VLSI Testing PA3 Report

R05921058
楊承翰

1. Testcase result

circuit number	number of gates	number of TDFs	number of detected faults	number of undetected faults	fault coverage
C432	245	1110	3	1107	0.27 %
C499	554	2390	1324	1066	55.4 %
C880	545	2104	608	1496	28.9 %
C1355	554	2726	426	2300	15.6 %
C2670	1785	6520	3997	2523	61.3 %
C3540	2082	7910	861	7049	10.9 %
C6288	4800	17376	13180	4196	75.9 %
C7552	5679	19456	14939	4517	76.8 %

2. Code explanation
   a. First we need to generate fault list (generate_tdf_fault_list) using similar algorithm as the original one. The difference is that we only collapse equivalent faults for BUF and NOT gates, because some equivalent stuck-at faults are not equivalent TDFs. For example, in c17.ckt, g2's input from PI3 s-a-0 is equivalent to g2's output s-a-1, but when applying pattern T'01111 1', the first fault is not activated, while the second fault is activated and detected.
   b. To record if a fault is activated in the first pattern, I add a member variable to struct FAULT to mark if the fault is activated.

```
struct FAULT {
  ...
  short activate;
  ...
};
```

   c. Simulate the first pattern and mark the activated faults

```
for (i = 0; i < ncktin; ++i) {
  nv = ctoi(vector[i]);
  sort_wlist[i]->value = nv;
}
for (i = 0; i < ncktwire; ++i) {
```

```
  if (i < ncktin) sort_wlist[i]->flag |= CHANGED;
  else sort_wlist[i]->valie = 2;
}
sim();
for (f = flist; f; f = f->pnext_undetect) {
  if (f->fault_type == sort_wlist[f->to_wlist]->value)
    f->activate = TRUE;
  else
    f->activate = FALSE;
}
```

d. Apply second pattern and run fault simulation (transition_sim_v2). The only change in fault simulation is that we need to additionally check if a fault is activated.

```
for (i = 0; i < ncktin; ++i) {
  if (i == 0) nv = ctoi(vector[ncktin]);
  else nv = ctoi(vector[i - 1]);
  sort_wlist[i]->value = nv;
}
for (i = 0; i < ncktwire; ++i) {
  if (i < ncktin) sort_wlist[i]->flag |= CHANGED;
  else sort_wlist[i]->valie = 2;
}
flist = transition_sim_v2(flist, num_of_current_detect);
```