European Safety and Reliability Association

Newsletter

http://www.esrahomepage.org

June 2014

Editorial

Enrico Zio
ESRA Chairman
Politecnico di Milano, Italy
École Centrale Paris,
Supelec, France

Dear ESRA members,

As we close down the football World Cup in Brazil, we get ready to open ESREL 2014, in Wroclaw, Poland, with guarantee of at least the same technical excellence and social fun. Papers have been delivered to our publisher for preparation of the proceedings, keynote lecturers have been invited and the conference dinner is in the oven. It will be another unforgettable moment of our ESRA.

Concerning the practical matters of our Association, we have advanced on the various important issues that we have been addressing in the past months: bylaws of ESRA, memberships update, etc.

Also, read in the newsletter the outcome of some the activities sponsored with seed money by ESRA, including the workshop in Bologna and the meeting of the young generation of scientists and researchers in Sicily.

Finally, this is very likely my last Chairman salute to you as I will be stepping down after having served my two terms. I am not in the position of evaluating my own work: all I dare say is:

- that the other officers that have accompanied me, have worked with passion, efficiency and precision, and I deeply thank them: I am indebted to them;
- that collaborating with all members, in the name of ESRA has been very interesting and pleasant;
- that carrying around the name of ESRA has been a great honor, and I thank all of you for giving me this opportunity.

There is certainly still work to do to improve ESRA and make it even more relevant in the scientific and technical communities active in the fields of safety and reliability, and I am very confident that the next Chairman will guide effectively the necessary actions in the proper directions.

With kind regards,

Enrico Zio
Chairman of ESRA

Feature Articles

Using Distributed Simulation Approach for Infrastructure System Modeling: Challenges and Recommendations

Cen Nan
Reliability and Risk Engineering
ETH Zürich, Switzerland

Wolfgang Kröger & Giovanni Sansavini
ETH Risk Center, ETH Zürich, Switzerland

Modeling infrastructure systems requires the integration of different domain-specific or sector-specific models developed by using a wide array of different approaches and techniques, e.g., CNT (Complex Network Theory), ABM (Agent based Modeling), SD (System Dynamic), etc. Each of these approaches can be used to deal with a specific topic and is capable to represent characteristic properties of a certain type of infrastructure system, e.g. engineered-physical, social, informational, governmental or cyber. The lack of coherent modeling approaches hinders the possibilities of analyzing/assessing dynamic system behaviors comprehensively in a heterogeneous network of infrastructure systems. Hence, there is a need to integrate different types of modeling approaches into one simulation tool in order to fully utilize benefits/advantages of each approach and optimize the efficiency of the overall simulation [1, 2]. The distributed simulation approach can be considered as means to implement the integration of different models to simulate these often called "system-of-systems" [3]. This innovative approach changes the way to design and develop simulation tools for analyzing infrastructure systems [4, 5]. Based on this approach, a simulation platform is developed using the HLA (High Level Architecture) simulation standard integrating multiple domain-specific or sector-specific models [6]. Simulation results from a number of experiments performed using the platform seem promising and demonstrate the feasibility of this approach [7]. However, as the consequences of increasing types of modeling approaches to be included and demands for more accurate simulation validation, the eligibility of this approach might be challenged due to following reasons:

- **Increasing complexity of infrastructure systems:** during recent decades, infrastructure systems have become increasingly complicated and their sizes have grown significantly, exhibiting a number of characteristics such as dynamic/nonlinear behavior, intricate rules of internal/external interactions and cascades. These characteristics make the modeling and simulation of such a system highly challenging.
- **Lack of common format to exchange data**: The lack of coherent modeling language and approaches results in different formats for data and information exchange, causing the compatibility issue, and will eventually hinder the efficiency of data flows among closely coupled (integrated) systems and the efforts of integrating various models into one simulation platform.
- **Time synchronization issue among integrated systems:** although time always moves forward during the simulation, the perception of "current time" might differ among different distributed models. Therefore, the issue of regulation and synchronization should be addressed, especially for "time-stepped" system. In [7], a simplified time management mechanism is proposed to handle the time synchronization issue. This mechanism is straightforward and easy to implement. However, it is only applied to overcome this issue between two models; one of them is mainly an event-based that requires much less time synchronization compared to a time-based model.
- **Lack of an efficiency method for performance optimization:** the performance of overall simulation needs to be optimized before conducting further experiments. For example, it is important to ensure that the data exchange among distributed simulation components is reliable, meaning that there should be no data lost during the simulation. Several experiments have been developed for the purpose of improving the capability of handing large data exchange among models, introduced in [6]. Based on the results from these experiments, the overall performance of the platform is further improved and the exchange rate is maximized. However, a more efficient performance optimization method, especially for the simulation platform in which more models from different domains need to be integrated, is still missing.
- **System integration verification:** the verification of the system integration is essential for ensuring the compatibility among different modeling approaches and the accuracy of simulation results. For example, information/data from one model to another might be interpreted incorrectly due to significant update latency. A failure propagation experiment for this purpose is developed and introduced in [8]. In this experiment, a number of tests are conducted by triggering a single technical failure or even multiple technical failures in order to simulate sequent events due to failure propagation between systems. However, how to verify the developed simulation platform if more and more systems need to be integrated remains in question.

To solve these technical challenges and improve the applicability and accuracy of the distributed simulation approach, following research tasks are recommended and should be performed:

1) All modeling approaches used for different infrastructure systems and even different domains should be studied comprehensively. In order to integrate different models more efficiently, all existing modeling approaches need to be analyzed and useful information, e.g., the role of time in each approach, the format of inputs and outputs, etc, need to be identified.
2) The missing of a unified data and information exchange format hinders the efficient integration of different system models. Each model uses its own data format serving the need for its simulation, which increases the difficulties for system integration, calling for the development of a unified data and information exchange format.

3) Rules need to be defined in order to ensure that all domain-specific models use same common format. These rules can be shared by all distributed models and implemented as part of the external interface of each model. The development of such rules as well as the implementation of external interfaces can also help to reduce reluctance of infrastructure operators to participate in a large scale assessment/analysis.
4) The performance of overall simulation environment needs to be optimized and verified before integrating infrastructure system models and conducting further experiments. How to tune and verify this type of simulation environment remains unclear yet. Therefore, it is necessary to develop a comprehensive methodology framework including working steps and methods. The IEEE organization has recommended several working phases for the purpose of specification, development, integration and execution of the distributed simulation technique in [9]. Although these working phases provide no answer about how to solve several important challenges listed above (e.g., time synchronization issue), they could still be used as a reference literature before developing own methodology.

In conclusion, adopting the distributed simulation approach for modeling infrastructure systems seems promising. However, enhancing efficiency and accuracy of this approach and further maximizing its performance remain challenging and need more efforts, listed in this article. The ultimate purpose of these tasks is to optimize the performance of the overall simulation environment (e.g., to ensure the efficiency of its data exchange rate), verify the developed simulation platform, ensure the interoperability among all distributed models, and minimize the effect of update latency. Although this type of approach has been widely used in other research areas and industries, such as communication data management, air traffic control, etc, it is still in the exploration stage in the research area of modeling of engineered-physical infrastructure systems. The experiences and knowledge gained in one research area might not be feasible to another one and therefore, should be carefully studied and considered before further transferring them.

[1] W. Kröger, and E. Zio, *Vulnerable systems*, London (UK): Springer Verlag, 2011.

[2] R. Bloomfield, N. Chozos, and P. Nobles, *Infrastructure interdependency analysis: Introductory research review*, Research Report, 2009.

[3] C. Nan, and W. Kröger, "Lessons learned from Adopting Distributed Simulation Approach for CI Interdependency Study," *ESRA (European Safety Reliability Association) Newsletter December*, 2011.

[4] I. Utne, H. Hassel, and J. Johansson, "A Brief Overview of Some Methods and Approaches for Investigating Interdependencies in Critical Infrastructures," *Risk and Interdependencies in Critical Infrastructures*, Springer Series in Reliability Engineering P. Hokstad, I. B. Utne and J. Vatn, eds., pp. 1-11: Springer London, 2012.

[5] R. Filippini, and A. Silva, "Resilience analysis of networked systems-of-systems based on structural and dynamic interdependencies," in PSAM 11 & ESREL 2012, Helsinki (Finland), pp 10, 2012.

[6] C. Nan, and I. Eusgeld, "Adopting HLA standard for interdependency study," *Reliability Engineering & System Safety*, vol. 96, no. 1, pp. 149-159, 2011.

[7] C. Nan, I. Eusgeld, and W. Kröger, "Analyzing vulnerabilities between SCADA system and SUC due to interdependencies," *Reliability Engineering and System Safety*, vol.113, no. 0, pp. 76-93, 2013.

[8] I. Eusgeld, C. Nan, and S. Dietz, ""System-of-systems" approach for interdependent critical infrastructures," *Reliability Engineering and System Safety*, vol. 96, no. 6, pp. 679-686, 2011.

[9] IEEE, "IEEE Recommended Practice for Distributed Simulation Engineering and Execution Process (IEEE Std 1730-2010)," IEEE Computer Society, p. 79, 2011.

PhD Degrees Completed

Reliability of emergency measures for flood prevention

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TU Delft
Supervisors: Prof. dr. ir. Bas Jonkman and Prof. dr. ir. Matthijs Kok.

Recent river floods in Central Europe and Great Britain demonstrated once again that floods account for a large part of damage and loss of life caused by natural disasters. In the summer of 2013 large rainfalls occurred in Central Europe resulting in floods on the Elbe and Donau rivers in Central Europe. Local authorities, civilians and the army worked together to place tens of thousands of sand bags attempting to prevent large breaches in the flood defences. Even though these measures are used often there is still limited insight in their reliability and effect on flood risk.

The objective of this research is to develop a method to determine the reliability and effectiveness of emergency measures for flood defences. The investigation is focused on emergency measures that prevent breaching of a flood defence in a river system; measures to limit and/or close breaches are beyond the scope. The research elaborates on human reliability aspects and determines the influence of time and technical reliability of emergency measures. Two failure mechanisms of a flood defense are treated: overtopping and piping.

When including emergency measures in the reliability analysis of flood defences failure can occur if the flood defence fails in spite of a correct functioning emergency measure or if both the emergency measure and the flood defence fail. To determine the failure probability of flood defences with emergency measures two assessments are made: 1) The reliability of emergency measures is determined and 2) The effect of the emergency measures on the failure probability of the flood defence.

Ad 1): For an emergency measure to function correctly three phases need to be completed successfully: 'Detection', 'Placement' and 'Construction'. In the 'Detection' phase the expected river flood is monitored and inspections of the flood defences are performed to find possible weak spots. In the 'Placement' phase a diagnosis is made whether or not measures are required, after which these are built. During the 'Construction' phase the emergency measure needs to function correctly to effectively prevent further damage to the flood defence. The system is modelled in an event tree forming a series system, see figure 1.

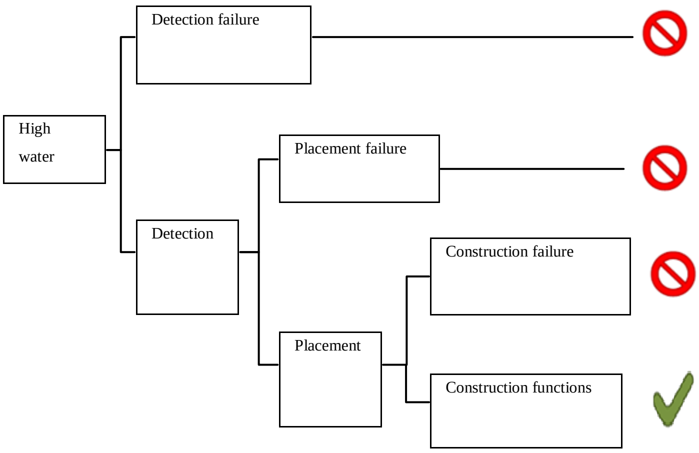

Figure 1: Event tree control and/or emergency measures

The reliability of the 'Detection' and 'Placement' phase depends on human reliability (probability of errors) and the feasibility of complete placement of all emergency measures within the available time. To estimate typical human error rates of the 'Detection' and 'Placement' phase the method of Rasmussen is used, which divides human behaviour in three levels: Knowledge based, Rule based and Skill based. The assignment of error rates to the different employees involved is based on expert judgement of the author. During an exercise with emergency measures these estimates were not refuted.

For each dike section the probability of no (incomplete) placement is determined probabilistically. Distributions are assumed for the available and required time for 'Detection' and 'Placement'. Through Monte Carlo simulation an estimate is made of the failure probability in time.

The reliability of 'Construction' is determined by the technical reliability of the emergency measure. Calculations were made for various emergency measures for overtopping and piping. The resulting technical failure probabilities proved to be negligible when compared to the failure probabilities of 'Detection' and 'Placement'.

Ad 2) the effectiveness of the emergency measure determines the maximum increase in reliability of the flood defense due to a correct functioning emergency measure. Overtopping measures only effectively reduce the failure probability of the dike section for water levels close to the crest, but piping measures can potentially reduce the failure probability at lower levels.

For a case study along part of the river Ijssel in the Netherlands a failure probability of 1/3 per event is estimated for piping emergency measures and 1/9 per event for overtopping emergency measures. Note that these estimates are case dependent and strongly influenced by the amount of weak spots in the flood defence. Errors during 'Detection' and 'Placement' prove to be dominant in the reliability of the emergency measures, specifically for piping where errors in 'Detection' account for almost 90% of the total failure probability.

When translated to dike ring level the failure probability is reduced with about a factor 2. This is largely explained by the length effect: with increasing amounts of weak spots in a flood defence the contribution of emergency measures decreases. Taking the aforementioned limitation in to account, this research provides insight in the important factors which determine the reliability of emergency measures for flood prevention. Furthermore, it is demonstrated that the reliability of flood defences can be increased with emergency measures. The increase in safety depends on the failure mechanism of the

flood defence, the organization responsible for emergency measures and feasibility of complete detection and placement within the available time.
The author is a researcher at the chair of Hydraulic Structures and Flood Risk, within the faculty of Civil Engineering at the Technical University of Delft, the Netherlands. The research is supervised by Prof. dr. ir. Bas Jonkman and Prof. dr. ir. Matthijs Kok.

The author would like to express their gratitude to the STOWA for providing the resources for this project. Further, D.J. Sluiter of water board Groot Salland is thanked for his cooperation and E.J.C. Dupuits and T. Schweckendiek are thanked for their useful comments and insights.

Microgrid Agent-Based Modelling and Optimization under Uncertainty

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This thesis work concerns the energy management within electricity microgrids, regarded as the promising solution contributing to energy efficiency by adequate management of production and consumption [1] that brings value to both the utility and the consumers [2]. In addition, microgrids can "smartly" improve local reliability and power quality, while moderating local greenhouse gas emissions and costs of power supply by the exploitation of renewable sources and storage.

The diversification of microgrid actors, their interconnections and objectives, followed by the increase of uncertainties in the operational context due to the stochasticity of operational and environmental parameters, and the technical failures of the renewable power generators, drives the development of intelligent energy management approaches. In this view, framework for microgrid energy management can be designed by awarding different types of Computational Intelligence (CI) to microgrids actors, which will become capable for sense-making, decision-making and adaptation, and by promoting additional collaborations not only between different hierarchical levels, but also horizontally between microgrid actors [3]. These connections will bring more homogenous distribution of grid actors connections inside the system by decreasing the number of super nodes and, therefore, reducing system vulnerability to direct attacks.

The review of current developments in term of intelligent energy management reveals several critical open issues related to a weak treatment of uncertainties, technical failures of power generators and electrical lines and interests of the individual microgrid actors. This thesis focuses on the addressing these limitations through the scientific developments of *(i)* modelling and *(ii)* optimization within the problematic of microgrid energy management by taking into account uncertainties, dynamics, communication, multiple actors with various goals and their interactions. Thesis contributions are illustrated through the development of framework for modelling dynamic interactions between microgrids actors and optimal energy management, whereby the different stakeholders can establish their profitable and efficient strategies of use of the local renewable generators and storage facilities in dynamically changing environments under uncertainty.
The typical urban microgrid considered here is composed of several individual actors, holding the functions of energy consumer or/and energy producer, integrating battery storage facilities (
Figure 1a). The microgrid operates in the upstream connected mode. The uncertainties accounted for energy management are related to the variability of energy consumption, generation with renewable energy sources. In addition, the integration of technical failures of renewable generators and electrical lines in the microgrid models was regarded as the necessary development addressing the open issues of current research. Indeed, recent publications presenting research on intelligent energy management usually avoid the technical failures and focus their effort on the development of optimization approach efficient for management energy demand and supply fluctuations.
We use the term technical failure to represent all modes of failures of energy generation units leading to their technical unavailability. For the exemplification, wind power generation failures can be classified into two major categories depending on their causes: (i) mechanical components failures associated with the blades, gearbox, hydraulic unit, yaw unit and brake pad, and (ii) electrical and electronic components failures related to the control panel, capacitor panel and generator failures. The analysis of failures in the field shows that a wind farm usually experiences more failures due to mechanical components than failures due to electrical and electronic components (79% and 21% of failures over a lifetime period, respectively, are the values reported in [4]). Moreover, the loss of power generation due to mechanical components failure is higher than that of the electrical components failure to an extent up to 116% [4]. Different approaches have been used for technical failures modelling, i.e., as the independent failures simulated by sampling with the inverse transform technique [5], [6] or as the failures correlated with the intensity of external event [7].
In the case of failures correlation with the external event intensity a Markov chain modelling framework has been adopted to describe the dynamics of stochastic transition among different levels of wind speed conditions and mechanical states (
Figure 1b). The transition rates between wind speed states are calculated based on the principle of

frequency balance between any two states, presented in [8]. As input data for the transition rates calculation, the wind speed data with one hour time step from [9] is used. Markov chain relates the mechanical states to normal and extreme levels of wind speed: *(i)* the low and medium wind speed states representing normal wind speed conditions with potential minor damages occurring at transition rate λ to the mechanical failures and *(ii)* the states of high wind speed describing extreme wind speed operational conditions (before the cut-off) with potential minor or severe damage occurring at a failure rate λ' ($\lambda' > \lambda$).

The microgrid system is described by Agent-Based Modelling (ABM) able to account for individual microgrid agent (actors) objectives. For optimization purpose the Robust Optimization (RO) based on Prediction Intervals (PIs), estimated by a Non-dominant Sorting Genetic Algorithm (NSGA-II) – trained Neural Network (NN), and the Reinforcement Learning (RL) are used. The long-term optimization goals for each agent is translate in terms of expenses and revenues for energy purchase and sell, respectively. To meet this lack the microgrid model accounts for technical failures and the performance of the developed optimization approaches is evaluated not only in term of classical indicators, i.e., expenses and revenues for energy purchase and sell, but also in term of reliability (adequacy) indicators for energy systems such as Loss of Load Expectation (LOLE) and Loss of Expected Energy (LOEE).

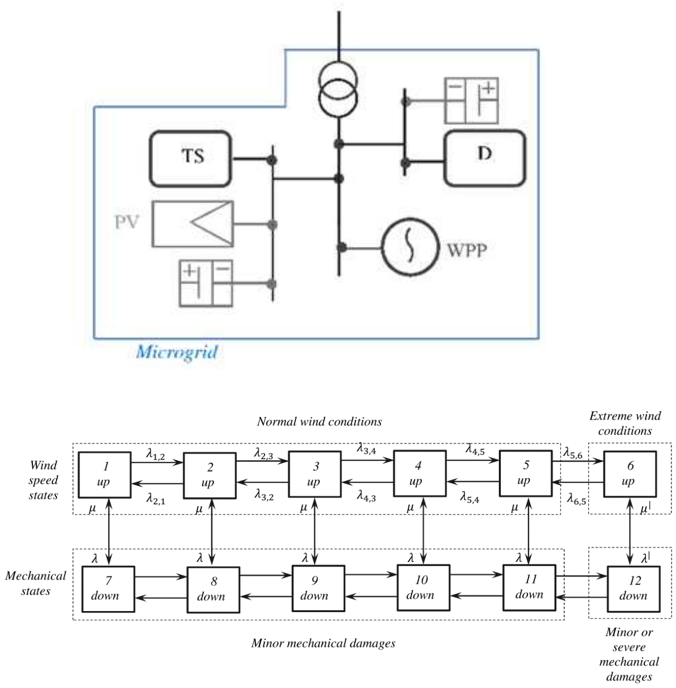

Figure 1. a) Typical urban microgrid; b) Markov chain model for wind speed generation.

References:

[1] R. Hledik, "How Green Is the Smart Grid?," *The Electricity Journal*, vol. 22, no. 3, pp. 29–41, Apr. 2009

[2] R. Duan and G. Deconinck, "Multi-agent Coordination for Market Environments," in *Intelligent Infrastructures SE - 7*, vol. 42, Springer Netherlands, 2010, pp. 151–177 LA – English.

[3] G. K. Venayagamoorthy, "Dynamic, stochastic, computational and scalable technologies for Smart Grids," *IEEE Computational Intelligence Magazine*, pp. 22 – 35, 2011.

[4] G. M. J. Herbert, S. Iniyan, and R. Goic, "Performance , reliability and failure analysis of wind farm in a developing country," *Renew. Energ.*, vol. 35, no. 12, pp. 2739–2751, 2010.

[5] E. Kuznetsova, Y.-F. Li, C. Ruiz, and E. Zio, "An integrated framework of agent-based modelling and robust optimization for microgrid energy management," *Accepted for publication in Applied Energy*, 2014.

[6] E. Kuznetsova, Y.-F. Li, C. Ruiz, and E. Zio, "Analysis of robust optimization for decentralized microgrid energy management under uncertainty," *Submitted to Electrical Power and Energy Systems*, pp. 1 – 46, 2013.

[7] E. Kuznetsova, C. Ruiz, Y. F. Li, E. Zio, G. Ault, and K. Bell, "Reinforcement learning for microgrid energy management," *Energy*, vol. 59, pp. 133–146, 2013.

[8] F. C. Sayas and R. N. Allan, "Generation availability assessment of wind farms," in *IEE Proc.-Gener. Transm. Distrib.*, 1996, pp. 507–518.

[9] D. C. Hill, D. Mcmillan, K. R. W. Bell, and D. Infield, "Application of auto-regressive models to UK wind speed data for power system impact studies," *IEEE Trans. on Sustain. Energy*, vol. 3, no. 1, 2012.

[10] R. N. Clark and R. G. Davis, "Performance of an Enertech 44 during 11 years of operation," in *Proceedings of the AWEA Wind-Power'93 Conference*, 1993, pp. 204–212.

[11]S. Faulstich, P. Lyding, and B. Hahn, "Component reliability ranking with respect to WT concept and external environmental conditions," Kassel, Germany, 2006.

[12]L. Duenas-Osorio, "Unavailability of wind turbines due to wind-induced accelerations," *Engineering Structures*, vol. 30, no. 4, pp. 885–893, Apr. 2008.

[13]P. Tavner, "SUPERGEN Wind 2011 General Assembly," in *SUPERGEN Wind 2011 General Assembly*, 2011, no. March.

[14]D. M. Louit, R. Pascual, and A. K. S. Jardine, "A practical procedure for the selection of time-to-failure models based on the assessment of trends in maintenance data," *Reliability Engineering & System Safety*, vol. 94, no. 10, pp. 1618–1628, Oct. 2009.

[15]R. Karki and R. Billinton, "Reliability/cost implications of PV and wind energy utilization in small isolated power systems," *IEEE Trans. on Energy Convers.*, vol. 16, no. 4, pp. 368–373, 2001.

Past Safety and Reliability Events

Young Researcher Workshop - The Future of Reliability and Risk Analysis

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Enrico Zio
Politecnico di Milano, Italy

Donnafugata, Sicily, Italy, 26-27 May 2014

On 26-27 May of this year, we reunited a working group of young researchers to exchange and discuss on "The Future of Reliability and Risk Analysis". The idea of this working group was to establish a network of young researchers, and obtain increased awareness and understanding of the importance of being committed to, and take responsibility for, the development of the reliability and risk analysis fields.

Some 20 young researchers from Europe and US joined the working group and spent two days exchanging and discussing on foundational and practical issues of reliability and risk analyses. The discussions were carried out in subgroups and the resolutions of each subgroup were, then, discussed in a final plenary session. Below, we summarize some of the reflections that have emerged from this dynamic group of young researchers.

One common reflection that was brought up from different viewpoints, was the need to set up frameworks of risk and reliability analyses that are decision-driven from the outstart, with a precise definition and understanding of the information needed by the decision makers and the form for its representation, visualization, communication useful for the decision makers. A somewhat strong "warning" was raised with respect to the attention to be paid to not separating the risk assessment from the broader decision making context, which brings in other angles of the problem including benefits, constraints etc.

Another point that was raised strongly by the participants was the need for transparency and traceability of the assessment, in terms of the clear communication of the data, information, assumptions which the assessment performed rests on. This links to the need to also somehow evaluate these elements which make up the knowledge which supports the assessment and, thus, gauges the confidence in the results: there is a strong feeling that a risk assessment should be corroborated by a measure (quantitative, qualitative, or semi) of the knowledge involved.

One related issue that has been raised for the future needs, and corresponding developments, regards the need for procedures of model development, i.e. the definition of ways (guidelines, procedures, …?) to choose among the different methods and models, balancing details, approximations, parameter and model uncertainties. Obviously, the subject of completeness of the analysis, surprises and black swans, was brought up in the context of the need to evaluate and clearly communicate the limitations of the analysis so to alert the monitoring for hazards and events that might have been missed.

At the other end of the model resolution depth, the issue of validation of reliability and risk assessment models has been discussed: how to evaluate the "performance" of the reliability or risk assessment? How to look backward and see if the results of the risk assessment made an impact on the decision and the impact of the decision itself (e.g. the choice of specific safety measures)?

The topic of "foundations" of the scientific fields of reliability and risk assessment was discussed with passion, because solid foundations were felt necessary particularly in view of the role that the outcomes of the assessment play in the practice of decision making. Some advocated that the foundations are solidly built around the triplet of Kaplan and Garrick (scenarios, probabilities, consequences), others highlighted the need for extensions to reflect the dimensions of uncertainty and knowledge. It was also pointed to the need to consider other dimensions, including the underlying decision setting (as previously mentioned) and risk perception aspects: loud voices were raised with respect to the need of opening to multidisciplinary to fill the related gaps in disciplines like sociology, psychology, economists, etc., particularly considering the socio-technical character of the engineered systems of interest.

The problem of a common terminology for shared understanding and non-ambiguity also was raised, with some participants expressing the need for uniformity and some others expressing their thought that different vocabularies exist in different fields, and this is a situation to be accepted without too much worry. In this respect, the effort on the writing of a glossary of terms by the specialty group on Foundational issues of the Society of Risk Analysis led by Prof. Aven was mentioned.

Uncertainty was a hot topic in all groups and in general. Discussions (heated…by the sun of Sicily) developed with respect to parameter uncertainty, model uncertainty, probabilistic and non-probabilistic methods for representing and treating uncertainty.

The general feeling that emerged is that efforts should be made to clarify the solidity of the theoretical bases (axiomatic, operational, etc.) of the different methods, and compare them also with respect to their applicability and understandability in practice by engineers and analysts, depending on the specific context. For these purposes, the possibility of benchmarks was mentioned for comparison of different approaches, not necessarily to evaluate them but to understand them.

Still on the modeling for reliability and risk assessment, it was clearly stated that the next generation models will need to be able to handle and integrate the different forms of information (expert judgments) and data (statistical and measured, numerical and linguistic, …), and to deal with the complexity of interdependent systems and their dynamic evolution and emergent behavior.

A number of stimuli were also given with respect to initiatives that could be taken to facilitate the developments along the directions identified. Thematic workshops of the kind experienced (but open also to decision makers and other disciplines, like sociology and psychology), in which ample room is left for exchanges and discussions, were said to be quite important, in parallel to the larger-size conferences, within which more "discussion sessions" would also be desirable.

Training was advocated, of practitioners to critically evaluate the tools and methods they are using, engineers to understand the outputs they are calculating, decision makers to interpret the results and their value. Obviously, a difficulty was identified in defining the content and level of the training, in a way that is useful for the different profiles.

Outreach and education was also raised, as there is a common feeling that the practitioners and decision maker communities need to be exposed in simple ways to the basic concepts of reliability and risk assessment for decision making (probability, decisions, dependence, options, preferences) and the models to describe them. New technological media could be considered, e.g. web-based education (including for sharing course material, list of topics etc.), MOOC etc., besides classical means like a textbook on fundamental basis of risk analysis.

From the point of view of us organizers, we feel comfortable in saying that the objectives of networking (with a serious professional attitude and a pleasant human spirit), responsibilisation and commitment have been achieved. This gives us the necessary motivation to support (also with seed funds, if available and possible) and stimulate future initiatives of this kind and by this group (possibly extended), with a clear demand from our side of a concrete active reaction by the participants in terms of proposal of initiatives (organization of tutorials/sections/sessions at conferences, research exchanges, etc.).

Calendar of Safety and Reliability Events

33rd International Conference on Offshore Mechanics and Arctic Engineering (OMAE 2014) Structures Safety and Reliability Symposium

San Francisco,CA,USA

8-13 June, 2014

Coordinator: Carlos Guedes Soares

Important dates

September 30, 2013 - Abstract Submission
October 21, 2013 - Abstract Acceptance
January 6, 2014 – Submission of Full-Length draft paper to review
January 27, 2014 – Notification of Paper Acceptance
March 16, 2014 – Submission of Final Paper

Conference Website: http://www.omae2014.com

12th International Probabilistic Safety Assesment and Management Conference - PSAM 2014

Honolulu, Hawaii

22-27 June, 2014

The PSAM conference brings experts from various industries, research organizations, regulatory authorities and universities in the fields of nuclear, process and chemical industries, off-shore and marine, transportation, space and aviation, IT and telecommunications, bio and medical technology, civil engineering, financial management and other fields. The multi-disciplinary conference is aimed to cross-fertilize methods, technologies and ideas for the benefit of all.

Important dates

February 27, 2014 – Online Registration Open
March14, 2014 – Full Paper Submission Deadline
April 30, 2014 - Speaker's Bio Submission Deadline

Secretariat
Dr. Todd Pauloos
Email: secretariat@psam12.org

Conference Website: http://www.psam12.org

10th International Conference on Digital Technologies 2014
Zilina – Slovak Republic
9-11 July, 2014

The Tenth International Conference DT 2014 is the annual event that is held in Žilina traditionally. The aim of the conference is to bring together researches, developers, teachers from academy as well as industry working in all areas of digital technologies. The conference makes is focused on a wide range of applications of computer systems. Topics of interest include:

- Reliability analysis and risk estimation
- Testing and fault-tolerant systems
- Accident and incident investigation
- Human factor
- Risk and hazard analysis
- Software reliability

The two Workshops in framework of the conference will be organized:

- International Workshop on Biomedical Technologies
- International Workshop on Reliability Technologies

Important dates

31 March, 2014 - Full paper submission
5 May, 2014 - Paper acceptance notification
30 May, 2014 - Camera-ready papers
30 June, 2014 - Final program

All submitted papers will be reviewed by Program Committee members. Accepted papers will be published in conference proceedings (CD-version under an ISBN reference).

Secretariat

DT'2014 Organizing Committee
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dt@fri.uniza.sk

Conference Website: http://dt.fri.uniza.sk

23rd International Conference Nuclear Energy for New Europe
Portorož, Slovenia,
September 8-11, 2014

Coordinator: Igor Jencic

Important dates

April 30, 2014 - Abstract Submission
June 21, 2014 - Abstract Acceptance
August, 2014 – Submission of Full-Length paper

Conference Website: http://www.nss.si/nene2014

24th European Safety and Reliability Conference - ESREL 2014
Wroclaw, Poland
14-18 September, 2014

The XXIV edition of the conference, ESREL 2014 will provide a forum for presentation and discussion of scientific works covering theories and methods in the field of risk, safety and reliability, and their application to a wide range of industrial, civil and social sectors and problem areas. ESREL 2014 will also be an opportunity for researchers and practitioners, academics and engineers to meet, exchange ideas and gain insight from each other.

The conference will be hosted by the Congress Centre at the Wrocław University of Technology.

Important dates

26 January, 2014 – Submission of abstracts
31March, 2014 – Submission of full length papers
30 May, 2014 – Early bird registration

Secretariat

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Conference Website: http://www.esrel2014.org

7th International Conference Workingonsafety.net Learning from the past to shape a safer future
Scotland, UK,
30 September – 03 October 2014

Workingonsafety.net is an international network of decision-makers, researchers and professionals responsible for the prevention of accidents at work. The network attracts researchers, regulators, inspection bodies, safety professionals and other experts in this field of research and policy-making. It consists of an Internet platform (www.workingonsafety.net) and a biennial conference).

The organizing committee of the 7th conference invite to Scotland, United Kingdom. The hosting organization is the Institution of Occupational Safety and Health (IOSH), based in Leicestershire, England. Abstracts should be submitted electronically through the conference website, www.wos2014.net.

Important dates

January 31, 2014 – Abstract Submission
Mid March, 2014 - Notification of Acceptance
June 15, 2014 - Full Paper Submission and end of early registration
August 31, 2014 – Deadline for the receipt of presentations

Secretariat

WOS Administrative Secretariat and National Organising Committee
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Conference Website: www.wos2014.net

ESRA Information

1 ESRA Membership

1.1 National Chapters

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

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- The Safety and Reliability Society, UK
- Danish Society of Risk Assessment, Denmark
- SRE Scandinavia Reliability Engineers, Denmark
- ESReDA, France
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- VDI-Verein Deutscher Ingenieure (ESRA Germany), Germany
- The Netherlands Society for Risk Analysis and Reliability (NVRB), The Netherlands
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- IDA Kobenhavn, Denmark
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- Bureau Veritas, France
- INRS, France
- Total, France
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- RINA, Italy
- TECSA, SpA, Italy
- TNO Defence Research, The Netherlands
- Dovre Safetec Nordic AS, Norway
- PRIO, Norway
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- Central Mining Institute, Poland
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- Cia. Portuguesa de Producção Electrica, Portugal
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- TECNUN, Spain
- TEKNIKER, Spain
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- HSE - Health & Safety Executive, UK
- Atkins Rails, UK
- W.S. Atkins, UK
- Railway Safety, UK
- Vega Systems, UK

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- University of Innsbruck, Austria
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- Pontifícia Universidade Católica, Brazil
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3 Standing Committees

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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.

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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.

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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.org.
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