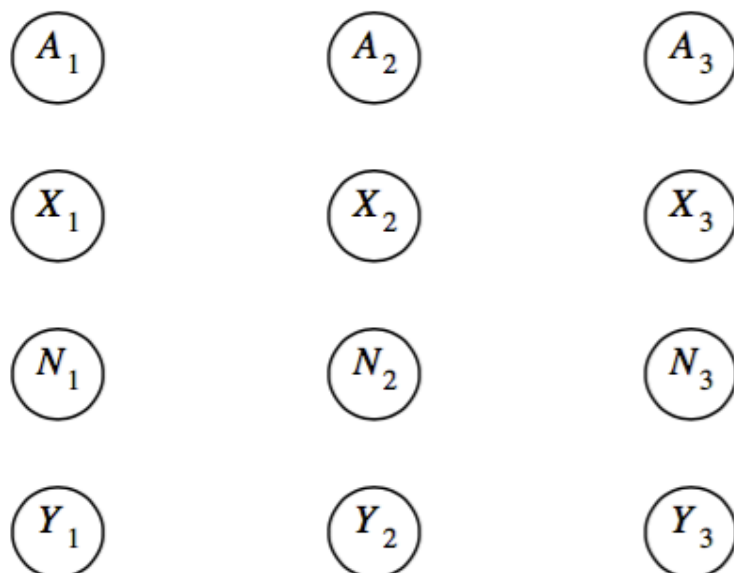


7. (12 pts.) **Dynamic Bayes Nets**

An agent lives in a 3×3 grid world surrounded by walls. (1,1) is at bottom left and (3,1) is at bottom right. The agent's action A can be *left*, *up*, *right*, or *down*. The percept is an integer N indicating the number of adjacent walls. The agent's state is just its (X, Y) position and the prior over X and Y is uniform. At each time step the agent receives a percept and then chooses its action.

- (a) (3) Here are the first three time slices of a dynamic Bayes net. Add links to make the best possible representation of the problem. (You need not add parents for A because the agent chooses its value.)



- (b) (2) Suppose the wall sensor is accurate and the agent's movement is deterministic. Given $N_1 = 1$, $A_1 = \textit{right}$, $N_2 = 2$, where could the agent be at time 2?

- (c) (2) Suppose the wall sensor detects each wall with independent probability $p < 1$, but detects the absence of a wall correctly. Given $N_1 = 1$, $A_1 = \textit{right}$, $N_2 = 1$, where could the agent *not* have been at time 1?

- (d) (2) *True/False*: Given the motion model of part (b) and the sensor model of part (c), it is impossible for the agent ever to know *exactly* where it is with certainty.