

Yousefi, Javad; Sedaghat, Yasser; Rezaee, Mohammadreza, "Masking wrong-successor Control Flow Errors employing data redundancy," in *Computer and Knowledge Engineering (ICCKE), 2015 5th International Conference on* , vol., no., pp.201-205, 29-29 Oct. 2015
doi: 10.1109/ICCKE.2015.7365827

Abstract: Advancements of CMOS technology lead to reduction of the transistor size and operating voltage levels that cause transistors to become more sensitive to cosmic rays. Therefore CMOS devices like memory (i.e., RAMs) are more likely to be hit by transient faults. Up to 77% of the transient faults cause Control Flow Errors (CFEs). One type of CFEs is wrong-successor CFE which is caused by faults in data variables resident in RAM. Previous control flow checking techniques neither detect nor correct this type of errors. A technique with the ability of masking wrong-successor CFEs is proposed in this paper. Since occurrence of these errors is induced by faults in data variables which affect the program execution flow (control variables), in the proposed technique, the control variables are being distinguished from other variables. This step is being followed by a traditional fault masking technique that is applied on the control variables. To evaluate the proposed technique, it was applied on five various benchmarks of the MiBench package. The experimental results demonstrated that the proposed technique is able to mask all 50,000 injected faults in control variables; while it had almost 21% performance overhead with 6% memory overhead. It is reasonable and feasible to apply this technique on the former control flow checking techniques due to its perfect wrong-successor CFE correction coverage and low overheads.

keywords: {Performance evaluation;Reliability;Control variables;Error correction;Wrong-successor control flow error;fault masking},

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7365827&isnumber=7365815>