Lab 3: Lazy Evaluation

January 10, 2024

The goal of this lab is to modify the substitution evaluation, in applicative order from Lab 2, and implement lazy evaluation.

1 Get Started

To get started, just copy the `applicative_order.py` into a Lab3 directory, and name it `applicative_order_lazy.py`:

```
mkdir Lab3
cp Lab2/applicative_order.py Lab3/applicative_order_lazy.py
```

2 Instructions

The implementation of a lazy evaluator, with the substitution model, is quiet straight forward. When doing an assignment, instead of evaluating the value, we can save the AST tree corresponding to the calculation in the value store, and the environment where the value need to be executed. Then when we want to get a value, we can simply check if the value was saved as an AST, or if it needs to be evaluated. Once it has been evaluated, the result of the evaluation can be stored in the value store, instead of the value.

To complete this lab, you might need to modify the `Value` class.

You will notice that, with lazy evaluation, the *applicative order* now has similar evaluation semantic as the *normal order*.

3 Test

You can test your evaluator with:

```
tdde55_lab3_tests dir_to_lab3
```

The test suite can be found in `/courses/TDDE55/Labs/Lab3/Tests/evaluator.py`. The following test cases have been defined:

- `test_00_literal` test an expression with just a number
- `test_01_arithmetic` test arithmetic
- `test_02_cond` test conditional expression
- `test_03_assignment` test assigning a literal to a named value and computing expression

- `test_04_custom_function` test defining and calling a custom function
- `test_05_custom_function_div_0` test passing an invalid expression as an argument, notice that this test is different from *Lab 1*
- `test_06_custom_high_order_function` test defining a high order function

`test_03_assignment` should be failing, as it now checks that you are not evaluating

You can run a single test case for your evaluator with:

```
tdde55_lab3_tests dir_to_lab3 Evaluator.test_00_literal
```

For instance:

```
tdde55_lab3_tests dir_to_lab3 Evaluator.test_00_literal
```

4 Demonstration

- Make sure the unit test works on the thinlinc or lab computer