Structural Based Testing Strategies

Symbolic Execution

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Objective

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Utilize symbolic execution

Symbolic Execution

- Technique for formally characterizing a path domain identifying a path condition
- All paths in the program form an execution tree
- Involves executing a program with symbolic values
- Identifies test data to execute a path or determination that a path is infeasible

Notation

- A variable “x” will have a succession of symbolic values: A_0, A_1, A_2 … as a path is traversed
- Subscripts refer to the number of the previous statement executed

Example

(0) input A,B
(1) A := A + B;
(2) B := A + B;
(3) A := 2 x A + B;
(4) C := A + 4;

Multiple Paths Example

```
if (x <= 0) or (y <= 0) then
(1)          x := x2;
             y := y2;
        else
(2)          x := x +1
             y := y + 1
        endif
        if (x < 1) or (y < 1) then
(3)          x := x + 1;
             y := y +1;
        else
(4)          x := x - 1;
             y := y – 1;
        endif
```

Example

Path Conditions

- In addition to symbolically evaluating a program variables along a path, we can also symbolically represent the conditions which are required for that path to be traversed
- The symbolic path condition must be expressed in terms of the initial symbolic values of the variables

Example for T,F Path

Example for T,F Path

Summary