Editorial

RESILIENCE engineering is emerging as new concept based on the edited work by Hollnagel [1]. The initial concept was more towards human errors and machine failures, and safety critical systems involving humans. Recently, resilience has been refers to the art of managing unexpected, or how a team or organizations becomes prepare to cope with surprises. These surprising events can sometimes pushed the system beyond its operational boundaries [2]. Therefore, the purpose of Resilience Engineering is to anticipate the changing potential for failure considering that plans and procedures have limits, gaps and there are unforeseen errors and the environment is very dynamic [1].

Sheridan presented some ways necessary to maintain a resilient systems [3]:

- Emphasis on anticipating future possible incidents and on what actions were mitigating of negative consequences and aided recovery for past incidents.
- Continuous monitoring and measurement of state variables

Networked and lifeline infrastructure appears to be one of the great challenges especially in the presence of surprise events. Designing resilient systems can limit and reduce the probabilities of failures and its consequence. Currently the resilience engineering in networked infrastructure is more qualitative than quantitative and there are few metrics for evaluating resilience in infrastructure systems, considering their interdependencies. The are no standard or a universal method of developing and analyzing the resilience indices, therefore the challenge is to how to define more specific measures, which are different from resilience indices in ecology, economics or social sciences. The new approach need to be "system of systems" concept. The proper formulation and analysis can then be used at both planning, design, construction and maintenance of the infrastructure.

The special section on resilience contains six papers, the first paper by Attoh-Okine, Cooper and Mensah formulate the development of resilience index of urban infrastructure using belief functions. The belief function framework the authors presented can handle subjective, independent information and hierarchical data, all which are characteristics of the inputs required for resilience index determination. Major advantage of the approach it that the future resilience indices of the initial condition and future condition can be calculated. Therefore the approach will allow decision makers and engineers to perform sensitivity analyses to determine the threshold resilience. The second paper by Badiru and Ijaduola discusses the application of half life theory of learning curves for system perform analysis. The predictive component of the half life analysis can be use as an intrinsic indicator of systems' resilience. Wang and Ip develop an approach to analyze the resilience of logistic networks. The authors develop a resilience index of the total logistic network based on weighted sum of the individual node resilience. But more generally, they defined the resilience index in logistical network as a ratio of the available supply over the demand in failure or attack cases. The paper provides a general guidance to logistic network design.

The paper by Reed, Kapur and Christie outline a method to characterize the behavior of networked infrastructure for natural hazard events such hurricanes and earthquakes. The approach include both resilience and interdependency measures. The model develop can be used to develop design strategies for increased resilience of urban infrastructure for extreme events scenarios. The authors support their analysis with data from Hurricane Katrina. Madni and Jackson develop a conceptual framework for resilience engineering. The authors did an excellent job by presenting the core definitions and roadmap of resilience form different perspective. The authors will able to clarify the differences between safety, reliability, survivability, and resilience. The authors also highlights resilience engineering challenges, vision of resilience and resilience heuristics. The final paper by McGill and Ayyub proposes the use of fuzzy systems to characterize the relationship between the performance of regional risk mitigation capabilities and potential for loss attributed to plausible initiating events. This paper has some similarity with Attoh-Okine, Cooper and Mensah paper, they highlights the importance of subjective information in resilience analyses. The authors, McGill and Ayyub used attributes from the Department of Homeland Security's Target Capabilities List for illustration. The approach can be used for regional analysis and quantification estimate of risks and benefits.

Resilience engineering is becoming a new paradigm for complex systems performance and maintenance decision making. Another important issue will be the discussion of resilience within the sustainability framework, development of new engineering discipline resilience engineering will not be a bad idea.

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