

## Application of Discrete Function and Software Control Flow to Dependability Assessment of Embedded Digital System

Jong Gyun Choi and Poong Hyun Seong

Department of Nuclear Engineering

Korea Advanced Institute of Science and Technology

373-1 Kusong-dong, Yusong-gu, Taejon, Korea 305-701

### Abstract

This article describes a combinatorial model for estimating the reliability of the embedded digital system by means of discrete function theory and software control flow. This model includes a coverage model for fault processing mechanisms implemented in digital system. Furthermore, the model considers the interaction between hardware and software. The fault processing mechanisms make it difficult for many types of components in digital system to be treated as binary state, good or bad. The discrete function theory provides a complete analysis of multi-state system as which the digital system can be regarded. Through adaptation software control flow to discrete function theory, the HW/SW interaction is considered for estimation of the reliability of digital system.

Using this model, we predict the reliability of one board controller in a digital system, Interposing Logic System (ILS), which is installed in YGN nuclear power units 3 and 4.

Since the proposed model is general combinatorial model, the simplification of this model becomes a conservative model that treats the system as binary state. Moreover, if information for coverage factor of fault tolerance mechanisms implemented in system through fault injection experiment is obtained, this model can consider detailed interaction of system components.