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\section*{PSAM11 & ESREL 2012}

\subsection*{29-Mo4-5}

\textbf{Optimizing Computer Representation and Computer Processing of Epistemic Uncertainty for Risk-Informed Decision Making: Finances etc.}

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Uncertainty is usually gauged by using standard statistical characteristics: mean, variance, correlation, etc. Then, we use the known values of these characteristics (or the known bounds on these values) to select a decision. Sometimes, it becomes clear that the selected characteristics do not always describe a situation well; then other known (or new) characteristics are proposed. A good example is description of volatility in finance: it started with variance, and now many descriptions are competing, all with their own advantages and limitations. In such situations, a natural idea is to come up with characteristics tailored to specific application areas: e.g., select the characteristic that maximize the expected utility of the resulting risk-informed decision making. With the new characteristics, comes the need to estimate them when the sample values are only known with interval uncertainty. Algorithms originally developed for estimating traditional characteristics can often be modified to cover new characteristics.

\subsection*{01S-Mo4-2}

\textbf{Petri-Net Simulation Model of a Nuclear Component Degradation Process}

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Multi physical state modeling (MPSM) is a novel approach being investigated for estimating the reliability of components and systems in the context of probabilistic risk assessment (PRA). The approach integrates multi-state modeling, which describes the degradation process by transitions among discrete states (e.g., initial, micro-crack, rupture, etc) and physical modeling by (physical) equations that govern the degradation process. In practice, the degradation process is non-Markovian and its transition rates are time-dependent and influenced by external factors such as temperature and stress. Under these conditions, it is in general difficult to derive the state probabilities analytically.

On the contrary, Petri nets provide a flexible modeling framework for describing degradation processes with arbitrary transition rates. In this paper, we build a Petri net in support of Monte Carlo simulation of the stochastic aging behavior of a nuclear component undergoing stress corrosion cracking. The results are compared with analytical results derived in a previous work of literature.

\subsection*{01S-Mo4-1}

\textbf{Presented in session 13-Fr2}

\textbf{Dempster-Shafer Theory of Evidence to handle maintenance models tainted with imprecision}

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The performance of a given maintenance policy can be a priori evaluated by modeling the behavior of the maintained component. The models developed to this aim rely on a number of parameters which may be weakly known in real applications, due to lack of real/field data collected during operation or properly designed tests. In these cases, the main source of information to estimate these parameters becomes the experts’ judgment, which is in general poorly refined. Resorting to probability distributions to represent this lack of knowledge may result in a set of assumptions and biases. Other techniques to represent and propagate uncertainty are needed and currently investigated. In this work, the authors consider the use of the Dempster-Shafer Theory of Evidence (DSTE) for maintenance policy assessment, in a situation in which:

- the model of the component’s behavior depends on a number of ill-known parameters.
- Information about the ill-known parameters is elicited from different teams of experts, with diverse skills and competences. Each expert is asked to provide an interval that he/she supposes containing the true value of the uncertain parameter. The method is illustrated with reference to a practical case study concerning a check valve of a turbo-pump lubricating system in a Nuclear Power Plant.