VLSI Testing and Design for Testability Assignment 1

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1. How to compile codes

   Go to the folder /podem, then enter “make” in command line to compile all codes.

2. The algorithm and idea of my codes

   A. Modification in codes

   In main.cc, I enrolled three options “path”, “start”,and “end”.

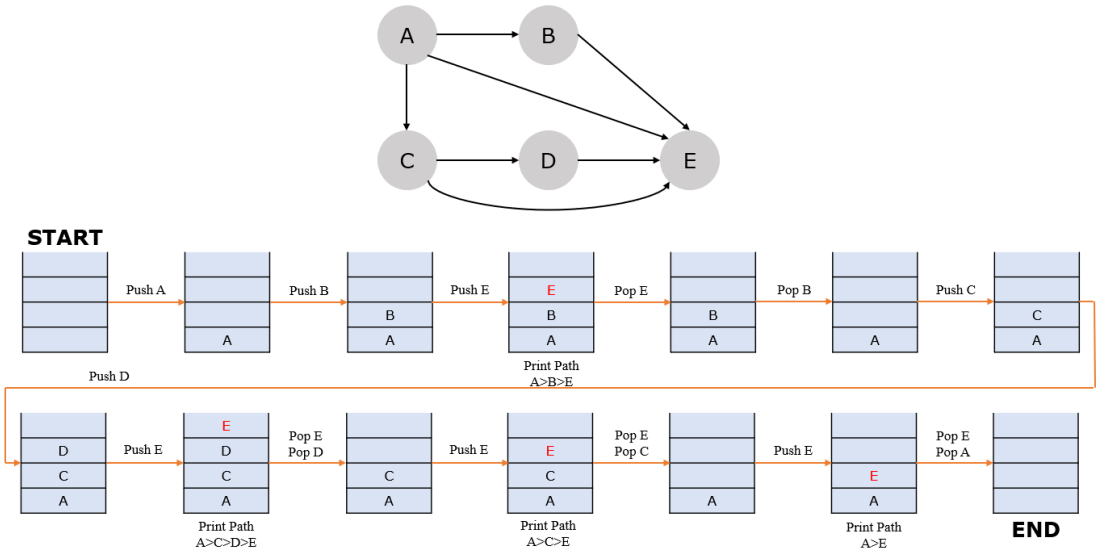
```
//Assignment 1
option.enroll("path", GetLongOpt::NoValue,
        "list and count all possible paths connecting", 0);
option.enroll("start", GetLongOpt::MandatoryValue,
        "set the input gate", 0);
option.enroll("end", GetLongOpt::MandatoryValue,
        "set the output gate", 0);
```

   In circuit.h, I added three function void ListPath at class CIRCUIT, void DFSPath, void PrintPath, which DFSPath and PrintPath are included in ListPath. And code them in circuit.cc.

```
    //Assignment 1
void ListPath(string start_gate, string end_gate);
void DFSPath(GATE *target_gate, vector<GATE*> &DFS_stack, int *total_path);
void PrintPath(vector<GATE*> DFS_stack);
```

   B. Algorithm

   Because the circuit is a directed graph without loop, we can apply DFS to find out all paths from PI to PO. The std::stack cannot output all elements directly, so I used std::vector instead of std::stack.



Assume we have a circuit as figure above. We want to get the paths from A to E, then the flow of DFS that finding all paths would like as above.

3. Test case results

A. c432.bench (start: 89GAT_27 , end: PO_ 329GAT_133)

```
[311510173@mseda03 podem]$ ./atpg -path -start 89GAT_27 -end PO_329GAT_133 ../circuits/iscas85/c432.bench
Start parsing input file
Finish reading circuit file
Assignment 1: Find all paths from 89GAT_27 to PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__52 251GAT_85 285GAT_104 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__51 251GAT_85 285GAT_104 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__55 247GAT_87 282GAT_106 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__59 243GAT_89 279GAT_108 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__63 239GAT_91 276GAT_110 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__67 236GAT_93 273GAT_112 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__71 233GAT_95 270GAT_114 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__75 230GAT_97 267GAT_116 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__79 227GAT_99 264GAT_118 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 203GAT_82b internal__83 224GAT_101 260GAT_120 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__56 247GAT_87 282GAT_106 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__60 243GAT_89 279GAT_108 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__64 239GAT_91 276GAT_110 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__68 236GAT_93 273GAT_112 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__72 233GAT_95 270GAT_114 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__76 230GAT_97 267GAT_116 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__80 227GAT_99 264GAT_118 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 199GAT_81 203GAT_82 internal__84 224GAT_101 260GAT_120 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 internal__55 247GAT_87 282GAT_106 296GAT_122 329GAT_133 PO_329GAT_133
89GAT_27 146GAT_39 177GAT_59 177GAT_59b internal__56 247GAT_87 282GAT_106 296GAT_122 329GAT_133 PO_329GAT_133
The paths from 89GAT_27 to PO_329GAT_133: 20
total CPU time = 0
```

B. c880.bench (start: 126GAT_30 , end: PO_863GAT_424)

```
[311510173@mseda03 podem]$ ./atpg -path -start 126GAT_30 -end PO_863GAT_424 ../circuits/iscas85/c880.bench
Start parsing input file
Finish reading circuit file
Assignment 1: Find all paths from 126GAT_30 to PO_863GAT_424
126GAT_30 517GAT_227 517GAT_227b 543GAT_236 581GAT_250 581GAT_250b 654GAT_270 734GAT_287 773GAT_351 773GAT_351b 788GAT_367 788GAT_367b 802GAT_372 808GAT_377 808GAT_377b 826GAT_391 837GAT_39
6 846GAT_407 855GAT_418 863GAT_424 PO_863GAT_424
126GAT_30 517GAT_227 517GAT_227b 543GAT_236 581GAT_250 581GAT_250b 654GAT_270 734GAT_287 773GAT_351 789GAT_368 789GAT_368b 802GAT_372 808GAT_377 808GAT_377b 826GAT_391 837GAT_396 846GAT_407
 855GAT_418 863GAT_424 PO_863GAT_424
126GAT_30 517GAT_227 517GAT_227b 543GAT_236 581GAT_250 651GAT_271 722GAT_295 763GAT_337 773GAT_351 773GAT_351b 788GAT_367 788GAT_367b 802GAT_372 808GAT_377 808GAT_377b 826GAT_391 837GAT_396
 846GAT_407 855GAT_418 863GAT_424 PO_863GAT_424
126GAT_30 517GAT_227 517GAT_227b 543GAT_236 581GAT_250 651GAT_271 722GAT_295 763GAT_337 773GAT_351 789GAT_368 789GAT_368b 802GAT_372 808GAT_377 808GAT_377b 826GAT_391 837GAT_396 846GAT_407
855GAT_418 863GAT_424 PO_863GAT_424
The paths from 126GAT_30 to PO_863GAT_424: 4
total CPU time = 0
```