
HW 5 – Algebraic Datatypes

CS 421 – Fall 2013

Revision 1.0

Assigned September 24, 2013

Due October 1, 2013, 19:59 pm

Extension 48 hours (20% penalty)

1 Change Log

1.0 Initial Release.

2 Turn-In Procedure

Solve the problem below in Ocaml. You must turn in an OCaml file that *must compile* and must contain detailed *comments* on why you wrote the code you did. Your file should be named `hw5.ml`. Your answers to the following questions are to be submitted electronically via the handin script as though an MP. This assignment is named `hw5`.

3 Objectives and Background

The purpose of this HW is to test your understanding of the algebraic datatype system in OCaml.

4 Problems

(25 points) Write an `bool_exp` data type in Ocaml that represents boolean expressions. Specifically, the `bool_exp` data type must be able to represent the following:

- a variable with its name given by a string
- the true boolean constant
- the false boolean constant
- the negation of a boolean expression
- the conjunction of two boolean expressions
- the disjunction of two boolean expressions

Write a function `bool_exp_eval` that takes a boolean expression (of type `bool_exp`, the data type you defined) and an environment (of type `string -> bool`) and evaluates the given boolean expression in the given environment. You may assume, without checking, that the environment maps each name occurring in the boolean expression to either `true` or `false`.

```
# let rec bool_exp_eval e env = ...;  
val bool_exp_eval : bool_exp -> (string -> bool) -> bool = <fun>
```

For example, `bool_exp_eval` should evaluate $(a \wedge b) \vee \neg \top$ in the environment $\{a \mapsto \text{true}, b \mapsto \text{false}\}$ to `false`.