

N-detect TDF ATPG And Compression

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PROBLEM DESCRIPTION

Given sample circuit netlists, our goal is to generate a N-detect TDF ATPG in LOS mode.

In N-detect fault simulation, a fault will be dropped only when it is detected more than N times.

However, it leads to increased test cost. Hence, we should apply test compression techniques, including STC and DTC.

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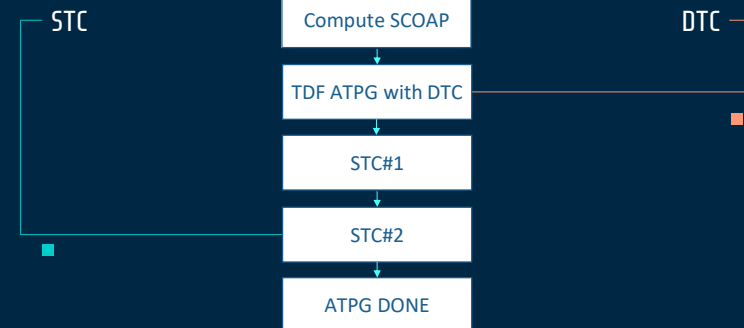
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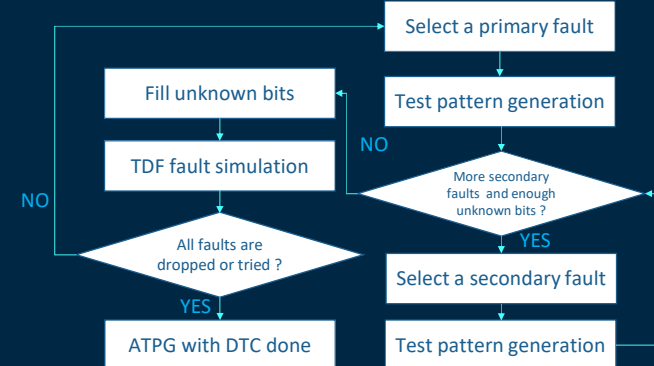
OVERALL ATPG FLOW



DYNAMIC TEST COMPRESSTION

- Choose primary fault by order
- First find V2 to detect certain fault
- Check if it can be activated by V1
- Randomly choose secondary fault
- At the end, we randomly fill unknown bits

DYNAMIC TEST COMPRESSTION FLOW



STATIC TEST COMPRESSTION

- STC#1
 - First, do reverse order simulation to drop faults
- STC#2
 - Second, reorder the test patterns according to the detected fault number
 - Then, do fault simulation in the order to drop faults

STATIC TEST COMPRESSTION FLOW

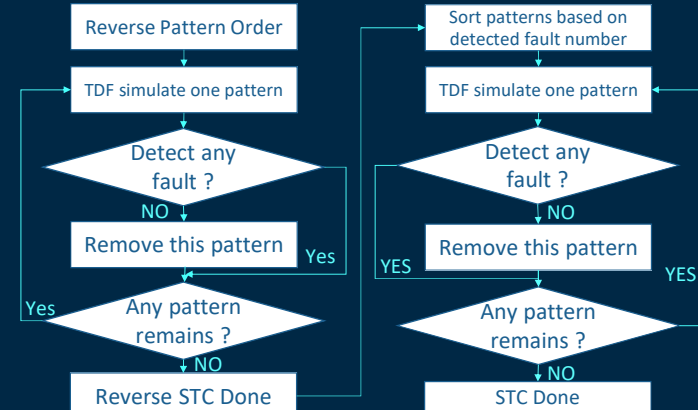


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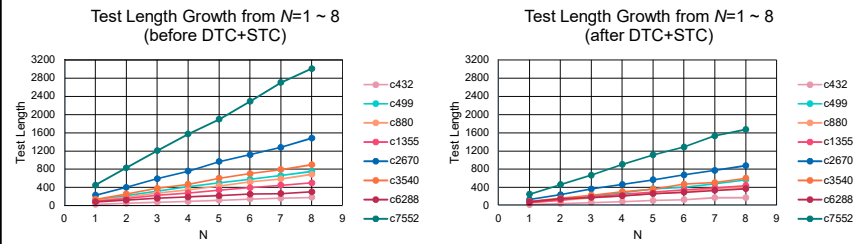
03

EXPERIMENTAL
RESULT
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COMPARING

Test Length Difference between N=1 and N=8 w/o compression

Circuit Number	Test Length (N = 1)	Fault Coverage	Run Time	Test Length (N = 8)	Fault Coverage	Run Time
c432	27	11.62	0.1	179	11.62	0.1
c499	118	94.31	0.42	750	91.17	0.7
c880	111	49.24	0.7	686	49.19	0.9
c1355	88	38.41	2.12	501	32.94	2.4
c2670	228	92.47	1.54	1481	91.73	2.8
c3540	137	22.96	10.33	896	22.88	11.5
c6288	83	97.23	6.15	303	96.82	9.8
c7552	449	97.73	5.7	3007	97.58	12.9

Test Length Difference between N=1 and N=8



Test Length Compare with PA3 w/ compression

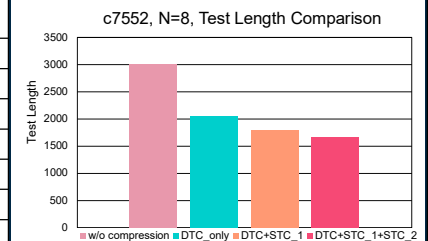
Circuit Number	Test Length (N = 1)	Fault Coverage	Test Length (PA3)	Fault Coverage
c432	23	11.62	20	0.27
c499	82	94.77	66	64.94
c880	68	49.76	65	37.64
c1355	65	38.41	62	21.75
c2670	135	92.81	135	71.6
c3540	89	22.92	98	14.44
c6288	81	97.27	42	95.14
c7552	249	97.93	288	89.54

Test Length Difference between Compression N = 8

Circuit Number	Test Length w/o comp	Fault Coverage	Run Time	Test Length w/ comp	Fault Coverage	Run Time
c432	179	11.62	0.1	173	11.62	0.2
c499	750	91.17	0.7	565	91.13	0.9
c880	686	49.19	0.9	412	49.24	1.4
c1355	501	32.94	2.4	438	32.94	2.8
c2670	1481	91.73	2.8	875	92.38	6.3
c3540	896	22.88	11.5	600	22.91	14.5
c6288	303	96.82	9.8	369	96.14	21.2
c7552	3007	97.58	12.9	1670	97.83	26.7

Test Length Difference between Compression N = 8

Circuit Number	Test Length w/o comp	Test Length w/ comp	Reduction Rate (%)
c432	179	173	3.35
c499	750	565	24.67
c880	686	412	39.94
c1355	501	438	12.57
c2670	1481	875	40.92
c3540	896	600	33.04
c6288	303	369	-21.78
c7552	3007	1670	44.46



Possible Improvements

- Reorder the fault list before ATPG
- Fill unknown bits more wisely
- Choose secondary fault more wisely

Contribution

- 劉旻鑫: DTC 、Simulation
- 林楷崴: Utility Functions 、PPT 、Report
- 葉冠宏: STC

Reference

- Goel, "An Implicit Enumeration Algorithm to Generate Tests for Combinational Logic Circuits," in IEEE Transactions on Computers, vol. C-30, no. 3, pp. 215-222, March 1981, doi: 10.1109/TC.1981.1675757.
- [Hamzaoglu 98] I.Hamzaoglu, J.Patel, "Test set compaction algorithms for combinational circuits", ICCAD 1998
- D. Xiang, W. Sui, B. Yin and K. -T. Cheng, "Compact Test Generation With an Influence Input Measure for Launch-On-Capture Transition Fault Testing," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. 22, no. 9, pp. 1968-1979, Sept. 2014, doi: 10.1109/TVLSI.2013.2280170.
- B. Benware et al., "Impact of multiple-detect test patterns on product quality," International Test Conference, 2003. Proceedings. ITC 2003., Charlotte, NC, USA, 2003, pp. 1031-1040, doi: 10.1109/TEST.2003.1271091.

Thank You

For Your Attention

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