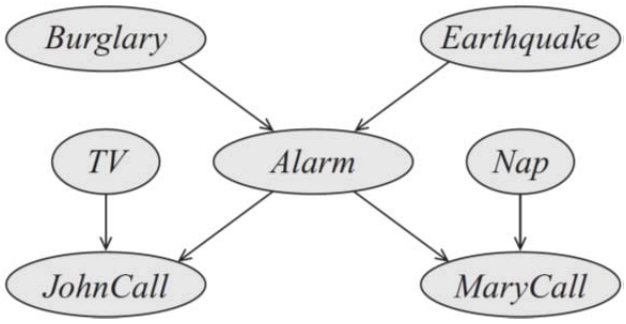
HOMEWORK ASSIGNMENT #3

DUE: Monday, February 23, 2015
CSCI573: Probabilistic Reasoning, Prof. Nevatia
Spring Semester, 2015

1. Show that the variable elimination on polytrees has computational complexity that is linear in the "size" of the network; size is defined in terms of the number of entries in the CPTs so the cost grows exponentially with the number of parents of a node.
As for any other graph structure, the complexity depends on elimination order. The task is to derive an algorithm that achieves linear complexity (as defined above) and applies to any given polytree.

2. Consider the "Alarm" network of Fig 3.14 (reproduced below).



Let CPDs associated with this network be as follows:

P (B = T) = 0.002; P (E = T) = 0.001; P (TV = T) = 0.8; P (NAP = T) = 0.25.

B	E	P(A) = T
T	T	0.93
T	F	0.85
F	T	0.6
F	F	.002

TV	Alarm	P(JohnCalls) = T
T	T	0.45
T	F	0.03
F	T	0.88
F	F	.02

NAP	Alarm	P(MaryCalls) = T
T	T	0.25
T	F	0.001
F	T	0.75
F	F	.01

Now compute probability of Earthquake given that JohnCalls is True and MaryCalls is False. Use the Variable Elimination algorithm described in the book (section 9.3, Algorithm 9.2).

Note that you are not asked to write a program to compute the answer; however, you may find the numerical calculations easier to carry out by writing a short program or functions to help you compute the desired entities. In either case, you must show all the steps in the calculations (all the intermediate factors that are computed).

You may also use any available BN inference tool to *verify* your answer but the submitted results should be by your own method.