

*American GNC Corporation's outstanding R&D team has received the honorary IEEE AUTOTESTCON (September 12-15, 2016, Anaheim, California) David M. Goodman Best Paper Award for Management Topics recognizing the many contributions made by the late Dr. Goodman in the formation of AUTOTESTCON and his encouragement of management theory and concepts.*

## Automated Maintenance Path Generation with Bayesian Networks, Influence Diagrams, and Timed Failure Propagation Graphs

Stephen Oonk and Francisco J. Maldonado  
American GNC Corporation  
888 Easy St., Simi Valley, CA, 93065

**Abstract** - Large and complex systems such as space vehicles, power plants, manufacturing facilities, oil refineries, gas delivery systems, among others often have networks of alarms monitoring basic parameters (e.g. high or low temperature, voltage out-of-tolerance, power loss, etc.) which are correlated to failure modes, but not necessarily in a very direct way. In this paper, we present a plurality of graph-based methods which are combined in a novel way for the automated analysis of a system's alarms (or any other observable discrepancies) to determine the most appropriate maintenance. Specifically: (i) Timed Failure Propagation Graphs (TFPG) and/or Bayesian Networks (BN) read alarms as evidence for conducting backward root-cause diagnosis and forward failure effects analysis while (ii) Influence Diagrams (ID) select optimal maintenance operations considering the likely causes and effects as well as the utility of available maintenance options. Innovative contributions to these individual techniques include an automated BN instantiation methodology and system/sensor TFPG diagnostic algorithms. The overall proposed system then determines optimal maintenance paths suggested to be conducted by personnel.

