

Assignment Report

CS 639: Program Analysis, Verification And Testing

Assignment #3: Program Synthesis using Symbolic Execution

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Problem Statement- In this assignment, you are given two programs P1 and P2. You are to find constant assignments to variables in P1 such that it becomes semantically equivalent to P2.

IMPLEMENTATIONS:

In this assignment, we are to compare two programs so we first make a .json file of both programs. The .json file contains information about our program. It is a dictionary that contains information on parameters , constant parameters , coverage, PC value, constraints covered of all possible paths.

From the two .json files we check for equivalent input. For the same input, we pick constraints and assignments corresponding to both files equate them and put them in solver function to get the values of c1 and c2.

Limitations

-gives no output when the constraint is in condition

These codes are to call the solver:

```
solve ( s.s.assertions())
```

Code to add all the symbolic variables:

```
for i in testData["1"]["params"]:  
    s.addSymbVar(i)
```

TEST CASES:

1.

Eqtest1:

:y = :x

if :x <= 42 [

 :y = :y + :c1

]

:y = :y + :c2

Eqtest2:

:y = :x

if :x > 42 [

 :y = :y + 40

] else [

 :y = :y + 22

]

2.

Eqtest1:

if :x <= :y [

 :y = :y + :c1

]

:y = :y + :c2

Eqtest2:

if :x > :y [

 :y = :y + 40

] else [

 :y = :y + 22

]

3.

Eqtest1:

```
:k = 0
if(:x > 70)[
    :k = :k + :c1
]
else[
    :k = :k + :c2
]
if(:y > 500)[
    :k = :k + :c3
]
else[
    :k = :k + :c4
]
:k = :k + :c5
```

Eqtest2:

```
:k = 0
if(:x > 70)[
    :k = :k + 39
]
else[
    :k = :k + 100
]
if(:y > 500)[
    :k = :k + 76
]
else[
    :k = :k + 90
]
:k = :k + 10
```

4.

Eqtest1:

```
:k = 0
if(:x > 100)[
    :k = :k + :c1
]
else[
    :k = :k + :c2
]
```

Eqtest2:

```
:k = 0
if(:x > 100)[
    :k = :k + 56
]
else[
    :k = :k + 98
]
:k = :k + 10
```

5.

Eqtest1:

```
:k = 0
if(:x > 10)[
    :k = :k + :c1
]
else[
    if(:x > 20)[
        :k = :x + :y + :c1
        :x = :y
    ]
    :k = :k + :c2
]
```

Eqtest2:

```
:k = 0
if(:x > 10)[
    :k = :k + 2
]
else[
    if(:x>20)[
        :k = :x + :y
        :x = :y
    ]
    :k = :k + 10
]
:k = :k + 1
```

outputs

```
lucifer@Abhisehks-MacBook-Air Submission % python3 symbSubmission.py -b eqtest2.kw -e '["x", "y"]'
[c2 = 40, c1 = -18]
lucifer@Abhisehks-MacBook-Air Submission % python3 symbSubmission.py -b eqtest2.kw -e '["x", "y"]'
[c2 = 40, c1 = -18]
lucifer@Abhisehks-MacBook-Air Submission % python3 symbSubmission.py -b eqtest2.kw -e '["x", "y"]'
[c2 = 0, c5 = 0, c4 = 200, c1 = -61, c3 = 186]
lucifer@Abhisehks-MacBook-Air Submission % python3 symbSubmission.py -b eqtest2.kw -e '["x", "y"]'
[c1 = 66, c2 = 108]
lucifer@Abhisehks-MacBook-Air Submission % python3 symbSubmission.py -b eqtest2.kw -e '["x", "y"]'
[c1 = 3, c2 = 11]
lucifer@Abhisehks-MacBook-Air Submission % █
```