CodeHint: Dynamic and Interactive Synthesis of Code Snippets

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Motivation
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Test cases

Desired type

Specification
CodeHint: Autocomplete for the modern age

- Autocomplete is useful but very limited.
- Our improvements:
  - Being dynamic
  - General specifications
  - Synthesis
Demo
Overview

Source code → Test case → Specification

CodeHint

Refine

Candidates
Benefits of dynamicity
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• Filter crashing code snippets.
Benefits of dynamicity

- Filter crashing code snippets.
- Determine exact value.
  - `((JFrame)t.getTopLevelAncestor()).getJMenuBar()`
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  - `((JFrame)t.getTopLevelAncestor()).getJMenuBar()`
- Show users concrete results.
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  - `((JFrame)t.getTopLevelAncestor()).getJMenuBar()`
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Synthesis from specifications

- Context-independent
- Context-dependent

Strength

Weak  |  Strength  |  Strong
Synthesis from specifications

Context-dependence

Context-independent

API exploration

Static type
rv instanceof JMenuBar

Program synthesis

Correctness condition
isSorted(array)

Weak

Strength

Strong

Value demonstrations
x == 42

Programming by demonstration
Synthesis from specifications

- Context-independent
  - API exploration
    - Static type
      - `rv instanceof JMenuBar`
  - Program synthesis
    - Correctness condition
      - `isSorted(array)`

- Context-dependent
  - Programming by demonstration
    - Value demonstrations
      - `x.toString().contains("Eve")`
  - Weak
    - `x == 42`
Mobile!
User studies

- Completed two user studies with 28 subjects.
- Found statistically-significant productivity improvements.
  - Fewer bugs and more tasks completed in less time.
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• Synthesis
  – Dynamic
  – General specifications
CodeHint: Dynamic and Interactive Synthesis of Code Snippets

- Synthesis
  - Dynamic
  - General specifications

Thanks!
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https://github.com/jgalenson/codehint