EE249 Design of Embedded Systems
Fall 2007, Homework 2

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Due in class, Nov. 13, Tuesday, 10% off for up to 1 week late

Note: The first two questions are about Esterel programming. We have shown in the lab that how to use Esterel compiler. You can use the official version from http://www-sop.inria.fr/esterel.org/Html/Downloads/Soft/SoftwareDownloads.htm or the Columbia Esterel Compiler from http://www1.cs.columbia.edu/~sedwards/cec/.
Please send your Esterel source files as email attachments (for testing) and hand in a printed copy to me (for grading).

1. (30 points) Write an Esterel program that implements the simplified seat-belt example: when the key is turned on, a timer is started. When the timer expires, an alarm beeps for 5 seconds (here for simplification, you can simply use an end_timer event to indicate that 5 seconds have passed), or until the seat belt has been fastened, or until the key has been turned off.

2. (40 points) Write an Esterel program that implements the following problem: as shown in Figure 1, M1 and M2 are two FSMs. x and y are two inputs of M1; e is the output of M1 and input of M2; z is the output of M2. The overall specification is that *e is equal to 1 at clock cycle t_i if x and y were carrying the same Boolean value at the previous cycle t_{i-1}. z is equal to 1 at cycle t_i if the output value of e at cycle t_i is equal to the output value of e at cycle t_{i-1}*.

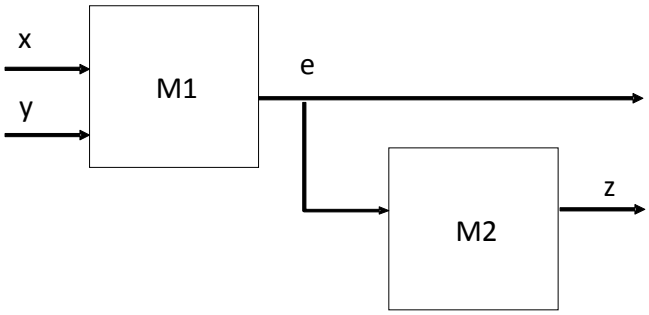

Figure 1: Block diagram for Problem 2

3. (30 points, from Prof. Reinhard von Hanxleden)
   Consider a node with the signature

   node N (x: bool) returns (y: bool)

   a. Give the clocks for all sub-expressions of

      current (current (N (x when c1)) when c2)

      where x, c1, and c2 all run on the basic clock.

   b. Show that in general, this expression is not equal to

      current (current (N (x) when c1) when c2)