

Assignment 2 — Combinators — assigned Monday 9 September — due Wednesday 18 September

Total number of points available on this project is 100. Full credit is equivalent to 100 points.

2.1 Combinators and combinator reduction

This project is an extension of the λ -calculus system of the previous assignment. The goal is to develop a combinator representation of λ -terms and a combinator reduction machine.

For combinatory expressions, we shall use the following ML type:

```
datatype CExpr = K | S | I | B | C | CVar of string | CApplication of CExpr * CExpr
```

Tasks:

1. (50 pts.) Read the handout on combinators. Add combinatory expressions over the combinator base $\{\mathbf{S}, \mathbf{K}, \mathbf{I}, \mathbf{B}, \mathbf{C}\}$. Implement the translation of λ -terms to combinatory expressions according to Curry's algorithm. Test on the translation of the λ -term for \mathbf{Y} , as well as a few other λ -terms. How is the size of the resultant combinatory expression related to the size of the input λ -term?
2. (50 pts.) Implement graph reduction as outlined in the handout. Test on various λ -terms. Report how fast the evaluator works for different inputs or input sizes. *Careful: have you truly achieved the sharing of graph nodes of the kind depicted in the handout? If not, what is the obstacle? What are the repercussions for performance of graph reduction?*

How to turn in

Turn in your code by running `~darko/handin your-file` on a regular UNM CS machine or on *delta*.

You should use whatever filename is appropriate in place of *your-file*. You can put multiple files on the command line, or even directories. Directories will have their entire contents handed in, so please be sure to clean out any cruft.

Remember to submit extensive tests of your programs!

Homework must be accompanied by the following statement: "*I pledge my honor that in the preparation of this assignment I have complied with the University of New Mexico Board of Regents' Policy Manual, including Section 4.8, Academic Dishonesty.*" The manual is available at <http://www.unm.edu/~brpm/index.html>.