CS 745 Fall 2017

Assignment # 1

Due in class on Oct. 12th

The questions all have the same weight.

Part 0. Recall the program skeleton, P_i, for Process i in the dining philosophers example given in class. The intention was that for the program P = || P_i where i ranges over [1..n], each P_i requires exclusive access to all it's shared resources when it is in local state E.

The program discussed in class is run on a ring network. Consider running the program on a wrap around mesh. There are connections going along the rows, and there are connections going up and down the columns. For instance, the mesh might have 3 rows and 4 columns. The mesh is `wrap around' in the sense that there is a connection going from the right, at the end of each row, back to the left at the beginning of the row. Similarly, the the mesh is wrap around from the top of each column to the bottom of the column.

a) Give program skeletons for an `arbitrary' philosopher.

b) If P(i) is the program model for the philosopher given in part a) above, how many states does the model M(P(i)) have when there are 3 rows and 4 columns?

c) How many states are there in the mesh? Can you generalize your answer to an m by n mesh?

d) Give a correctness specification for the philosophers guaranteeing that only `appropriate access' to each shared resource is allowed.

e) Give a correctness specification for the philosophers guaranteeing that any process that asks for access to the shared resource is eventually granted such access.

f) Write your answers in parts d) and e) to CTL, LTL or CTL* as appropriate.

g) Does the program given in part a) generate models that satisfy the specifications in part f)? Explain your answer.

Part 1. Say that two temporal logic state formulae f and g are equivalent on finite
structures, if for all (finite) structures M = (S, R, L), for all states s in S,
M, s |= f iff M, s |= g.

a) Show that for all atoms p the CTL formula AFp is
equivalent to the CTL formula p v AXAFp.

b) Is the formula EFEGp equivalent to EFGp? Explain your answer.

c) Is the formula EGEFp equivalent to EGFp? Explain your answer.