CS409
Software Testing

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Slides adapted from https://bitbucket.org/gatoatigrado/sketch-frontend/wiki/Tutorial

Administrative Info: Schedule

- Dec 18: MP3 due
- Dec 21 Lecture: Final Exam Review
- Dec 21 Lab: Final Presentation (All members need to attend and present)
- Dec 25: Final Report due
- Dec 25: All lab assignments due
- Jan 4: Final exam at 16:30-18:30 荔园2栋101（Lychee Hill, Building 2, Room 101）

Administrative Info

All lab assignments due on 25 December 2020, 11.59pm:

Remember to write the answers for all question in README.md and include your name and student id for all assignments:

- Android-graph Lab: https://classroom.github.com/a/-wVDOh_I
- Fuzzing Lab: https://classroom.github.com/a/WOPbCjnZ
- Graph Lab: https://classroom.github.com/a/rkg8YIET
- ISP-Lab(group assignment): https://classroom.github.com/g/tCTOdiKH
- Junit-Lab1: https://classroom.github.com/a/TnI4NoVY
- Junit2: https://classroom.github.com/a/8TQabGyd
- Logic coverage lab: https://classroom.github.com/a/6i6xSkX7
- Logic source code lab: https://classroom.github.com/a/WbKNTVOr
- Monkey delta lab: https://classroom.github.com/a/yq3B85aj
- TDD lab(group assignment): https://classroom.github.com/g/Rf2Mkwo7

Synthesis Technique learned during lecture

- Programming by Example
- Syntax-guided Synthesis
- Counter-example guided inductive synthesis
- Programming by Sketching

FlashFill

Modern Synthesizer for End Users

- Uses Programming by Example

Using FlashFill to extract field

- Go to https://office.live.com/start/Excel.aspx or use your local Excel/ WPS
- Copy the following table to a spreadsheet
- Extract the second fields(e.g., 12345 nkki9)
  - Hint: Use FlashFill (智能填充)
    - Give one example and Select Data-> FlashFill

CFYKV/12345/CFYKV	
JSDFF/2326/CFKG	
CFKG/6452/GEETAT	
GRYGETS/135466/RERAR	
SWFARAR/1257/EGSAT	

Handling duplicate

- Go to https://office.live.com/start/Excel.aspx or use your local Excel/ WPS
- Copy the following table to a spreadsheet
- Extract the third fields
  - Hint: Use FlashFill
    - Give one example in the first row and Select Data-> FlashFill.
      - What is the output?

CFYKV/12345/CFYKV	
JSDFF/2326/CFKG	
CFKG/6452/GEETAT	
GRYGETS/135466/RERAR	
SWFARAR/1257/EGSAT	

Synquid

Modern Synthesizer

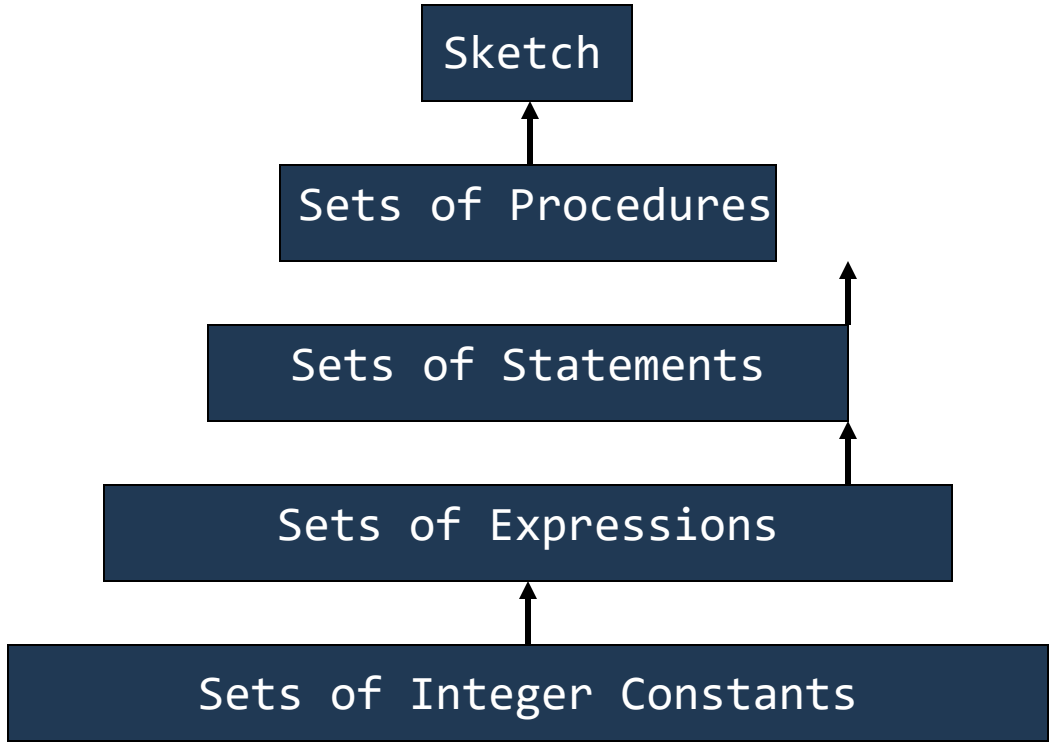
Holes

- Holes are placeholders for the synthesizer
  - synthesizer replaces hole with concrete code fragment
  - fragment must come from a set defined by the user

Defining sets of code fragments is the key to Sketching effectively

Defining sets of code fragments

- Sets are defined hierarchically
  - a component is a set of possible programs
  - the synthesizer will chose a correct program from the set



Example Synthesizer: Program with Holes

```
type Nat = {Int | _v >= 0}

neg :: x: Nat -> {Nat | _v == x - x}
identity :: x: Nat -> {Nat | _v == x }
double :: x: Nat -> {Nat | _v == x * 2}
triple :: x: Nat -> {Nat | _v == x * 3}


doubleSpec :: x: Nat -> {Nat | _v == x + x}
doubleSpec = ??
```

Components to try

?? represents program hole

specifies the programmer's requirements

1. Copy and paste this to http://comcom.csail.mit.edu/comcom/#welcome->Synquid
2. According to the Synquid synthesizer, what is the value of ??

References

- https://bitbucket.org/gatoatigrado/sketch-frontend/wiki/Home

MP3

MP3 due on **18 December 2020** (this week) at 11.59pm.

- Need you to debug and repair open issues in your app!
  - Don’t forget to include the link for each of the selected issues (for App A and from similar issue)

Final Presentation

- Next week due during lab session! All members need to attend and present!