
CS 440 – Programming languages and translators

Week 12

Reading:

1. Recommended Book: *Programming Language Pragmatics*
 - Chapter 3, especially on 3.3 ~ 3.4 section.
 - Chapter 8, especially on 8.2, 8.3, 8.6 section.
2. Study a reference web page for beginning – “A page about call/cc” (Reference [8]).

Objectives:

1. To learn the concepts of Variable binding and Parameter passing by quick review.
2. To learn what the Continuous Passing Style is.
3. To learn the basic concept of Call/CC in this week and then deeper in the next.

Concepts:

1. Variable Binding, Parameter Passing
2. Continuous Passing Style
3. Call/CC

Outlines:

1. Variable Binding, Parameter Passing
2. Continuous Passing Style
3. Call/CC

Reference:

1. http://en.wikipedia.org/wiki/Free_variables_and_bound_variables
2. <http://www.scheme.com/tspl2d/binding.html>
3. http://en.wikipedia.org/wiki/Scope_%28programming%29
4. <http://brpreiss.com/books/opus4/html/page591.html>
5. <http://www.cs.wisc.edu/~hasti/cs368/CppTutorial/NOTES/PARAMS.html>
6. http://en.wikipedia.org/wiki/Continuation-passing_style
7. <http://web.comlab.ox.ac.uk/geomlab/teachers.html>
8. <http://www.madore.org/~david/computers/callcc.html>

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1. Variable Binding, Parameter Passing

- Review and remind the contents taught in the last week
- Variable Binding
 - ◆ The definition of Variable Binding
 - ◆ The definition of Scope
 - ◆ Variable Binding vs Scope
 - ◆ Small examples to review
- Parameter Passing
 - ◆ The definition of Parameter Passing
 - ◆ Two ways of parameter passing – by value and by reference
 - ◆ Examples to review this concepts and the operation.

2. Continuous Passing Style

- Description of Continuous Passing Style
 - ◆ CPS
 - ◆ Functional programming
 - ◆ Control is passed in the form of a continuation.
- Examples
 - ◆ In C/C++ language
 - ◆ In Scheme language
- Tail calls
 - ◆ No implicit continuation
 - ◆ Every call is a tail call.
 - ◆ Tail call optimization (TCO)
- Continuous Passing Style vs TCO
 - ◆ Cause the explicit continuation to grow during recursion.
 - ◆ Also cause the function stack.
 - ◆ Both eliminate the concept of an implicit function return.
- Advantages of using CPS
 - ◆ Remove recursion from the program
 - ◆ The top level can repeatedly apply the continuation in the current result.

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3. Call/CC

- Basic Introduction
 - ◆ Call/CC: call with current continuation
 - ◆ Not a static *goto* instruction, but dynamic.
 - ◆ Capture the current continuation and apply its argument to this.
 - ◆ Small example to introduce how it works.
- Hint for next week
 - ◆ More detail knowledge of its operation
 - ◆ More examples for its operation and the application.