Automated Generalization and Refinement of Code Templates with Ekeko/X

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Motivation

- Code templates lower the learning curve of specifying program searches/transformations
- Hard to master: not always evident to produce only the desired match results

Ekeko/X

- Our template-based search/transformation tool
 - Search and transform Eclipse Java projects
 - Not just syntactic constraints, but semantic ones too

The Ekeko/X Program Transformation Tool

Coen De Roover and Katsuro Inoue

14th IEEE International Working Conference on Source Code Analysis and Manipulation 2014, Tool Demo

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```
[public void acceptVisitor(ComponentVisitor v) ...]  
@[(invoked-by ?x)]
```

```
[...acceptVisitor(...)]@[(equals ?x)]
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How to create this template

```
public void acceptVisitor(ComponentVisitor v) {  
    Iterator<Component> i=elements.iterator();  
    while (i.hasNext()) {  
        Component comp=(Component)i.next();  
        comp.acceptVisitor(v);  
    }  
}  
  
cs.acceptVisitor(vstor);
```

How to create this template

```
public void acceptVisitor(...) ...
```

```
comp.acceptvisitor(v);
```

Too few matches!

How to create this template

```
public void acceptVisitor(...) ...  
....acceptvisitor(...);
```

Too *many* matches!

Recommending changes

- How to assist users if a template produces too few/many matches?
- Genetic search approach: Find a sequence of mutations leading to more desired matches
- User marks what is desired/undesired

Genetic algorithm

Initial template

Genetic algorithm

Initial template

Current population

Genetic algorithm

Genetic algorithm

Genetic algorithm

Genetic algorithm

Genetic algorithm

Fitness function

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- Number between 0 and 1 , based on two components:
 - **F-score:** how many (un)desired matches?
 - In terms of true/false pos. & false neg.
 - Coarse-grained
 - **Partial score:**
 - For each desired snippet, how close is the template to finding it?
 - Fine-grained

Demo

Summary

- Assist Ekeko/X users by means of a genetic search algorithm that can recommend template mutations
- Future work: Towards transformations
- Find Ekeko/X on Github:

github.com/cderoove/damp.ekeko.snippets