10. Exercises

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Test generation - predicate analysis

Consider the BOR, BRO, BRE criteria for testing predicates including expressions and relational operator, and shortly introduce their objectives and differences. Use the most appropriate criteria to generate a test set, able to discover logical and relational fault, for the following compound predicate. In case it is possible you can simplify the condition:

$$a \geq b \wedge \neg((a = b) \vee (c \geq b + 5)) \tag{1}$$

$$(x^2 \geq 0 \wedge x^2 y \geq 5z) \vee x^2 > y \tag{2}$$

Our company is going to develop a communication system that has to abide by the following specification (protocol):

1. Initiallly the system waits a message that can include an integer betwenn the value 0 and 100 and then it behaves accordingly to the following rules:
   - In case the received value is smaller or equal to 50 the system output message `ack` and then it moves at point 2
   - In case a value between 51 and 100 is received the system output message `ack` and it moves at point 3
2. if the system receives message `msg1` it outputs message `error` and it moves to point 4 while if it receives message `msg2` it outputs message `ack` and it moves to point 3
3. if the system receives message `msg2` it outputs message `error` and it moves to point 5 while if it receives message `msg1` it outputs message `ack` and it moves to point 2
4. if the system receives message `msg1` it outputs the message `ack` and it goes to 4. At receiving `msg2` the system outputs message `ack` and it moves back to point 2.
5. if the system receives message `msg2` it outputs the message `ack` and it goes to 5. At receiving `msg1` the system outputs message `ack` and it moves to 3.

Select the test derivation stategy that you consider best suited for testing the system to be implemented.

Our company is going to develop a system that has to run according to the following possible configuration parameters:

- Operating System: Linux, Windows
- Browser: Chrome, Edge
- DBMS: MySQL, PostgreSQL
- Web Server: IIS, Apache
- Business Logic Container: ISAPI, Tomcat

Derive a test set according using the most suitable approach among the ones presented in the course. In the generation consider that there are some constraints that have to be respected:

- It is not possible to generate a configuration of a system using the OS Linux and the Web Server IIS
- The container ISAPI can be used only with the web server IIS and equally the Tomcat container can be used only with the Apache Web Server
- The Apache, Postgres combination is not available on a Windows machine for which the connector is not available

Example

Consider a program conceived to satisfy the following requirements:

R_1: Given coordinate position `x`, `y`, and `z`, and a direction value *d*, the program must invoke one of the three functions `fire-1`, `fire-2`, and `fire-3` as per conditions below:

- $R_{1,1}$: Invoke `fire-1` when (`x<y`) `and` (`z*z>y`) `and` (prev="East") where *prev* and *current* denote, respectively, the previous and current values of *d*.
- $R_{1,2}$: Invoke `fire-2` when (`x<y`) `and` (`z*z`$\leq$`y`) `or` (current="South")
- $R_{1,3}$: Invoke `fire-3` when none of the two conditions above is `true`

R_2: The invocation described above must continue until an input Boolean variable becomes `true`

- Select a generation strategy to "carefully" test the system

A possible Source Code

Consider the following code and provide an evaluation for the Condition/decision coverage obtained by the defined test suite:

```
begin
float x,y,z; direction d; string prev,current; bool done;
input(done); current ='North';
while(!done) {
  input(d); prev=current;current=f(d); input(x,y,z);
  if ((x<y) and (z*z>y) and (prev=='East'))
    fire-1(x,y);
  else
     if ((x<y) and (z*z <= y) or (current == 'South'))
       fire-2(x,y);
     else {
       fire-3(x,y);
       input(done); }
}
output('Firing completed');
end
```

Improve the Test suite

. . . continue

Given the code shown in the previous slide try to derive a test suite satisfying the MC/DC coverage criterion

Miscellanea

- Given a set of requirements apply domain partitioning
- Combinatorial approaches
- Build a data flow graph
- Questions to be synthetically answered
- Combinations of different approaches
- ...