Program Analysis Verification And Testing

(CS 639)

ASSIGNMENT - 2

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Objective:

We are given two programs P1 and P2. You are to find constant assignments to variables in P1 (given using -c flag) such that it becomes semantically equivalent to P2.

Implementation:

We have implemented the checkEq() function , in that we are performing symbolic execution on programs and finding the value of constants on which both programs will work the same.

Loading Test Data:

We are loading test data from JSON files, testData.json and testData1.json, using the json module and storing them in the testData and testData1 dictionaries, respectively.

Defining Z3 Variables:

We define several Z3 integer variables using Int('var_name') for variables like p, q, r, s,t,u,v,w,x,y,z etc., which represent symbolic variables. We are using z3 solver for solving equations.

Processing Test Data:

We process the test data dictionaries to extract parameter values and symbolic encodings from the tesdata.son file with no holes. We create lists of equations (input_eq and output_eq) based on the parameter values and symbolic encodings.
And extract constraints and equations from test data1.json file with holes , and store those constraints and equations in constraint and eq lists respectively.

Constraint Processing:

We process constraints from the testData dictionary, splitting them into individual constraints and converting them into Z3 expressions. These constraints are stored in the constraint list.

Solving using Z3 Solver :

We iterate through the test cases and use Z3 solvers (s1 and s2) to check the satisfiability of the input conditions and the output symbolic encodings while considering constraints we are solving satisfiability input and constraints , if conditions satisfy we will make the equations of using file with holes and not holes (from output_eq and eq lists) anding giving those equations to another solver s2. Which is returning the value of constant parameter on which program is giving the same output , s2 solver will return “Not Satisfied” if there are no values of constant parameter on which programs are giving the same output.

Assumptions

1. The tool assumes that programs P1 and P2 are provided in a specific format compatible with the tool’s interface, and the functions.
2. It assumes that the symbolic variables, constraints, and assignments are specified using the correct syntax as demonstrated in the provided code snippet.
3. The tool assumes that the input programs are free from syntax errors and conform to the expected format.

Limitation :

1. Use only p,q,r,s,t,u,v,w,x,y,z for giving inputs and c1,c2,c3,c4,c5,c6,c7 ,c8,c9,c10 for constant parameters.
2. Can work on programs which take a maximum of 11 inputs and 10 constant parameters.
3. The Names of the inputs in both programs should be the same.
4. Works for only the same structural programs.