National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Information Technology and Software

Interactive Diagnostic Modeling Evaluator

Patent Only, No Software Available For License.

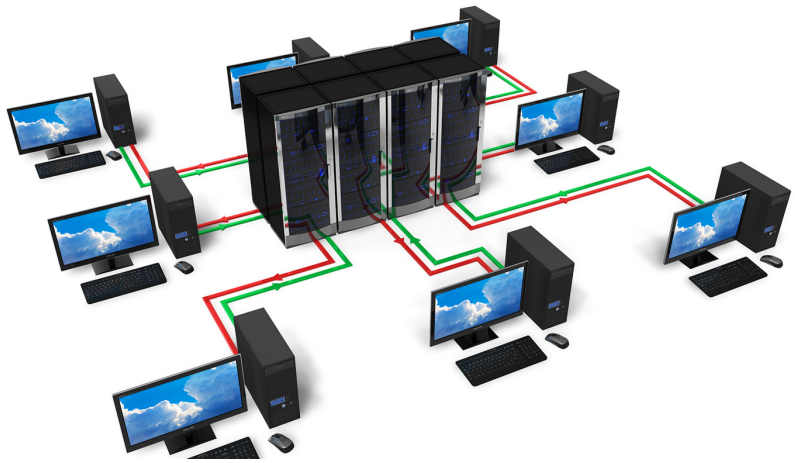
NASA Ames has developed an interactive diagnostic modeling evaluator (i-DME) tool to aid in modeling for noise and lag in the data and debugging of system models when fault detection, isolation, and recovery results are incorrect. i-DME is designed to dramatically speed up the modeling debugging process. Often what hinders human-led model developments are, 1) the sheer size of playback files, 2) the modeling for noise and lag in the data, and, 3) debugging the fault/test relationships in the model. To alleviate these problems, i-DME can automatically playback very large data sets to find time points of interest where user-set performance criteria for detection and isolation are violated. i-DME modifies the diagnostic model through its abstract representation, diagnostic matrix (D-matrix). The types of modifications are procedures ranging from modifying 0s and 1s in the D-matrix adding/removing the rows/columns, or modifying test/wrapper logic used to determine test results. This software has the capacity to be applied to any complex system for navigation or generation of large amounts of complex data to identify, prioritize, and resolve errors in a self-correcting manner.

BENEFITS

- Cost effective modeling process
- Can be used in multiple areas
- Can automatically playback very large data sets
- Speeds up the modeling process
- Tracks all changes made over many iterations

THE TECHNOLOGY

The i-DME is a computer-user interactive procedure for repairing the system model through its abstract representation, diagnostic matrix (D-matrix) and then translating the changes back to the system model. The system model is a schematic representation of faults, tests, and their relationship in terms of nodes and arcs. D-matrix is derived from the system models propagation paths as the relationships between faults and tests. When the relation exists between fault and test, it is represented as 1 in the D-matrix. To repair the D-matrix and wrapper/test logic by playing back a sequence of nominal and failure scenarios (given), the user sets the performance criteria and accepts/declines the proposed repairs. During D-matrix repair, the interactive procedure includes conditions ranging from modifying 0s and 1s in the matrix, adding/removing the rows (failure sources) columns (tests), or modifying test/wrapper logic used to determine test results. The translation of changes to the system model is done via a process which maps each portion of the D-matrix model to the corresponding locations in the system model. Since the mapping back to the system model is non-unique, more than one candidate system model repair can be suggested. In addition to supporting the modification, it provides a trace for each modification such that a rational basis for each decision can be verified.



This software has the capacity to be applied to any complex system for navigation of large amounts of data to identify, prioritize, and resolve errors

APPLICATIONS

The technology has several potential applications:

- Industrial applications
- Consumer service applications
- Aerospace
- Chemical plant process monitoring
- Oil and gas plant operations
- Health monitoring systems

PUBLICATIONS

Patent No: 10,275,548

technology.nasa.gov

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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More Information

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