

Homework # 7

due October 25

1 Reading

Please read Chapter 11 in your textbook.

2 Problems

Please do the following problems

1. Enums can be seen as a variation on “variants”. Write new evaluation and typing rules (on paper, not SASyLF) for a type T written like `[red,green,blue]` with new syntax:

$$\begin{array}{l}
 t ::= \dots \\
 \quad | \quad n_i \text{ as } [n_1, \dots, n_m] \quad (\text{a new kind of value}), \\
 \quad | \quad \text{case } t \text{ of } n_1 \rightarrow t_1 \mid \dots \mid n_m \rightarrow t_m.
 \end{array}$$

2. Explain informally why these type rules should be sound. (You might wish to write the SASyLF proofs for sum types first; otherwise your explanations may not be convincing!)

3 Proofs

Modify the proofs of type soundness of the simply-typed lambda calculus with “unit” types to add sums (See Figure 11-9). A skeleton file is available which gives the syntax. This file will only work with version “SASyLF 1.0.2 (uwm 2)” or later. You may need to fetch a new JAR file. Your evaluation and types rules should follow the book as closely as possible.

4 Extra

Optionally, add type, evaluation and proof rules for products too. The syntax is defined already.

5 Graduate Students

Read Chapter 12.

Could the proofs in the this chapter be expressed in (i) Twelf, (ii) Coq or (iii) Isabelle/HOL ? What about SASyLF? Explain! Give references/URLs to support your argument.

Which of the extensions in Chapter 11 (1,2,3,4,5,6,7,8,9,10,11,12) preserve normalization? For each, explain in your own words and/or give references/URLs to support your answer.