

# A Dynamic Fault Tree Analysis Model

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## Abstract

In this paper a model for dynamic fault tree (FT) analysis is developed. The model is used for the analysis of a cold standby redundant system. It is shown that a typical modern fault tree analysis (FTA), resulting in the Boolean domain in a short pseudopolynomial, i.e., a polynomial in the literals of the FT input variables, can yield grave errors in case of cold standby, even though the single terms are apparently evaluated correctly via convolution. Expanding the FT terms to minterms gives correct results, yet with considerable computational effort. Hence, here the FT is transformed to a special syntax tree based mainly on dual functions and on convolution which can be readily evaluated to give (strict sense) system reliability.

**Keywords:** Reliability, Fault Tree, Fault Tree Analysis, Minterm, Syntax tree, Cold Standby Redundancy, Convolution, Dual function, Priority AND.

## References:

- [1] J. Vaurio, Treatment of general dependencies in system fault tree and risk analysis. *IEEE Trans. Reliability* 51 (2002), 278-288.
- [2] W. Schneeweiss, *Reliability Modeling*. LiLoLe-Verlag 2001.
- [3] W. Schneeweiss, *The Fault Tree Method*. LiLoLe-Verlag 1999.
- [4] Y. Dutuit, A. Rauzy, Exact and truncated computations of prime implicants of coherent and non-coherent fault trees with ARALIA. *Reliability Engg. and System Safety* 58 (1997), 127-144.
- [5] M. Bozzano, A. Villaforita, Integrating fault tree analysis with event ordering information. *Proc. ESREL 2003*, 247-254.
- [6] J. Bechta Dugan, S. Bavuso, M. Boyd, Dynamic fault-tree models for fault-tolerant computer systems. *IEEE Trans. Reliability* 41 (1992), 363-377.
- [7] J. Fussel, E. Aber, R. Rahl, On the quantitative analysis of Priority AND failure logic. *IEEE Trans. Reliability* 25 (1976), 324-326.