Safety Engineering and Risk/Reliability Analysis Division Newsletter

Vol. 8 - First Quarter 2021 Edition

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Chair's Message

Hello SER^{2}AD Members,

This is my last message as chair of our division. The world is getting back to the regular order and the country is reopening by reversing the restrictions.

I want to first welcome Professor Xiaobin Le from Wentworth Institute of Technology (WIT) on his appointment as next division chair for the 2021-2022 ASME fiscal year. Xiaobin will bring his vast academic experiences about reliability and failure analysis into SERAD. Additionally, I congratulate Dr. Andrey Morozov from University of Stuttgart on his appointment as 4th Vice Chair/Secretary of the Division. Andrey will strengthen the division position within European risk, reliability and safety communities and will bring good energy and ideas into the division activities. I also welcome Dr. William Munsell as the Safety/Risk/Reliability Track Chair for ASME IMECE conference 2022. We have a number of other new volunteers taking positions in the next few months. Please contact our volunteer leaders and offer your support and ideas on how to make our division stronger and more relevant. And again, if any of you would like to contribute to the work of our division, please contact the leadership and ask how you can get involved. This quarter's newsletter contains some interesting technical articles and the news about the division's activities.

Our division in the past year, completed a successful IMECE conference track with 47 papers presented, presented eight awards to graduate and undergraduate students, and one award to the JRUES, Part B best journal paper. Our planning for virtual IMECE 2021 in November continues on schedule with an interesting mix of over 60 submitted papers for safety/risk/reliability track; keep an eye out for future announcements on this event and our invited plenary speaker.

The division has recently established a new technical committee on the Awards and Fellow Nomination. The aim is to establish a committee to oversea the awards offered within the division and support for the recognition and promotion of the division members to the ASME fellow grade membership.

I will continue to advise the division over the next year as the past chair, involve in the establishment of the technical committee of Awards and Fellow Nomination and I look forward to hearing from members about how we can continue to make our division better. If you have ideas about how our division can help you be better equipped as a professional, feel free to contact me or other members of the executive committee.

Wishing you all safety and health in the coming year,

Mohammad Pourgol-Mohammad, Ph.D, PE
ASME SER^{2}AD Chair, 2020-2021

Featured ASCE-ASME Journal Papers Part B: Mechanical Engineering

Call for Papers

ASCE American Society of Civil Engineers

ASME SETTING THE STANDARD

ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems
More Information: https://ascelibrary.org/journal/ajrub7 Contact Prof. Bilal M. Ayyub, Editor in Chief, ba@umd.edu

A Sensitivity-Based Approach for Reliability Analysis of Randomly Excited Structures With Interval Axial Stiffness

Alba Sofi, Giuseppe Muscolino, and Filippo Giunta
ASME J. Risk Uncertainty Part B. Dec 2020, 6(4): 041008, https://doi.org/10.1115/1.4047574
2020 Best Paper Award

Abstract

Reliability assessment of linear discretized structures with interval parameters subjected to stationary Gaussian multicorrelated random excitation is addressed. The interval reliability function for the extreme value stress process is evaluated under the Poisson assumption of independent up-crossing of a critical threshold. Within the interval framework, the range of stress-related quantities may be significantly overestimated as a consequence of the so-called dependency phenomenon, which arises due to the inability of the classical interval analysis to treat multiple occurrences of the same interval variables as dependent ones. To limit undesirable conservatism in the context of interval reliability analysis, a novel sensitivity-based procedure relying on a combination of the interval rational series expansion and the improved interval analysis via extra unitary interval is proposed. This procedure allows us to detect suitable combinations of the endpoints of the uncertain parameters which yield accurate estimates of the lower bound and upper bound of the interval reliability function for the extreme value stress process. Furthermore, sensitivity analysis enables to identify the most influential parameters on structural reliability. A numerical application is presented to demonstrate the accuracy and efficiency of the proposed method as well as its usefulness in view of decision-making in engineering practice.

Resilience Decision-Making for Complex Systems

Julian Salomon, Matteo Broggi, Sebastian Kruse, Stefan Weber, Michael Beer
ASME J. Risk Uncertainty Part B. Jun 2020, 6(2): 020901, https://doi.org/10.1115/1.4044907
Most read paper

Abstract

Complex systems–such as gas turbines, industrial plants, and infrastructure networks–are of paramount importance to modern societies. However, these systems are subject to various threats. Novel research does not only focus on monitoring and improving the robustness and reliability of systems but also focus on their recovery from adverse events. The concept of resilience encompasses these developments. Appropriate quantitative measures of resilience can support decision-makers seeking to improve or to design complex systems. In this paper, we develop comprehensive and widely adaptable instruments for resilience-based decision-making. Integrating an appropriate resilience metric together with a suitable systemic risk measure, we design numerically efficient tools aiding decision-makers in balancing different resilience-enhancing investments. The approach allows for a direct comparison between failure prevention arrangements and recovery improvement procedures, leading to optimal tradeoffs with respect to the resilience of a system. In addition, the method is capable of dealing with the monetary aspects involved in the decision-making process. Finally, a grid search algorithm for systemic risk measures significantly reduces the computational effort. In order to demonstrate its wide applicability, the suggested decision-making procedure is applied to a functional model of a multistage axial compressor, and to the U-Bahn and S-Bahn system of Germany's capital Berlin.

Human Reliability Analysis-Based Method for Manual Fire Suppression Analysis in an Integrated Probabilistic Risk Assessment

Tatsuya Sakurahara, Zahra Mohaghegh, Ernie Kee
ASME J. Risk Uncertainty Part B. Mar 2020, 6(1): 011010, https://doi.org/10.1115/1.4044792

Abstract

Fire is one of the most critical initiating events that can lead to core damage in nuclear power plants (NPPs). To evaluate the potential vulnerability of plants to fire hazards, fire probabilistic risk assessment (PRA) is commonly conducted. Manual fire protection features, performed by the first responders (e.g., fire brigade), play a key role in preventing and mitigating fire-induced damage to the plant systems. In the current fire PRA methodology of NPPs, there are two main gaps in the modeling of manual fire protection features: (i) the quantification of the first responder performance is solely based on empirical data (industry-wide historical fire events), and so the plant-specific design and conditions cannot be explicitly considered; and (ii) interactions of first responders with fire propagation are not fully captured. To address these challenges, the authors develop a model-based approach, grounded on human reliability analysis (HRA) and coupled with the fire dynamics simulator (FDS), to model the first responder performance more realistically and consider the interface between the first responder performance and fire propagation more explicitly. In this paper, the HRA-based approach is implemented in an integrated PRA (I-PRA) methodological framework for fire PRA and applied to a switchgear room fire scenario of an NPP. The proposed model-based approach (a) adds more realism to fire PRA and so to risk assessment in NPPs and (b) provides opportunities for sensitivity and importance measure analyses with respect to design conditions; therefore, contributes to risk management in NPPs.

Digital Twins: State-of-the-Art and Future Directions for Modeling and Simulation in Engineering Dynamics Applications

D. J. Wagg, K. Worden, R. J. Barthorpe, P. Gardner
ASME J. Risk Uncertainty Part B. Sep 2020, 6(3): 030901, https://doi.org/10.1115/1.4046739

Abstract

This paper presents a review of the state of the art for digital twins in the application domain of engineering dynamics. The focus on applications in dynamics is because: (i) they offer some of the most challenging aspects of creating an effective digital twin, and (ii) they are relevant to important industrial applications such as energy generation and transport systems. The history of the digital twin is discussed first, along with a review of the associated literature; the process of synthesizing a digital twin is then considered, including definition of the aims and objectives of the digital twin. An example of the asset management phase for a wind turbine is included in order to demonstrate how the synthesis process might be applied in practice. In order to illustrate modeling issues arising in the construction of a digital twin, a detailed case study is presented, based on a physical twin, which is a small-scale three-story structure. This case study shows the progression toward a digital twin highlighting key processes including system identification, data-augmented modeling, and verification and validation. Finally, a discussion of some open research problems and technological challenges is given, including workflow, joints, uncertainty management, and the quantification of trust. In a companion paper, as part of this special issue, a mathematical framework for digital twin applications is developed, and together the authors believe this represents a firm framework for developing digital twin applications in the area of engineering dynamics.

Path Integral Methods for the Probabilistic Analysis of Nonlinear Systems Under a White-Noise Process

Mario Di Paola, Gioacchino Alotta

ASME J. Risk Uncertainty Part B. Dec 2020, 6(4): 040801 , https://doi.org/10.1115/1.4047882

Abstract

In this paper, the widely known path integral method, derived from the application of the Chapman–Kolmogorov equation, is described in detail and discussed with reference to the main results available in literature in several decades of contributions. The simplest application of the method is related to the solution of Fokker–Planck type equations. In this paper, the solution in the presence of normal, α-stable, and Poissonian white noises is first discussed. Then, application to barrier problems, such as first passage problems and vibroimpact problems is described. Further, the extension of the path integral method to problems involving multi-degrees-of-freedom systems is analyzed. Lastly, an alternative approach to the path integration method, that is the Wiener Path integration (WPI), also based on the Chapman–Komogorov equation, is discussed. The main advantages and the drawbacks in using these two methods are deeply analyzed and the main results available in literature are highlighted.

Research News

Assessing Protection Effected by Regulated Systems

Ernie Kee, Martin Wortman, and Pranav Kannan
The Organization for Public Awareness of Hazardous Technology Risks

1 Introduction

This fourth and final article in the newsletter series on "Protection, Regulation, and Risk Assessment" summarizes regulation of protective systems and, depending on the choice of method, how different risk assessment methods can influence regulatory oversight and rules. In this series, the focus has been on how reasonably complex technological systems are regulated with the objective to attenuate upsets before they progress to harmful consequences. In this article we detail our understanding of the results and possible pitfalls that we believe should be identified and presented in any assessment of risk, particularly in risk quantification.

The following sections summarize discussions of our thoughts up to the present article. Our thoughts to date have been summarized in three articles in this series, Section 1.1, Catastrophes, Protections and the Social Welfare, Section 1.2, Protection, Regulation, and Risk Assessment, and Section 1.3, Protective systems. We summarize the main points from these articles in the following.

1.1 Catastrophes, Protections and the Social Welfare

We argue that because potential liability (as identified through the calculus of negligence and following from the well–known Coase Theorem) does not substantially influence profit maximizing decisions associated with the design and operation of safety–critical protective systems, regulatory authority necessarily arises so as to ensure mitigation of moral hazard for a certain element of the public (those having large potential for losses in the event of a catastrophe). Regulatory authority induces, up to affine transformation as a corollary to the Expected Utility Theorem, a social welfare function that enforces a unique socially optimal price–point for regulated protection. In so doing, regulated protection does not enhance revenues. Margins of safety are associated with protective system alternatives that exhibit a lower probability of catastrophe than a unique socially–optimal level of protection. The overall decision-making framework, that includes regulation and design of production systems, identifies reliability premiums and catastrophe premiums associated with safety margins in a manner that allows protective system design and operation decisions to be considered in the context of expected lifecycle costs.

1.2 Protection, Regulation, and Risk Assessment

We describe some of the primary challenges faced by engineers who are asked to quantify something like "risk" in a protective system design for which they are responsible. Although certainly useful in many contexts of system design, we describe why results from traditional reliability analyses are inappropriate for use in a quantified "risk assessment" that includes frequency of initiating events that have Poisson arrival characteristics. In support of our assertion, we describe the requirements necessary for such an approach to be validated for complex protective systems. We identify a primary shortfall is Lack of Anticipation (LOA) and the requirement for stationarity that will not be satisfied in protective systems where maintenance policies are effective in addressing failures. No practical "work around" or analytical method such as Markov state transition models, discrete event modeling, or other proposed "dynamic modeling", that would overcome the inherent problems with quantification are have been identified and as a consequence, we conclude this approach should be used with extreme caution.

1.3 Protective Systems

We observe that protective systems, those arising from regulation, overlay hazardous production technologies to throttle possible harm that might arise from operational anomalies. Elements of protective systems are regulated to ensure *ex ante* protection from collateral harm to involuntary stakeholders for example, near neighbors of a hazardous technology. Regulations are focused specifically on the effectiveness of protections ... not the production process associated with profit-making. That is, regulators establish rules that constrain the design of protective systems. Thus, compliance with regulatory rules defines "adequate protection."

Adequate protection explicitly serves the economic interests of involuntary stakeholders by providing them prior protections from collateral harm. Importantly, regulators are required to eschew all economic figures of merit in establishing the regulatory rules that constrain protective system design. An example is the "Adequate Protection" standard in the Atomic Energy Act.[1] In this example, the Nuclear Regulatory Commission (NRC) only considers cost in power reactor licenses when the technical specification in question does not affect the adequate protection of the public health and safety.[2] Regulators are specifically tasked with establishing rules where compliance defines adequate protections for the public; compliant protective systems by definition provide adequate protection. Regulators, therefore, are not arbiters of the "public good"; the public good of safety-critical protective systems is not determined within the auspices of regulatory agencies. We assert that public good is only within the auspices of our political system. Legislators create laws that regulatory agencies are given the executive authority to implement and enforce on profit making enterprises.

2 Engineering & Design of Hazardous Technological Systems

Although it can be said that society would prefer no harm from technological systems, it (society) does require hazardous technological systems be created and operated. Engineers who work in profit-making enterprises have the responsibility to both maximize profits, that is, minimize costs, and to comply with regulations that apply. Because these engineers hold the most accurate and detailed information about how their designs will behave, they have a great responsibility to ensure the designs serve enterprise's goals and the regulator's constraints. They rely, in part, on codes and standards to help ensure adequate margins to failure are maintained. Insurability adds further safety margins, but we believe compliance with regulation is essential to reduce the likelihood for catastrophic failures (of the hazardous technology) to within expectations of the public.

We have described the difficult design task engineers face when they must create cost-effective designs that also meet regulations. In our view, the socially optimal design is the one that meets the regulatory constraints imposed at the minimum cost *and* in a production design that maximizes profit. See for example, Wortman et al. (2017) for details. Regulatory cost is fixed by the constraints regulations impose and is unrelated to production costs, *per se.* On the other hand, production costs are set by market forces and investor preferences.

3 Why Risk Quantification?

This question this section title asks is probably, at least superficially, obvious. Probably a better question may be what would the engineer do with a number, say a probability for risk of a consequential accident? We argue that engineering decisions (design and operations) boil down to rank ordering alternatives and then choosing the alternative that is 'most preferred.' Here, 'most preferred' is implicitly understood to be the alternative that maximizes enterprise profits within regulatory constraints. Experienced engineers understand that their decisions are often fraught with uncertainty. For example, it is not possible to know with certainty the economic outcome of selecting a particular protection system design alternative, and hundreds of millions of dollars can be riding the outcome. Thus, engineering practitioners, whether explicitly or implicitly, find themselves in the position of a gambler wagering enterprise stakeholder monies; they are managing stakeholders' 'value at risk.' Like all good gamblers, engineers seek to understand their likelihood of success, when placing bets. A good poker player would never stake their bet without first assessing the likelihood of improving their economic position by assessing the available data (which cards have been played, number of players at the table, competitor intangibles *etc.*)

Value at risk, from the engineering perspective, can be thought of as the cumulative probability distribution on

[1] The Atomic Energy Act of 1954, 42 U.S.C. §§2011-2021, 2022-2286i, 2296a-2297h-13, Sec. 182.

[2] For example, see the court case: Union of Concerned Scientists, et al., Petitioners v. U.S. Nuclear Regulatory Commission and the United States Of America, Respondents Nuclear Utility Backfitting and Reform Group, Intervenor (two Cases), 824 F.2d 108 (D.C. Cir. 1987).

the net present value of an engineering decision alternative. Note that value at risk is a function, not an event probability. Hence, the question,"Why Risk Quantification?" has an obvious answer. *Quantifying value at risk gives the gambler–engineer an analytical means, via the Expected Utility Theorem, to identify the most preferred engineering decision alternative.* But, capturing value at risk for various engineering decision alternatives is not a straightforward matter.

It is readily recognized that the value of any engineering decision alternative will play out over time. This is to say, the net present value of any alternative is determined by complicated temporal stochastic processes, *e.g.,* reliability, maintenance, market for product, looking far into the future. It is data collected on the histories of these temporal processes that provide the information needed to estimate risk, and this is what makes risk quantification so difficult. For all but the most analytically stylized circumstances, the probability laws that govern the underlying stochastic processes determining risk are not quantifiable; Hansson gives insights in his 2009 article, "From the Casino to the Jungle: Dealing with Uncertainty in Technological Risk Management." Thus, the holy grail of high-fidelity 'Risk Quantification', for engineers, remains all but impossible, because of the physics–based reality in which they live and work.

4 The Sharp Teeth of Engineering Reality

The elusiveness of realistic risk quantification associated with their decisions does not excuse design and operations engineers from making multi–million dollar bets. When designing against hazardous consequences, engineers will rely on deterministic engineering design principles. Numerical results produced in risk quantification methodologies such as Probabilistic Risk Assessment (PRA) or Probabilistic Safety Assessment (PSA) are unhelpful to engineers responsible for protective system design. In the United States, regulators at the NRC have facilitated a remarkable history of nuclear safety that relies on prescriptive rules that were developed in close cooperation with enterprise engineers. The emergence of risk–informed regulation built on predictive risk analytics has not led to decision makers abandoning deterministic concepts such as 'defense in depth' or 'safety factors' in managing risk.[3] Nonetheless, it is important to appreciate that political forces have great sway in regulatory oversight.

Regulatory authority is created through legislation and managed through executive oversight. Thus, engineers do not necessarily have the last word, where public safety is concerned. Engineers responsible for the design, operation, and regulatory oversight of safety–critical protective systems must maintain awareness of political influences that might, through a poor understanding of safety and technology, attempt to supplant prescriptive regulatory rules with risk quantification methods relying on modeling assumptions that do not apply to the physics at hand.

Discussion

Engineers operate in the realm of the state space determined by regulators. This is as it should be since regulators, who are appointed by elected officials, serve as a proxy for the interest of the larger public. Thus the efficacy of protective systems are, in real terms, determined by the public's confidence on the license-to-operate provided by the regulators. Engineers make design choices intended to meet that confidence based on a combination of physics-based understanding of the technology and experiential judgement. The bases for their confidence, in the domain of protective system design, exclude risk analytics that include structural challenges both in terms of assumptions made for computations, and an extremely complex state space of operation. Regulations serve as boundaries of operation not to limit enterprise, but rather to protect the public from any "beyond the fence" consequences, especially for non-profit seeking stakeholders. As has been seen time and again in various industrial sectors, the state space designated by regulations has allowed for innovation to accommodate an improvement in efficiencies, safety and output; though there continues to be an active area of discussion on where there may be concerns of regulatory capture. Ultimately, the efficacy of protective systems is at the intersection of physics-based engineering choices and the public's expectation of safety as expressed by regulators.

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[3] See for example, the guidance in NRC Regulatory Guide 1.174, Rev. 2, Page 5.

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ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems
More Information: https://ascelibrary.org/journal/ajrub7 Contact Prof. Bilal M. Ayyub, Editor in Chief, ba@umd.edu

ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering, Part B: Mechanical Engineering

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Established in 2014 by the current Editor-in-Chief, Professor Bilal M. Ayyub from the University of Maryland College Park, the ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering and Part B: Mechanical Engineering serves as a medium for dissemination of research findings, best practices and concerns, and for discussion and debate on risk and uncertainty-related issues in the areas of civil and mechanical engineering and other related fields. The journal addresses risk and uncertainty issues in planning, design, analysis, construction/ manufacturing, operation, utilization, and life-cycle management of existing and new engineering systems.

Both Part A and Part B are listed in the Emerging Citation Sources by Clarivate Analytics, formerly Thomson Reuters, and are eligible for indexing in 2018. From 2016 onward, all articles will be included in Web of Science. They are also included in Scopus.

Part A has successfully secured an impact factor of 1.331 based on the latest Journal Citation Reports by Clarivate Analytics.

Journal of Risk and Uncertainty contents

Issue	Latest Issues		Issue Date
Volume 7-Issue 3	Part A	Part B	(September 2021, in progress)
Volume 7-Issue 2	Part A	Part B	(June 2021)
Volume 7-Issue 1	Part A	Part B	(March 2021)
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Volume 6-Issue 3	Part A	Part B	September 2020
Volume 6-Issue 2	Part A	Part B	June 2020
Volume 6-Issue 1	Part A	Part B	March 2020

Latest State of the Art Reviews: Part A

"Structural System Reliability: Overview of Theories and Applications to Optimization" by Junho Song, Won-Hee Kang, Young-Joo Lee, Junho Chun

"Probabilistic Inference for Structural Health Monitoring: New Modes of Learning from Data" by Lawrence A. Bull, Paul Gardner, Timothy J. Rogers, Elizabeth J. Cross

"Scale of Fluctuation for Spatially Varying Soils: Estimation Methods and Values" by Brigid Cami, Sina Javankhoshdel, Kok-Kwang Phoon, and Jianye Ching

"Social Indicators to Inform Community Evacuation Modeling and Planning" by William Seites-Rundlett, Elena Garcia-Bande, Alejandra Álvarez-Mingo, Cristina Torres-Machi, and Ross B. Corotis

"Assessment Methods of Network Resilience for Cyber-Human-Physical Systems" by Sisi Duan and Bilal M. Ayyub

Latest Review Articles: Part B

"Optimizing Predictive Maintenance With Machine Learning for Reliability Improvement" by Yali Ren

"Path Integral Methods for the Probabilistic Analysis of Nonlinear Systems Under a White-Noise Process" by Mario Di Paola and Gioacchino Alotta

"Sensemaking in Critical Situations and in Relation to Resilience - A Review" by Stine S. Kilskar, Brit-Eli Danielsen, Stig O. Johnsen

Latest Special Collections: Part A

"Special Collection on Bayesian Learning Methods for Geotechnical Data" Ka-Veng Yuen, Jianye Ching, Kok Kwang Phoon

"Special Collection on Resilience Quantification and Modeling for Decision Making" Gian Paolo Cimellaro and Nii O. Attoh-Okine

Latest Special Issues And Special Sections: Part B

"Special Section: Nonprobabilistic and Hybrid Approaches for Uncertainty Quantification and Reliability Analysis" by Matthias G. R. Faes, David Moens, Michael Beer, Hao Zhang, Kok-Kwang Phoon

"Special Section on Response Analysis and Optimization of Dynamic Energy Harvesting Systems in Presence of Uncertainties" by Agathoklis Giaralis, Ioannis A. Kougioumtzoglou, Pol D. Spanos

"Special Section on Uncertainty Management in Complex Multiphysics Structural Dynamics" by Sifeng Bi, Michael Beer, Morvan Ouisse, Scott Cogan

"Special Section on Resilience of Engineering Systems" by Geng Feng, Michael Beer, Frank P. A. Coolen, Bilal M. Ayyub, Kok-Kwang Phoon

"Special Issue on Human Performance and Decision-Making in Complex Industrial Environments" by Raphael Moura, Michael Beer, Luca Podofillini

Recognitions & Awards

Recognitions for Papers

Part A	
Editor's Choice Paper	"Probabilistic Inference for Structural Health Monitoring: New Modes of Learning from Data" by Lawrence A. Bull, Paul Gardner, Timothy J. Rogers, Elizabeth J. Cross
Most Read Paper	"Climate Impact Risks and Climate Adaptation Engineering for Built Infrastructure" by Mark G. Stewart and Xiaoli Deng
Most Cited Paper	"Resilience Assessment of Urban Communities" by Omar Kammouh, Ali Zamani Noori, Gian Paolo Cimellaro, Stephen A. Mahin
Editor's Choice Collection	For each issue of the journal, the Chief Editor may select a paper to be featured on the journal homepage in the ASCE Library. The paper is available for free to registered users for 1 to 4 months, depending on how frequently the journal is published. A list of Editor's Choice selections is available here.

Part B	
Most Read Paper	"Resilience Decision-Making for Complex Systems" by Julian Salomon, Matteo Broggi, Sebastian Kruse, Stefan Weber, Michael Beer
Most Cited Paper	"Structural Life Expectancy of Marine Vessels: Ultimate Strength, Corrosion, Fatigue, Fracture, and Systems" by Bilal M. Ayyub, Karl A. Stambaugh, Timothy A. McAllister, Gilberto F. de Souza, David Web
Featured Article	"The Application of Downhole Vibration Factor in Drilling Tool Reliability Big Data Analytics–A Review" by Yali Ren, Ning Wang, Jinwei Jiang, Junxiao Zhu, Gangbing Song, Xuemin Chen

Outstanding Reviewers

Part A 2020 Outstanding Reviewers	Part B 2020 Reviewers of the Year
Byron Tyrone Adey	Edoardo Patelli, *University of Strathclyde, UK*
Michele Barbato	Ketson dos Santos, *Columbia University, USA*
André T. Beck	
Michael Beer	
Michele Betti	
Shui-Hua Jiang	
Samuel Labi	
Edoardo Patelli	
Alba Sofi	
Cao Wang	

Best Paper Award

Starting in 2019, the Best Paper Award will be given annually to one paper in Part A and one paper in Part B appearing in the preceding volume year. Papers are evaluated by the Editorial Board members based on the following criteria:

- fundamental significance
- potential impact
- practical relevance to industry
- intellectual depth
- presentation quality.

2020 Part A Recipients
Authors: Yue Hu, Yu Wang, Tengyuan Zhao, and Kok-Kwang Phoon
Title: "Bayesian Supervised Learning of Site-Specific Geotechnical Spatial Variability from Sparse Measurements"

2020 Part B Recipients
Authors: Alba Sofi, Giuseppe Muscolino, and Filippo Giunta
Title: "A Sensitivity-Based Approach for Reliability Analysis of Randomly Excited Structures With Interval Axial Stiffness"

The award for the Best Paper published in 2020 in Part A and Part B will be presented to the authors in attendance at the ASME Safety Engineering and Risk Analysis Division (SERAD) award ceremony at the International Mechanical Engineering Congress & Exposition (IMECE), Virtual Conference, which will be held online during the period November 1–5, https://event.asme.org/IMECE.

ASCE and ASME post the winning paper's information on the journal website as well as on social media. The winning papers are made freely available from the ASCE Library (Part A) and from the ASME Digital Collection (Part B) for one year to anyone interested once registered and logged in to download. Moreover, ASME offers the authors a one-year free subscription to Part B.

Calls for Papers

Part B: active Calls for Special Issues

Special Issue on "Decommissioning and Life Extension of Complex Industrial Assets" (SI048B). Paper submission deadline: July 31, 2021.

Special Issue on "Advances in Probabilistic Assessment and Uncertainty Quantification Methods for Nuclear Safety" (SI051B). Paper submission deadline: October 1, 2021.

Social media (Twitter and LinkedIn)

The ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems in its two parts is now also active on Social Media. Follow our pages on Twitter and LinkedIn:

Twitter: ASCE-ASME Journal of Risk and Uncertainty

LinkedIn: ASCE-ASME Journal of Risk and Uncertainty

https://chinahow.guide/wechat-registration-sign-up/

to stay up-to-date on latest issues, highlighted journal content, active calls for special issues and special collections, recognitions and awards.

Journal's Newsletter

The Journal's Newsletter is sent out on a quarterly basis. To receive updates on the Journal's progress and announcements, subscribe to the Newsletter here: Subscribe to the Journal Newsletter

Submission

Part A: Submit to Part A here

Part B: Submit to Part B here

State-of-the-Art Reviews (Part A) and Review Articles (Part B) on topics of current interest in the field of risk and uncertainty are especially welcome.

Please contact the Editor or Managing Editors by email if you are interested in guest editing a Special Collection (Part A) or a Special Issue (Part B).

IMECE ®
International Mechanical Engineering Congress & Exposition®

2021 Student Paper on Safety Innovation Challenge Contest

by the

ASME - Safety Engineering, Risk and Reliability Analysis Division (SERAD)

Annually, SERAD hosts a challenge to undergraduate and graduate students to submit papers on Safety Engineering, Risk and Reliability Analysis topics, including papers already submitted to the ASME International Mechanical Engineering Congress & Exposition (IMECE) 2021. The papers are peer-reviewed by experts in these areas. The top winning papers in each of the undergraduate and graduate groups will be presented in a special SERAD session at the ASME IMECE 2021 and honored at a SERAD awards banquet during the conference. Recognitions also include cash honorariums for first place winning authors, and reimbursement with a limit for the conference-related expense (registration) for all students presenting their paper at the special session.

Submitting Papers to the 2021 SERAD Student Paper Contest

Participants

- Undergraduate and graduate students
- An academic sponsor/advisor is required.

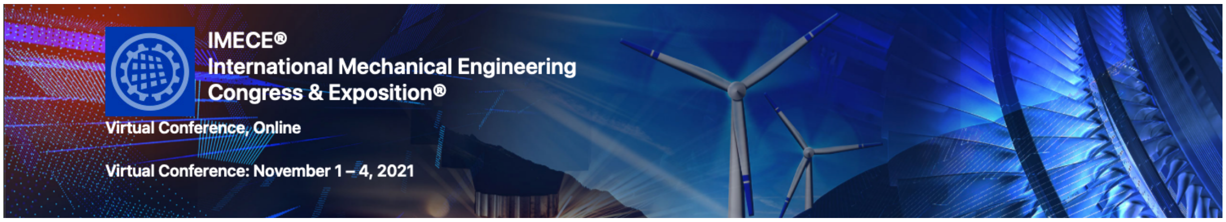
Important Dates

- Student paper submission by **May 28, 2021**.
- SERAD announces 1st and 2nd place winners in respective undergraduate and graduate group on **June 25, 2021**.
- Presentation Only Abstract Submission by 1st and 2nd place winners by **July 9, 2021**.
- SERAD special session for student contest, and awards banquet in **November 1-5, 2021** during IMECE 2021 which will be virtual.

Submittals

- Initial submittals must be previously unpublished work, but can be papers used for academic credits.
- Submittals are not required to follow ASME's conference paper format, although it is encouraged. Suggested paper size is 4-6 pages including figures.
- Recommendation and statement of student status from the academic sponsor is required with submission.
- Submittals and questions regarding 2021 student contest: Prof. Stephen Ekwaro-Osire (stephen.ekwaro-osier@ttu.edu) or Prof. Jeremy M. Gernand (jmg64@psu.edu).

Sponsor: FM Global



Call for Papers

Track 14: Safety Engineering, Risk, and Reliability Analysis

Track Description

The Track contains a collection of Topics in the broad area of safety engineering and risk analysis, which are individually organized by leaders in the field. The topics give a comprehensive coverage of experimental, computational, and analytical approaches to the safety question. Safety Engineering, Risk, and Reliability Analysis - is organized by the Safety Engineering, Risk, and Reliability Analysis Division (**SERAD**) of the ASME.

Track Objectives

Authors and presenters are invited to participate in this event to expand international cooperation, understanding, and promotion of efforts and disciplines in the area of Safety Engineering, Risk, and Reliability Analysis. Dissemination of knowledge by presenting research results, new developments, and novel concepts in **Safety Engineering, Risk, and Reliability Analysis** will serve as the foundation upon which the conference program of this area will be developed.

Track Topics

1. General Topics on Risk, Safety and Reliability
2. Reliability and Risk in Energy Systems
3. Reliability and Safety in Industrial Automation Systems
4. Reliability and Safety in Transportation Systems
5. Models and Methods for Probabilistic Risk Analysis
6. Probabilistic Risk Assessment of Protective Systems
7. Machine Learning for Safety, Reliability, and Maintenance
8. Reliability and Safety of Deep Learning-based Components
9. Big Data and IoT Applications in Reliability, Maintenance, and Security
10. Crashworthiness, Occupant Protection, and Biomechanics
11. Congress-Wide Symposium on Prognostic and Health Management: NDE and prognostics of structures and systems
12. Users, Technology, and Human Reliability in Safety Engineering
13. Student Safety Innovation Challenge
14. Plenary Session

Journal Publication

Authors of selected papers presented at the conference will be invited to submit updated and expanded versions of their papers for publication consideration in the **ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering**.

Abstract Submission: March 22, 2021
Paper Submission: April 29, 2021
Acceptance Notification: June 15, 2021
Final Paper Submission: July 30, 2021

Track Chair

Andrey Morozov
University of Stuttgart, Germany

Track co-Chairs

Mihai A. Diaconeasa
North Carolina State University, USA
Ernie Kee
University of Illinois Urbana-Champaign, USA
Bill Munsell
Munsell Consulting Services, USA
John Wiechel
SEA Limited, USA

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Root Cause, Regulation, Protection, & COVID-19

In this editorial column and short tech briefs, this author and colleagues have written about protective systems, risk quantification, and how engineers could help reduce the spread of the COVID-19 virus.[4] In the Volume 5 - June 2020 editorial column of this newsletter the need for *a priori* protections in hazardous technological systems is reviewed, but the emphasis is on *ex post* systems. Recent news reports are referring to US Department of State assertions that protective system breakdown(s) in a laboratory could have resulted in the spread of an "engineered" version of the relatively common form of the COVID virus.[5] Regardless of theories from where the virus evolved and subsequently spread, the scenario(s) leading to the resulting catastrophic consequences must be understood in order to engineer protections against reoccurrence.

The current data indicate urgency as deaths from COVID-19 are estimated between 3.7 million and 6.9 million worldwide.[6] In perspective, and depending on veracity of the data, the death toll likely exceeds that of any war since the World War ending in 1945, possible exceptions are the Korean War, the Vietnam War, and the Second Sudanese Civil War. The number of COVID-19 deaths likely only exceed those of two pandemics in recent history, the 1918 Spanish Flu (possibly, as many as 100 million deaths) and HIV/AIDS (possibly, 35 million or more deaths.) In summary, the data indicate a need for serious root cause analysis and well-designed engineering protections.

In root cause analysis and solutions, the COVID-19 pandemic appears to be unique in recent history with regard to identification of cause, especially given advancements in information exchange and advances in epidemiological science. Although a handful of theories have been proposed, none of them have been shown to be conclusive for the origin of COVID-19. Hopefully, epidemiologists will be able to pin down the scenario that led to the spread of infection. In my opinion, it is only by knowing this scenario that a similar outbreak can be protected against. Engineers need to understand, for such a scenario, the pathways that must be blocked, the associated costs of protection, and the consequences that follow if protection breaks down. Of course, included in this understanding is the risk for protective system failure.

Protection against pandemic scale disease spread requires early detection at the source and, as implied in its nature, worldwide cooperation and communication. Such protection has greater potential in the current time as opposed to past centuries. Probably the most important protection that could be put in place with existing technologies is a communications system or network that would interconnect country states' disease centers having its purpose to alert all country states when a potentially deadly disease is identified. If developed as a database containing basic clinical information, vector(s) for spread, as well as the disease characteristics such as bacterial or viral, and any scientific findings, the world community could immediately begin to take action against its spread as well as its treatment. The issue is complex since insects, animals, birds, livestock, and people all could carry a deadly disease that could be transmitted among humans by various means. By knowing at the earliest time, the way it may spread, and the nature of its transmission, would give country states valuable information about what protections to implement against a new disease. A feedback mechanism could be included that would give information about the efficacy of protections implemented in different countries. Such feedback would be invaluable for example, to Bayesian analysts.

What are your thoughts? Let's talk!
Ernie Kee, SER^{2}AD Editor
Send your feedback/thoughts on this or any reliability subject to me at erniekee@illinois.edu.

[4] "Engineering in a Season of Pandemic", https://community.asme.org/safety_engineering_risk_analysis_division/b/weblog/archive/2020/07/07/asme-sera2d-newsletter-2nd-quarter-2020.aspx.

[5] See for example, Early State Department Reports and More Recent Reports, (websites accessed 6 June, 2021.)

[6] See IMHE Estimates and WHO Estimates, (websites accessed 6 June, 2021.)

SER^{2}AD Committee

Table 1. 2018–2019 SER^{2}AD Committee Membership

Executive Committee		Appointments	
Position	Person	Position	Person
Chair	Mohammad Pourgol-Mohammad, pourgol-mohamadm2@asme.org	**Nominating Chair**	Mohammad Pourgol-Mohammad
1st Vice-Chair	Xiaobin Le, lex@wit.edu	**Award Chairs**	Jeremy Gernand, jmg64@psu.edu John Weichel, jwiechel@sealimited.com
2nd Vice-Chair-Treasurer	Arun Veeramany, arun.veeramany@pnnl.gov	**Newsletter Editor**	Ernie Kee, erniekee@illinois.edu
3rd Vice Chair-Membership	Stephen Ekwaro-Osire, Stephen.Ekwaro-Osire@ttu.edu	**Webinars / Outreach Chair**	Open
4th Vice-Chair-Secretary	Mihai Diaconeasa madiacon@ncsu.edu	**Student Program Coordinator**	Deivi Garcia, deivi.garciagarzon@gmail.com
Past Chair	Jeremy Gernand jmg64@psu.edu	**Technical Content Coordinator**	Giulio Malinverno, giulio.malinverno@gmail.com
MECE 2021 Track Organizers	Andrey Morozov, andrey.morozov@tu-dresden.de Ernie Kee Bill Munsell, bmunsell@att.net Mihai Diaconeasa		