Developing a System Reliability Model Structure for Complex Systems: Challenges and Progress at Developing Improved Tools

Andrew Koehler and Richard Klamann
Los Alamos National Laboratory

A significant challenge in the development of statistical reliability models for engineered systems is to develop a sufficient understanding of how component and system behaviors are related. This is a non trivial problem: theoretically a system with n components and k states could exhibit k^n unique system behaviors. In actuality, engineered systems tend to exhibit many fewer identifiable behaviors than this theoretical maximum, however developing, calculating, and parsing out possible combinations of component states based upon system behavioral observations in order to produce a calculable reliability model has not been well addressed by either the systems engineering or the statistical community in the past.

This poster will describe initial efforts at developing a tool to facilitate the statistical analysis of complex engineered systems. Based on requirements developed by Los Alamos National Laboratory's Statistical Sciences group (D-1), we are using and developing a tool that provides system representation and logic analysis to describe how component states relate to system behavior as part of eliciting and checking the logical consistency of system information from subject matter experts, data sources, and system documentation. The software, called GROMIT for Graphical Representation, Ontology and Modeling Inference Tool, is part of a broader effort to integrate all available system information in the construction of improved reliability models.