



EVALUATING CODE-BASED TEST INPUT GENERATOR TOOLS

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Code-based test generation

```

int fun1(int a, int b){
    if (a == 0){
1      printf(ERROR_MSG);
2      return -1;
    }
    if (b > a)
3      return b*a + 5;
    else
4      return (a+b) / 2;
}

```

#	a	b	stm
1	0	*	1, 2
2	a!=0	b > a	3
3	a!=0	b =< a	4

Code-based test generator tools

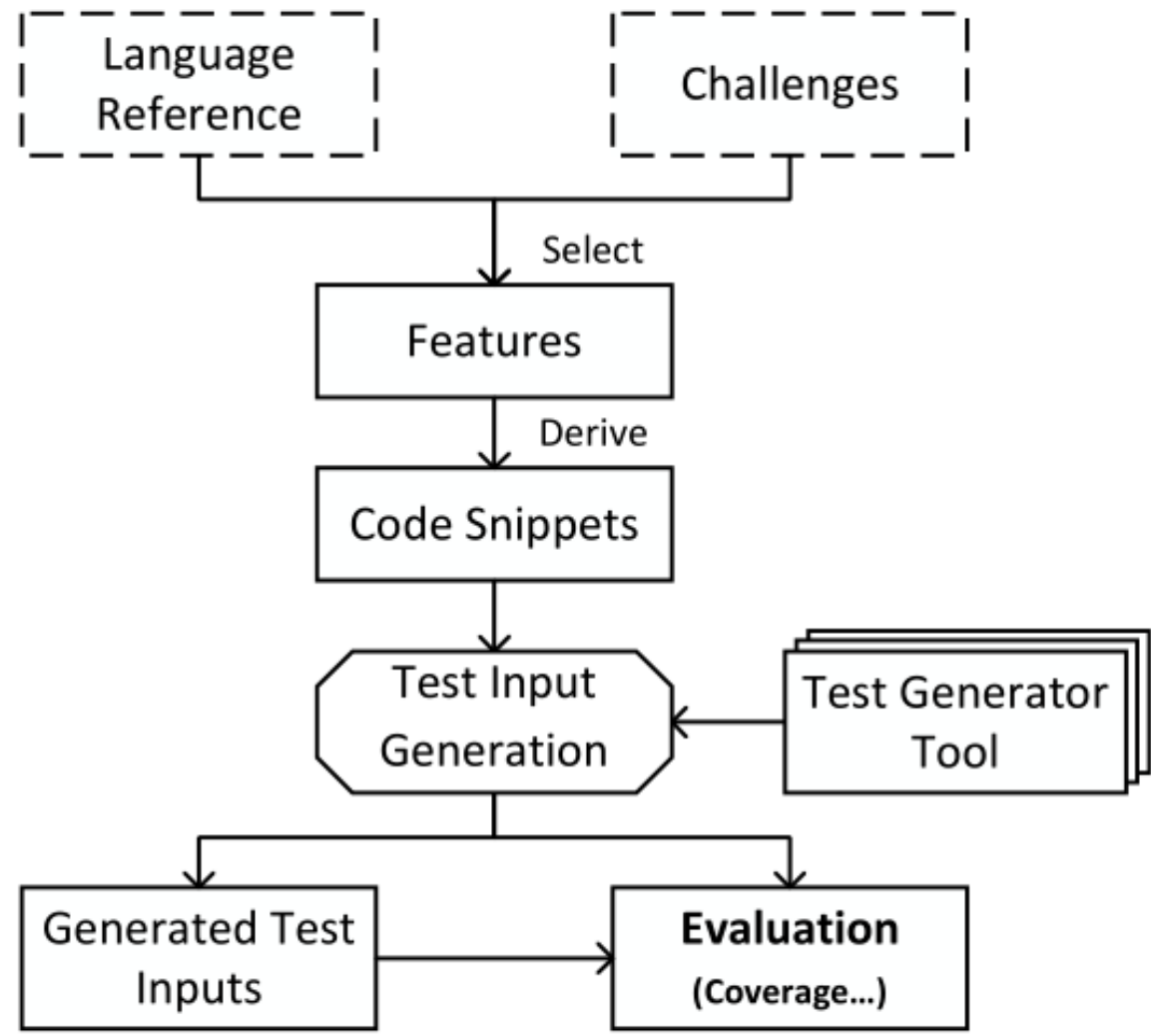


Detailed list of tools: <http://mit.bme.hu/~micskeiz/pages/cbtg.html>

Motivation

How can the different
test input generator tools
be **compared** and **evaluated**?

APPROACH



Core features

- Types, Operators
- Conditionals, Loops
- Arrays, Functions

Basic

- Structure usage
- Nested structures
- ...

Structures

- Object usage
- Inheritance, interfaces
- ...

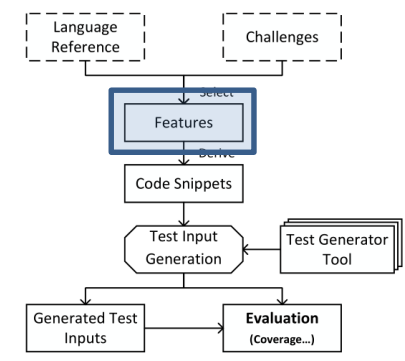
Objects

- Generic functions
- Generic objects
- ...

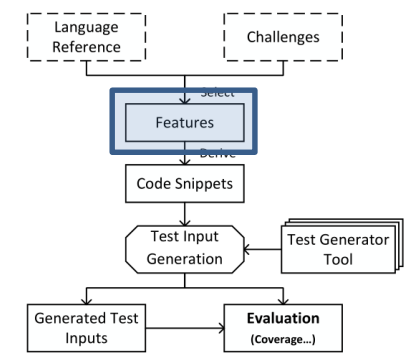
Generics

- Arithmetic, Strings
- Collections
- ...

Library



Extra features



- Stdin, Properties
- Files, Sockets

Environment

- Threads, Locks
- Indeterminacy

Multi-threading

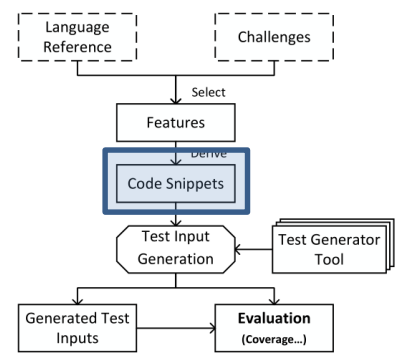
- Classes, Methods

Reflection

- Native functions

Native code

Snippets



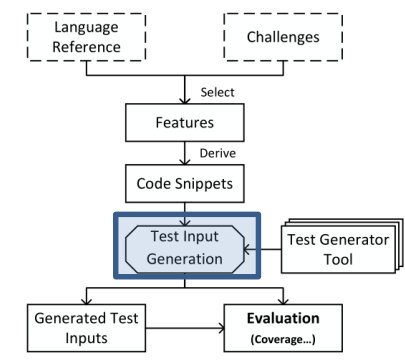
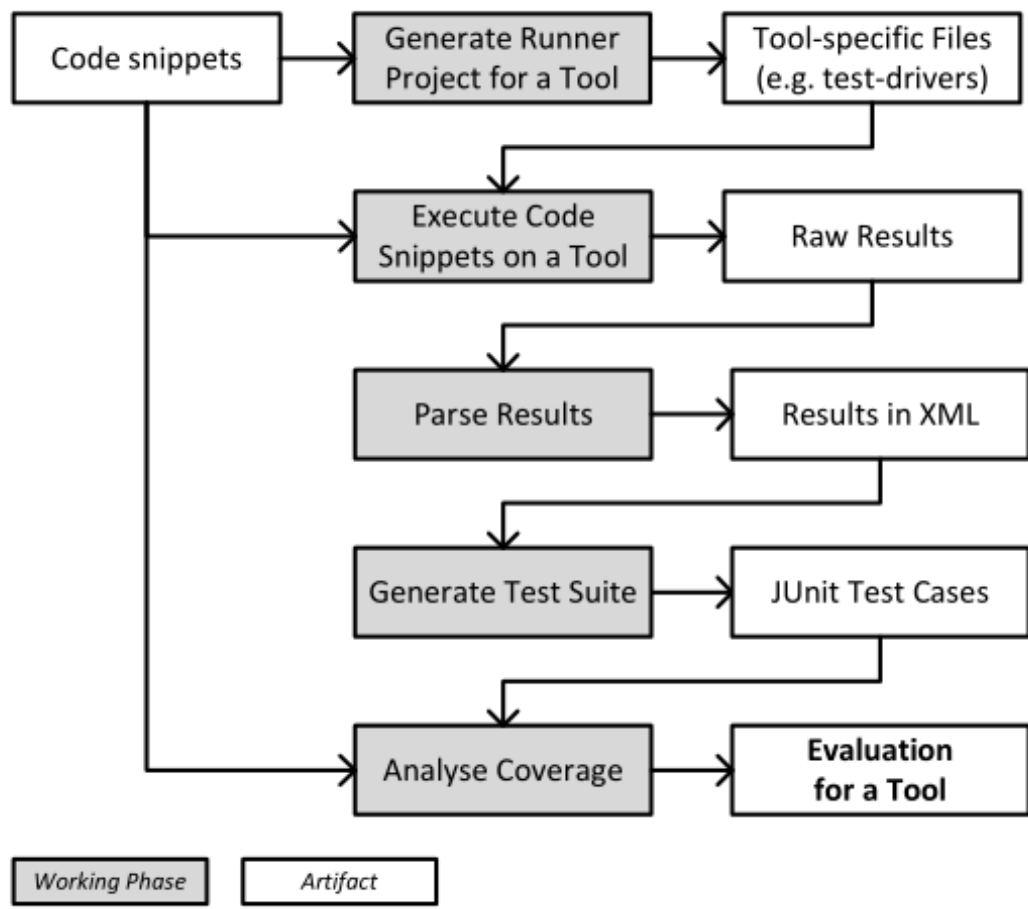
```
public static int guessObject(SimpleObject obj) {  
    if (obj == null) {  
        return -1;  
    }  
  
    if (obj.getOperationCount() == 2 && obj.getResult() == 3) {  
        return 1;  
    } else {  
        return 0;  
    }  
}
```

300 core snippets

63 extra snippets

Manual sample inputs

Execution (SETTE framework)

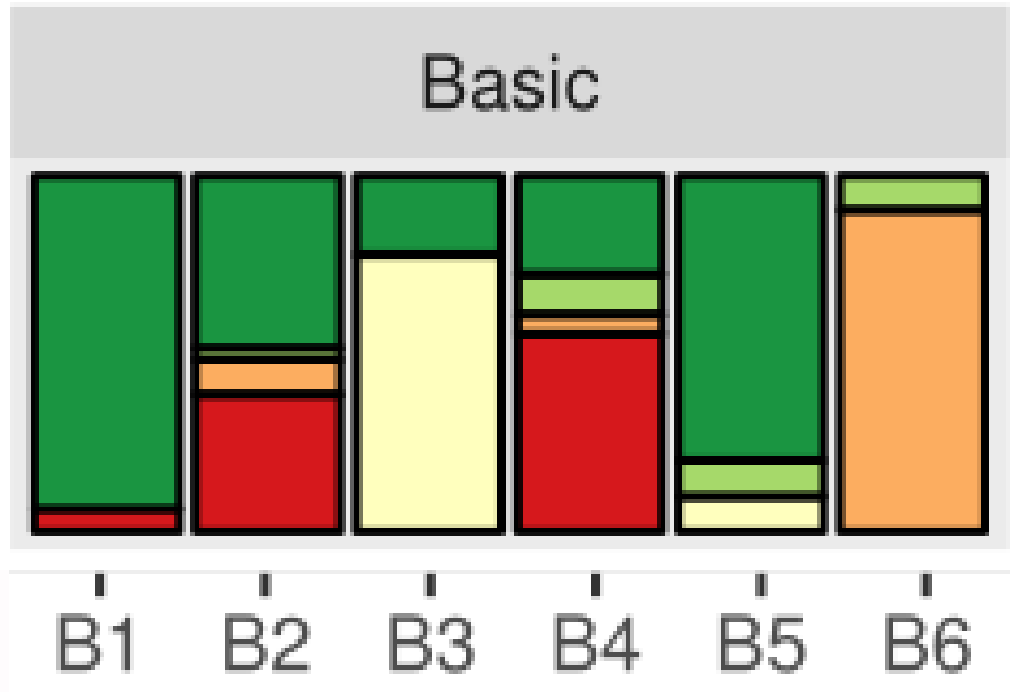


RESULTS

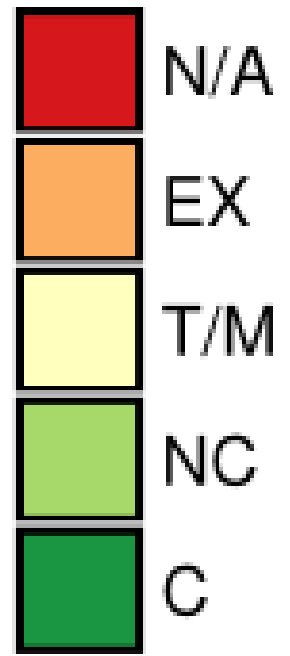
Experiments

Tools	Status	Measures	Setup
<ul style="list-style-type: none">• CATG• EvoSuite• IntelliTest• jPET• SPF• Randoop	<ul style="list-style-type: none">• N/A• EX• T/M• NC• C	<ul style="list-style-type: none">• Coverage• Size• Duration• Mutation score	<ul style="list-style-type: none">• 30s limit• Repeat 10x• Variable time

Overview of capabilities (Status)



Legend

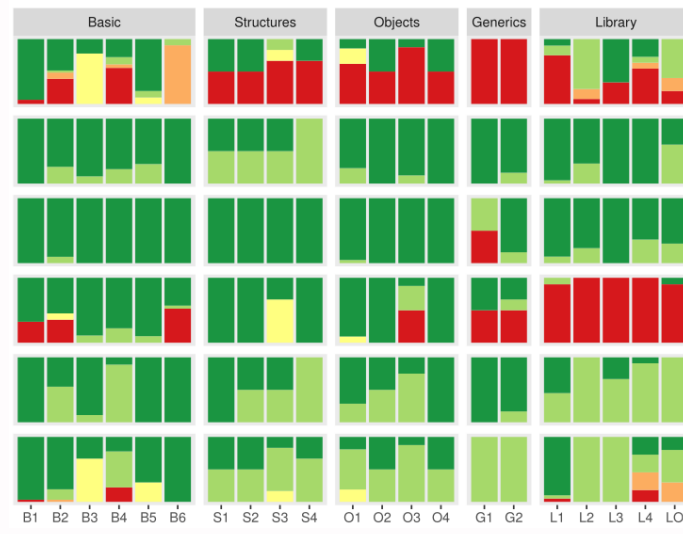
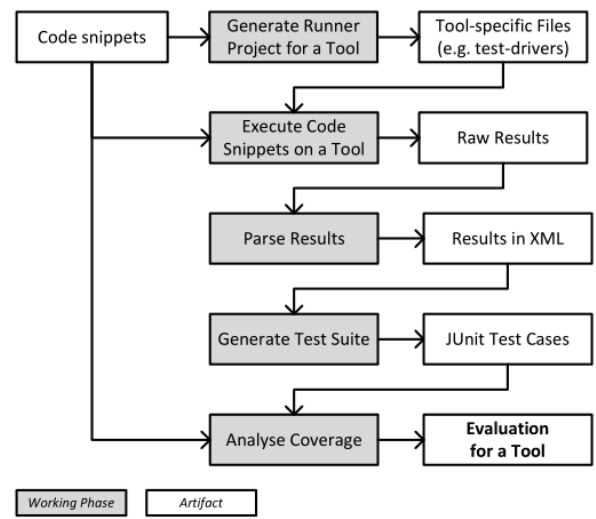
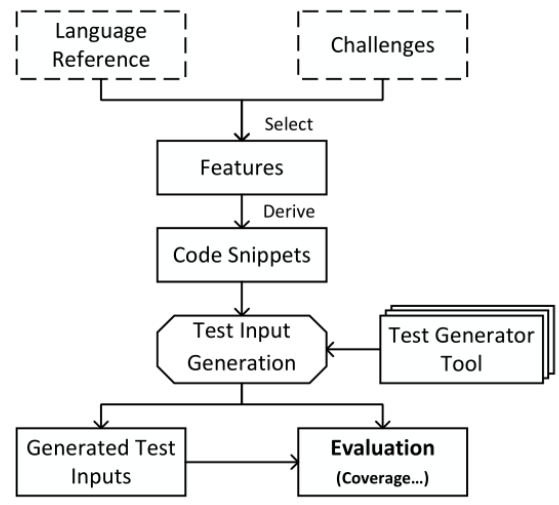




Summary of insights

- **Duration:** 20 min – 200 min
 - Randoop, EvoSuite use all available time
- **Size:**
 - 700 (manual) < 1000 (IntelliTest) << 270 000 (Randoop)
- **Extra snippets**
 - EvoSuite: custom sandbox
 - Otherwise significant challenge

Summary



All code and results are available:
<http://sette-testing.github.io>