: *Dr. Martin Lukac*, Nazarbayev University, Kazakhstan)
- **Biomedical Technologies** (chair: *Prof. Serge Ablameyko*, Belarusian State University, Belarus)
- **Reliability Technologies** (chairs: *Prof. Radim Bris*, VŠB - Technical University of Ostrava, Czech Republic and *Prof. Enrico Zio*, European Foundation for New Energy-Electricité de France at Ecole Centrale Paris and Supelec, France, Politecnico di Milano, Italy

•**Dynamical systems and real world applications** (chairs: *Prof. Darya Filatova*, Kielce University of Technology, Kielce, Poland and *Prof. Charles El-Nouty*, Université Paris 13, Sorbonne Paris Cité LAGA, Paris, France)
•**CERES: Modern Experience on Young Researchers Organization** (chair: Prof. Vitaly Levashenko, University of Zilina, Slovakia)

More than 140 papers have been submitted for the conference and 71 papers were published in final Proceedings based on reviews that were provided by members Program Committee and reviewers from all over the world.

As result, 50% submitted papers were published in the Conference's Proceedings. The workshops' chairs mainly organized the review process and the process was made by a large number of reviewers. The organization team is gratefully for their contributions to the improvement of quality of the accepted papers. At least two anonymous reviewers examined each paper in order to ensure fair and high-quality reviews. The Conference Proceedings of the Conference IDT 2017 has been indexed in the well-known scientific repositories as IEEEXplore (http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=8007434).

The approved papers are organized into 19 working sections. More then 70 presenters created a very creative and productive discussion atmosphere for the more than 150 participants during the working and plenary sessions and in the breaks. In the plenary sessions, distinguished invited speakers given a review of the future perspectives in their research areas: reliability, information technologies and medical informatics. In particular, next invited lectures were been:

•*Selected Aspects of Multiple-valued Bent Functions*, Prof. Claudio Moraga (Technical University of Dortmund, Germany
•*The Survival Signature for System Reliability*, Prof. Frank Coolen, (Durham University, United Kingdom)
•*Challenges in Medical Image Analysis*, Prof. Max A. Viergever (University Medical Center Utrecht, The Netherlands)
•*Towards uniform approaches to create quantum Grover oracles for practical problems*, Prof. Marek Perkowski (Portland State University, USA)

The Czechoslovakia section of IEEE organized the competition for best papers of at the Conference IDT 2017 and 3 papers were selected after the evaluation by working sections' chairs and chairs of workshops:

•*Mixture Failure Rate: A study based on cross-entropy and MCMC method* (authors:Tien T. Thach, Radim Bris and Frank P. A. Coolen)
•*A Dynamically Reconfigurable VLSI Processor with Hierarchical Structure based on a Micropacket Transfer Scheme* (authors: Yoshichika Fujioka, Michitaka Kameyama and Martin Lukac)
•*Agent-Based Power Equilibrium in a Smart Grid with XBOOLE* (authors: Eric Msp Veith and Bernd Steinbach)

The similar competition was provided for paper of young researchers:

•*Application of the Stewart Platform for studying in control theory* (authors: Dmitrii Dobriborsci, Aleksandr Kapitonov and Nikolay Nikolaev)
•*Predicting clinical status of patients after an acute ischemic stroke using random forests* (authors: Adéla Vrtková)
•*Vehicle recognition and its trajectory registration on the image sequence using deep convolutional neural network* (authors: Dmitry Yudin and Alexander Knysh)

In cooperation with ESRA the competition for best papers of young researchers at the Workshop on Reliability Technologies has been organized. The selection will be based on reviews and evaluation of sections' chairs after presentations. The best papers will be awarded by 2 special diplomas of ESRA:

Statistical Hypotheses Testing for Random and Pseudorandom Generators Based on Statistical Estimators of Entropy (authors: Uladzimir Palukha and Yuriy Kharin)
•*Multiple-Valued Logic in Analysis of Critical States of Multi-State System* (authors: Miroslav Kvassay, Jan Rabcan, Patrik Rusnak)

IEEE Czechoslovakia Section Chair Dr. Matej Pacha and Vice-chairman of ESRA Prof. Radim Bris awarded diplomas for authors of the selected papers at the conference dinner. Prof. Radim Bris presented ESRA and its activities for the conference's participants.

Need say some words about CERES workshop that has been organized for young participants, first of all PhD candidates, students and postdoctoral fellows.

The submitted contributions for this workshop were reviewed and published as the special Proceedings of Workshop.
By this way young participates had possibility to take part at the IDT Conference, present and discuss own results even their papers were not accepted at the general part of the Conference.

The local organizing committee has been organized several cultural and social events that were held in pleasant atmosphere. Participants of the conference visited two famous Slovakian castles in Trencin and Strecno.
The Trencin castle had seen below its walls hostile armies of Czech and Polish kings,
Tatar hordes, imperial landsknechts, soldiers of the Turkish sultan, Tatars of the Khan of Krym, companies of the Duke of Sesia, and Kurucs and Labanec armies. However, it has never been conquered by a direct attack. The oldest stone construction of the castle is the pre-Romanesque rotunda, which dates back to Great Moravia period (at the end of 9th century).

The Strečno Castle is a ruin of a medieval castle of an irregular plan located in northern Slovakia, 12 km east of Žilina. The castle stands on a 103-metre-high cliff above the river Váh. The first recorded mention of the stone castle is from 1316.

The next conference will be organized by the team from University of Zilina in June 2019 in Zilina (Soavakia). Our organization team will be glad to extend the cooperation with ESRA. New ESRA members are welcome in the Program Committee. We will be glad to obtain your proposition about cooperation and new ideas for the Conference by e-mail of organization team idt@fri.uniza.sk or elena.zaitseva@fri.uniza.sk. Therefore the support of ESRA is very important for IDT Conference development.

ESRA Workshop on Virtual Maintenance

Luleå University of Technology, Sweden

29th September 2017

Author: Professor Uday Kumar, Associate & Professor Janet Lin

Virtual Maintenance (VM) is an engineering technology using currently existing digital mock up and related maintenance information to build a virtual scene that simulates maintenance processes. The ESRA Workshop on Virtual Maintenance with specific focus on Safety and Reliability scenario was held in Luleå Sweden on 29th September, 2017.
This workshop was sponsored by European Safety and Reliability Association (ESRA) and Virtual Maintenance Laboratory at Beijing Beihang University (BUAA) (note: BUAA's VM Lab is one of China's State Key Laboratories of Virtual Reality Technology and Systems, established in 2000.
It assists the Defence Technology Laboratory of Reliability and Environmental Engineering and is a national teaching centre for virtual simulation.). It was coordinated by Division of Operation and Maintenance Engineering, Luleå University of Technology (LTU), Sweden.

Photo 1 Delegates of the workshop

The workshop has aimed at:
1) sharing knowledge and project experience of advanced VM techniques for safety and reliability scenario;
2) promoting international collaborations in VM research and education;
3) establishing cooperation and mutual exchange among VM labs;
4) promoting the transfer of good practices of VM.
In total, there were 35 delegates from Government, Industry and academy have participated this workshop. Professor Thomas Olofsson from LTU has introduced Virtual Reality Lab at LTU and research activities; Professor Uday Kumar, LTU gave a presentation on eMaintenance: Predictive and Prescriptive Analytics;
The group discussion was focussed on:
1) Knowledge of human factor in VM;
2) Virtual Reality technology for maintenance; and
3) Enhancement maintenance technology.
Based on the seminars and group discussion, it was unanimously agreed that Virtual Maintenance has fruitful applications for enhancing the effectiveness of

maintenance activities and life cycle management of industrial assets.

Photo 2 Professor Uday Kumar in the workshop

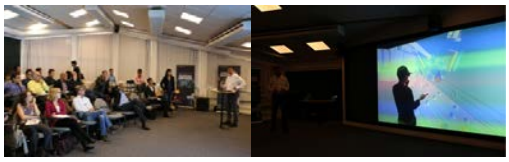

Photo 3 Professor Zhou Dong in the workshop

Calendar of Safety and Reliability Events

The 53rd ESReDA Seminar on Enhancing Safety: the Challenge of Foresight

EC DG JRC, Ispra, Italy
14-15 November 2017

Nicolas Dechy
Chairperson of ESReDA Project Group
Foresight in Safety
IRSN, France

The 53rd ESReDA Seminar will be held on the 14th-15th November 2017 and will be hosted by **EC DG JRC Directorate E: Space, Security and Migration**, Ispra (Italy) with the support of **EC DG JRC Directorate G: Nuclear Safety & Security** (Petten, The Netherlands). This seminar is organised with the support of the ESReDA Project Group *Foresight in Safety*. More information about the Project Group goals is available on ESReDA website.

The analysis of the major accidents and crises has shown that there were always early warning signs that could have been heeded and used as valuable information to design "relevant tools" and proactive strategies for preventing major events.

Such missed opportunities point towards the need to improve foresight methods for enhancing safety & crises management.

The shift from safety management approaches in which improvement is predominantly based on hindsight to include more foresight approaches has many hurdles to overcome, in theory as well as in practice. The seminar will address the question: How can foresight improve systems' resilience and accident prevention? This rises several topics such as: safety imagination with scenario approaches, foresight methods for short and long term, anticipation of new risks induced by new technology, the digital revolution, industry 4.0, the management of emerging risks, the detection and treatment of early warning signs (EWS), weak signals, accident precursors, the role of whistle blowers and of data mining with big data and linguistic tools, the social climate and reporting culture, the use of the past experiences and organizational learning… We aim to discuss theories, concepts, and experiences (successes and failures) of enhancing foresight in safety. All industrial sectors are concerned (energy, process, transport, space, health critical infrastructure, public sector, government …).

The **final call for papers** is already available at **ESReDA website**: https://www.esreda.org/.

The 54th ESReDA Seminar on Risk, Reliability and Safety of Energy Systems in Coastal and Marine Environments

Nantes, France
25-26 April 2018

Alaa Châteauneuf
Chairperson of ESReDA Project Group
Reliability of Wind Turbines
CIDECO, France

The 54th ESReDA Seminar will be held on the 25th-26th April 2018, hosted by **Université de Nantes** (Nantes, France). This seminar is organised with the support of the ESReDA Project Group *Reliability of Wind Turbines* (more information is available at ESReDA website).

Nowadays, sustainable energy production becomes a very challenging issue and most of the economically developed and underdeveloped countries plan rapid evolution in the 15 coming years. The climate changes can be already felt in most of them. Meanwhile, when the UNESCO revealed that 16% of the population lived by the seaside (less than 100km from the coast) in 1990, this percentage reached 50% in 2010 and is planned to jump to 75% in 2035. Energy production from the sea or from the littoral is herein not only an opportunity with the ocean covering approximately 71% of the Earth surface, but also a chance with only few installed industrial systems in comparison with the potential and the existing scientific and technological knowledge (environmental resources, controlled energy systems, grid optimization and materials in sea environment.

Since the early 2010's, the European Community promotes researches and innovations in the field of Marine Renewable Energy, with the improvement of existing wind offshore industry based on fixed

structures, the promising development of floating wind energy with increasing turbine capacities, the related increase of blade length and of the total height of the structure and the potential offered by ocean energy (wave, tidal, thermal). Recently, in 2016, the European Strategic Energy Technology Plan (SET-plan) wrote in its roadmap that the key goal is to reduce the LCOE (Levelized Cost Of Electricity) and set the target of 7 ct€/kWh to be reached by 2035. To reach this ambitious target, the European Platform of Universities in Energy Research & Education (EUA-EPUE) recommends to develop system reliability, maintenance and structural health monitoring optimization and to increase service lifetime from 25 years now to 35 years. There are many technical issues and human challenges where risk, reliability and safety are involved: evaluation of uncertain resources (wind, wave, currents), material reliability, complex system reliability, electrical grid optimization, collision with ships, governance of risk in a multi-usage area (fishing, tourism, maritime transport, European defence).

The aim of the 54th ESReDA seminar is to bring together scientists, engineers and decision makers in the field of complex engineering system safety, structural health monitoring, cost/benefit assessment and risk management, in order to present and discuss innovative methodologies and practical applications related to complex system reliability, economical risk and human risk in complex environment. Scientific methodologies, theoretical issues and practical case studies are expected to cover all the range from academic to industrial applications, including electro-mechanical and civil engineering.

Topics include (but are not limited to):

- Reliability-based design and optimization (including structural, material and electro-mechanical issues);
- Service lifetime extension;
- Risks during sea operations and during service lifetime in a multi-usage area;
- Robustness quantification of complex systems;
- Electrical grid optimization and asset management;
- Life-cycle assessment and optimization;
- Structural and mechanical reliability, including electro-mechanical systems
- Probabilistic degradation models;
- Added value of structural health monitoring and inspection, maintenance and repair optimization;
- Risk assessment and decision theory;
- Computation procedures in analysis and optimization;
- Failure consequences on human lives, activities and environmental damage;
- Organisational and societal modelling;
- Industrial case studies in coastal structures and marine renewable energy.

More information and the **Call for Papers** are available at the 54th ESReDA seminar website.

Welcome to ESREL 2018

Trondheim, Norway
17-21 June 2018

The annual European Safety and Reliability Conference ESREL is an international conference under the auspices of the European Safety and Reliability Association (ESRA).

The topic for ESREL 2018 is "Safe Societies in a Changing World" and our ambition for the conference is to advance in the understanding, modeling, and management of the complexity of the risk, safety and reliability fields characterizing our world, now and in the future. We aim at setting up a multidisciplinary platform to address the technological, societal and financial aspects of these fields. With the support of NTNU, we engage in broadening the scope of risk, safety and reliability from the technical to natural, financial and social aspects, focusing on

Inter-dependencies of functions and cascade of failures in complex systems.

The time for the conference is **17-21 June 2018**. The conference venue will be at the main campus of the Norwegian University of Science and Technology, NTNU.

Organisers:

Conference General Chairman:
Prof. Stein Haugen – NTNU

Conference Co-Chairs:
Prof. Jan Erik Vinnem– NTNU
Prof. Trond Kongsvik– NTNU
Prof. Anne Barros – NTNU

Important dates

- Abstract deadline: October 15, 2017
- Abstract approval: October 17, 2017
- Full paper deadline: December 15, 2017
- Registration Opening: January 2018
- Comments from reviewers: February 1, 2018
- Final paper: February 15, 2018

Conference Website:
https://www.ntnu.edu/web/esrel2018/home

37th International Conference on Ocean, Offshore and Arctic Engineering (OMAE2018)
Symposium on Structures, Safety and Reliability

Madrid, Spain
17-22 June 2018

Since 2003, the OMAE conference has more than tripled in size, with over 1,000 participants at OMAE 2015 in St. John's, Canada and over 900 in Busan, Korea. The annual OMAE conference is an international assembly of engineers, researchers, and students in the fields of ocean, offshore and arctic engineering. The conference is organized by thematic area in 9 traditional Symposia, one of which deals with topics of Safety and Reliability as applied to this

industrial domain. This Symposium typically has around 120 papers and thus is an interesting venue for reliability specialists that want to develop applications in this industrial sector.

Important Dates:

•Abstract submission: October 3, 2017

•Full paper deadline for review: January 12, 2017

Specific questions can be addressed to the **Symposium Coordinator** at:

c.guedes.soares@centec.tecnico.ulisboa.pt

Conference Website: http://www.omae2018.com

ESRA Information

1. ESRA Membership

1.1 National Chapters

- French Chapter
- German Chapter
- Italian Chapter
- Polish Chapter
- Portuguese Chapter
- Spanish Chapter
- UK Chapter

1.2 Professional Associations

- The Safety and Reliability Society, UK
- Danish Society of Risk Assessment, Denmark
- SRE Scandinavia Reliability Engineers, Denmark
- ESReDA, France
- French Institute for Mastering Risk (IMdR-SdF), France
- VDI-Verein Deutscher Ingenieure (ESRA Germany), Germany
- The Netherlands Society for Risk Analysis and Reliability (NVRB), The Netherlands
- Polish Safety & Reliability Association, Poland
- Asociación Española para la Calidad, Spain

1.3 Companies

- TAMROCK Voest Alpine, Austria
- IDA Kobenhavn, Denmark
- VTT Industrial Systems, Finland
- Bureau Veritas, France
- INRS, France
- Total, France
- Commissariat á l'Energie Atomique, France
- DNV, France
- Eurocopter Deutschland GMbH, Germany
- GRS, Germany
- SICURO, Greece
- VEIKI Inst. Electric Power Res. Co., Hungary
- Autostrade, S.p.A, Italy
- D'Appolonia, S.p.A, Italy
- IB Informatica, Italy
- RINA, Italy
- TECSA, SpA, Italy
- TNO Defence Research, The Netherlands
- Dovre Safetec Nordic AS, Norway
- PRIO, Norway
- SINTEF Industrial Management, Norway
- Central Mining Institute, Poland
- Adubos de Portugal, Portugal
- Transgás - Sociedade Portuguesa de Gás Natural, Portugal
- Cia. Portuguesa de Producção Electrica, Portugal
- Siemens SA Power, Portugal
- ESM Res. Inst. Safety & Human Factors, Spain
- IDEKO Technology Centre, Spain
- TECNUN, Spain
- TEKNIKER, Spain
- CSIC, Spain
- HSE - Health & Safety Executive, UK
- Atkins Rails, UK
- W.S. Atkins, UK
- Railway Safety, UK
- Vega Systems, UK

1.4 Educational and Research Institutions

- University of Innsbruck, Austria
- University of Natural Resources & Applied Life Sciences, Austria
- AIT Austrian Institute of Techn. GmbH, Austria
- Université Libre de Bruxelles, Belgium
- University of Mining and Geology, Bulgaria
- Czech Technical Univ. in Prague, Czech Republic
- Technical University of Ostrava, Czech Republic
- University of Defence, Czech Republic
- Tallin Technical University, Estonia
- Helsinki University of Technology, Finland
- École de Mines de Nantes, France
- Université Henri Poincaré (UHP), France
- Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), France
- Université de Bordeaux, France
- Université de Technologie de Troyes, France
- Université de Marne-la-Vallée, France
- INERIS, France
- Fern University, Germany
- Technische Universität Muenchen, Germany
- Technische Universität Wuppertal, Germany
- University of Kassel, Germany
- TU Braunschweig, Germany
- Institute of Nuclear Technology Radiation Protection, Greece
- University of the Aegean, Greece
- Universita di Bologna (DICMA), Italy
- Politecnico di Milano, Italy
- Politecnico di Torino, Italy
- Universita Degli Studi di Pavia, Italy
- Universita Degli Studi di Pisa, Italy
- Technical University of Delft, The Netherlands
- Institute for Energy Technology, Norway
- Norwegian Univ. Science & Technology, Norway
- University of Stavanger, Norway
- Technical University of Gdansk, Poland
- Gdynia Maritime Academy, Poland
- Institute of Fundamental Techn. Research, Poland
- Technical University of Wroclaw, Poland
- Instituto Superior Técnico, Portugal

- Universidade de Coimbra, Portugal
- Universidade Nova de Lisboa - FCT, Portugal
- Universidade de Minho, Portugal
- Universidade do Porto, Portugal
- University Politechnica of Bucharest, Romania
- University of Iasi, Romania
- Slovak Academy of Sciences, Slovakia
- University of Trencin, Slovakia
- Institute "Jozef Stefan", Slovenia
- Asociación Española para la Calidad, Spain
- PMM Institute for Learning, Spain
- Universidad D. Carlos III de Madrid, Spain
- Universidad de Extremadura, Spain
- Univ. de Las Palmas de Gran Canaria, Spain
- Universidad Politecnica de Madrid, Spain
- Universidad Politecnica de Valencia, Spain
- Institute de Matematica y Fisica Fundamental (IMAFF), Spain
- University of Castilla-La Mancha, Spain
- Luleå University, Sweden
- World Maritime University, Sweden
- Institut f. Energietechnik (ETH), Switzerland
- Paul Scherrer Institut, Switzerland
- City University London, UK
- Liverpool John Moores University, UK
- University of Aberdeen, UK
- University of Bradford, UK
- University of Salford, UK
- University of Strathclyde, Scotland, UK

1.5 Associate Members

- Federal University of Pernambuco, Brazil
- Fluminense Federal University, Brazil
- Pontifícia Universidade Católica, Brazil
- European Commission - DR TREN (Transport and Energy), in Luxembourg
- Vestel Electronics Co., Turkey

2. ESRA Officers

Chairman
Terje Aven (terje.aven@uis.no)
University of Stavanger, Norway

Vice-Chairman
Radim Bris (radim.bris@vsb.cz)
Technical University of Ostrava, Czech Republic

General Secretary
Coen van Gulijk (C.VanGulijk@hud.ac.uk)
University of Huddersfield, UK

Treasurer
Piero Baraldi (Piero.baraldi@polimi.it)
Politecnico di Milano, Italy

Past Chairman
Enrico Zio (enrico.zio@polimi.it)
Politecnico di Milano, Italy

Chairmen of the Standing Committees
Antoine Grall, University of Technology of Troyes, France
C. Guedes Soares, Instituto Superior Técnico, Portugal

3. Standing Committees

3.1 Conference Standing Committee

Chairman: A. Grall, University of Tech. of Troyes, France
The aim of this committee is to establish the general policy and format for the ESREL Conferences, building on the experience of past conferences, and to support the preparation of ongoing conferences. The members are one leading organiser in each of the ESREL Conferences.

3.2 Publications Standing Committee

Chairman: C. Guedes Soares, Instituto Sup. Técnico, Portugal
This committee has the responsibility of interfacing with Publishers for the publication of Conference and Workshop proceedings, of interfacing with Reliability Engineering and System Safety, the ESRA Technical Journal, and of producing the ESRA Newsletter.

4. Technical Committees

Methodologies

4.1 Accident and Incident modeling
Chairman: Stig Johnsen, Norway & Nicola Paltrinieri, Norway
E-mail: Stig.O.Johnsen@sintef.no; nicola.paltrinieri@ntnu.no

4.2 Economic Analysis in Risk Management
Chairman: Eirik B. Abrahamsen, Norway
E-mail: eirik.b.abrahamsen@uis.no

4.3 Foundational Issues in Risk Assessment and Management
Chairman: Terje Aven, Norway & Enrico Zio, France
E-mail: terje.aven@uis.no; enrico.zio@ecp.fr

4.4 Human Factors and Human Reliability
Chairman: Luca Podofillini, Switzerland & Chiara Leva, Ireland
E-mail: luca.podofillini@psi.ch; levac@tcd.ie

4.5 Maintenance Modeling and Applications
Chairman: Christophe Bérenguer, France & Mitra Fouladirad, France
E-mail: christophe.berenguer@grenoble-inp.fr; mitra.fouladirad@utt.fr

4.6 Mathematical Methods in Reliability and Safety
Chairman: John Andrews, UK & Nicolae Brinzei, France
E-mail: John.Andrews@nottingham.ac.uk; nicolae.brinzei@univ-lorraine.fr

4.7 Prognostics and System Health Management
Chairman: Piero Baraldi, Italy & Enrico Zio, France
E-mail: piero.baraldi@polimi.it; enrico.zio@ecp.fr

4.8 Resilience Engineering
Chairman: Ivonne Herrera, Norway & Eric Rigaud, France
E-mail: Ivonne.A.Herrera@sintef.no; eric.rigaud@mines-paristech.fr

4.9 Risk assessment
Chairman: Marko Cepin, Slovenia & Henrik Hassel, Sweden
E-mail: marko.cepin@fe.uni-lj.si; henrik.hassel@risk.lth.se

4.10 Risk Management
Chairman: Lesley Walls, UK & David Valis, Czech Republic & Marcelo Hazin, Brazil
E-mail: lesley@mansci.strath.ac.uk; david.valis@unob.cz; marcelohazin@gmail.com

4.11 Simulation for Safety and Reliability Analysis
Chairman: Nicola Pedroni, France & Edoardo Patelli, UK
E-mail: nicola.pedroni@ecp.fr; edoardo.patelli@liverpool.ac.uk

4.12 Structural Reliability
Chairman: Jana Markova, Czech Republic & Martin Krejsa, Czech Republic
E-mail: jana.markova@klok.cvut.cz; martin.krejsa@vsb.cz

4.13 System Reliability

Chairman: Gregory Levitin, Israel & Serkan Eryilmaz, Turkey
E-mail: gregory.levitin@iec.co.il; serkan.eryilmaz@atilim.edu.tr

4.14 Uncertainty analysis
Chairman: Emanuele Borgonovo, Italy & Roger Flage , Norway
E-mail: emanuele.borgonovo@unibocconi.it; roger.flage@uis.no

Application Areas - Technological Sectors

4.15 Aeronautics and Aerospace
Chairman: Darren Prescott, UK
E-mail: darren.prescott@nottingham.ac.uk

4.16 Chemical and Process Industry
Chairman: Valerio Cozzani, Italy & Gabriele Landucci, Italy & Nima Khakzad, The Netherlands
E-mail: valerio.cozzani@unibo.it; gabriele.landucci@unipi.it; nkhakzad@gmail.com

4.17 Civil Engineering
Chairman: Raphael Steenbergen, The Netherlands
E-mail: raphael.steenbergen@tno.nl

4.18 Critical Infrastructures
Chairman: Giovanni Sansavini, Switzerland & Enrico Zio, France
E-mail: sansavig@ethz.ch; enrico.zio@ecp.fr

4.19 Energy
Chairman: Michalis Christou, Belgium & Mahmood Shafiee, UK
E-mail: Michalis.Christou@ec.europa.eu; m.shafiee@cranfield.ac.uk

4.20 Information Technology and Telecommunications
Chairman: Elena Zaitseva, Slovakia & Ralf Mock, Switzerland
E-mail: elena.zaitseva@fri.uniza.sk; ralf.mock@zhaw.ch

4.21 Land Transportation
Chairman: Olga Fink, Switzerland & Bob Huisman, The Netherlands
E-mail: olga.fink@ivt.baug.ethz.ch; b.huisman@nedtrain.nl

4.22 Manufacturing
Chairman: Benoit Iung, France & François Peres, France
E-mail: benoit.iung@univ-lorraine.fr; francois.peres@enit.fr

4.23 Maritime and Offshore technology
Chairman: Jin Wang, UK & Ingrid B. Utne, Norway & Mario Brito, UK
E-mail: j.wang@ljmu.ac.uk; ingrid.b.utne@ntnu.no; M.P.Brito@soton.ac.uk

4.24 Natural Hazards
Chairman: Pieter van Gelder, The Netherlands & Bas Kolen, The Netherlands
E-mail: p.h.a.j.m.vangelder@tudelft.nl; B.Kolen@tudelft.nl

4.25 Nuclear Industry
Chairman: Sebastian Martorell, Spain & Francesco Di Maio, Italy
E-mail: smartore@iqn.upv.es; francesco.dimaio@polimi.it

4.26 Occupational Safety
Chairman: Ben Ale, The Netherlands & Reniers Genserik, Belgium
E-mail: ben.ale@xs4all.nl; genserik.reniers@uantwerpen.be

4.27 Security
Chairman: Sissel H. Jore, Norway & Zdenek Vintr, Czech Republic & Genserik Reniers, Belgium
E-mail: sissel.h.jore@uis.no; zdenek.vintr@unob.cz; genserik.reniers@uantwerpen.

ESRA is a non-profit international organization for the advance and application of safety and reliability technology in all areas of human endeavour. It is an "umbrella" organization with a membership consisting of national societies, industrial organizations and higher education institutions. The common interest is safety and reliability.
For more information about ESRA, visit our web page at http://www.esrahomepage.eu
For application for membership of ESRA, please contact the general secretary Coen van Gulijk E-mail: c.vangulijk@hud.ac.uk.
Please submit information to the ESRA Newsletter to any member of the Editorial Board: