



## TECHNOLOGY

# A Tree-to-Graph Folding Procedure for Systems Engineering Requirements

## OVERVIEW

In systems engineering circles, requirements management capability improves the likelihood of success in the team based development of complex multidisciplinary systems. Elements of this capability are an ability to identify, manage and validate requirements during the early phase of the system design process. This is when errors are cheapest and easiest to correct.

Commercial requirements management tools such as SLATE, CORE and DOORS provide the best support for the top-down development where the focus is on requirements representation, traceability, allocation of requirements to system abstraction blocks and recently, step-by-step execution of systems models. Most of these tools represent individual requirements as textual descriptions with no underlying semantics. As a result, computational support for validation and verification requirements is still immature. Current tools are incapable of analyzing requirements for completeness or consistency.

The state-of-the-art practice is to organize groups of requirements into tree hierarchies. However, when requirements are organized into layers for team development, graph structures are needed to describe the "comply" and "define" relationships. When software tools employ a tree-based model to display relationships among requirements, gaps appear between the visual representation and the underlying graph-based data structures. To correct this flaw, system engineers currently use manual procedures to identify and close the gaps. The tree representation only works well when requirements "comply" and "define" branch from single source.

In order to mitigate errors in the gap-closing process, researchers at the University of Maryland and NASA have formulated algorithms and implemented software tools for the graph-based organization and visualization of requirements. This new, more efficient technology does not compete with SLATE, CORE and DOORS; rather it augments the present-day commercial technologies.

see: <http://www.isr.umd.edu/%7Eaustin/paladinRM.html>

For more information please contact the University of Maryland, College Park, Office of Technology Commercialization, 301 405 3947 or by e-mail: [otc@umd.edu](mailto:otc@umd.edu).

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## **Additional Information**

### **INSTITUTION**

University of Maryland, College Park

### **PATENT STATUS**

Patent(s) pending

### **LICENSE STATUS**

Available for non-exclusive license

### **CATEGORIES**

- Aerospace
- Information Technology

### **EXTERNAL RESOURCES**

- [US Patent 7,877,737](#)

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