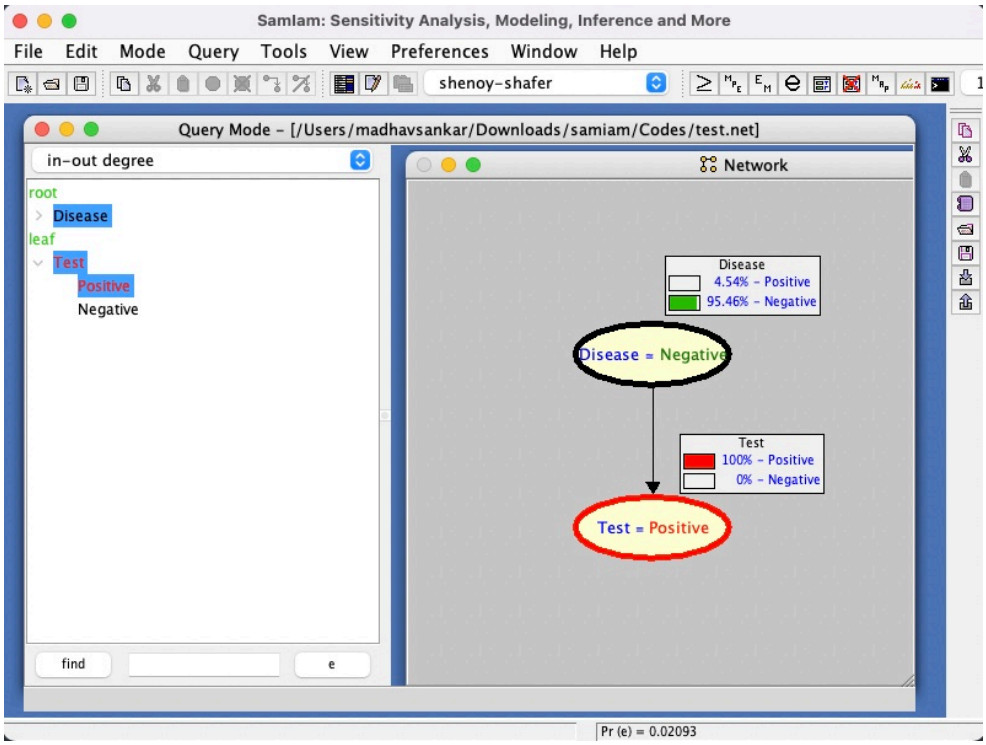
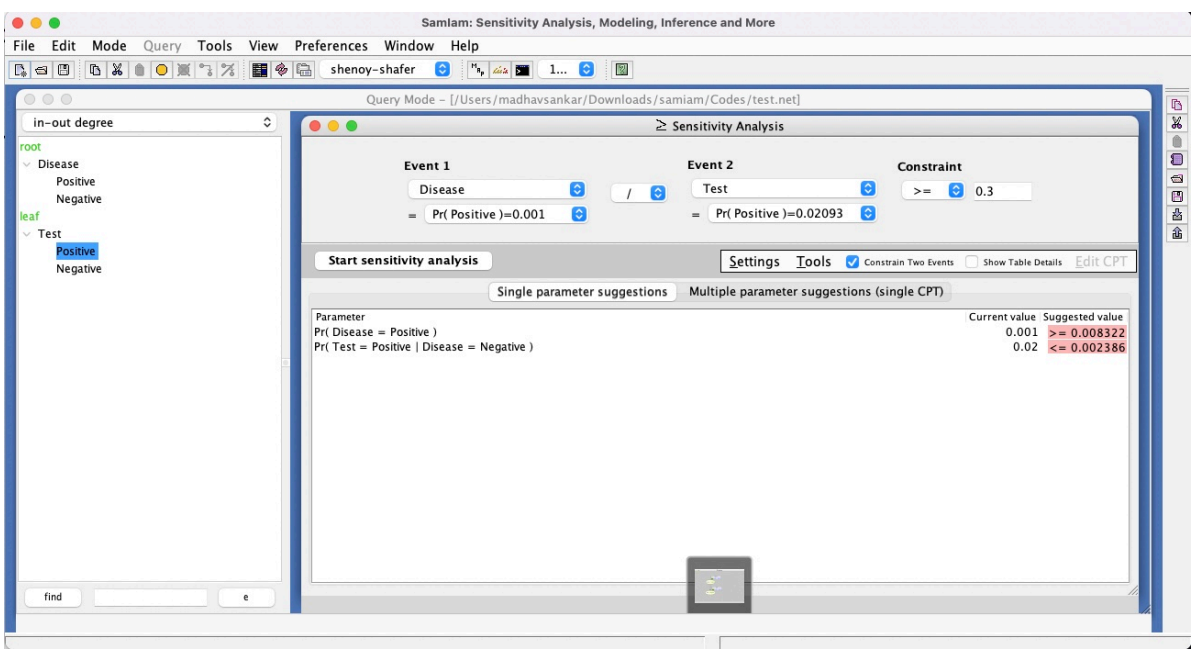
1.



Pr(D|T) does come to be 0.045. This verifies our network.



To ENSURE $Pr(D|T) \geq 0.3$, the following can be done

1. Prior Probability of having the disease:

$$Pr(D = \text{Positive}) \geq 0.008322$$

2. False Positive of the test:

$$Pr(T = \text{Positive} \mid D = \text{Negative}) \leq 0.002386$$

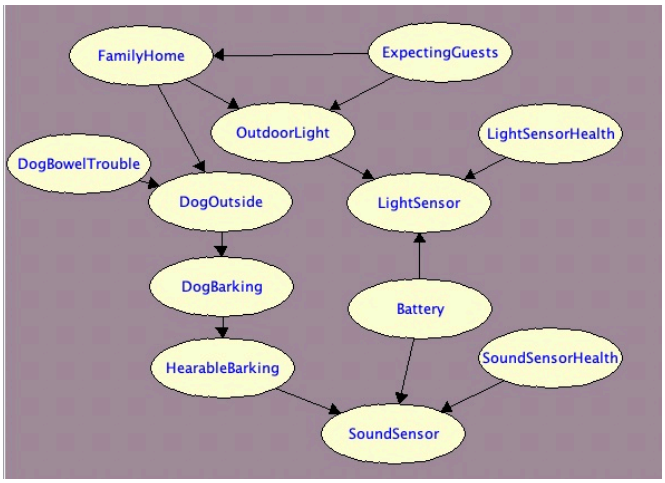
3. False Negative of the test:

Changing this will not help satisfy the constraint of

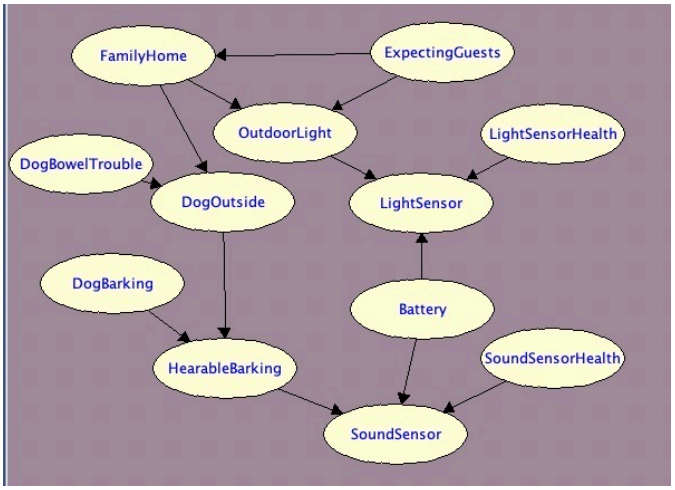
$$Pr(D|T) \geq 0.3$$

2. The DogBarking can be seen as

A: Our DogBarking : Then it depends on whether we leave the dog outside and it impacts if the barking is hearable, giving:



B: Any DogBarking : Then it does not depends on whether we leave the dog outside but it impacts if the barking is hearable, giving:



We have chosen definition A for the network.

Also, we assume FamilyHome depends on whether they are expecting guests. If they are expecting, they would mostly be home.

2. a.

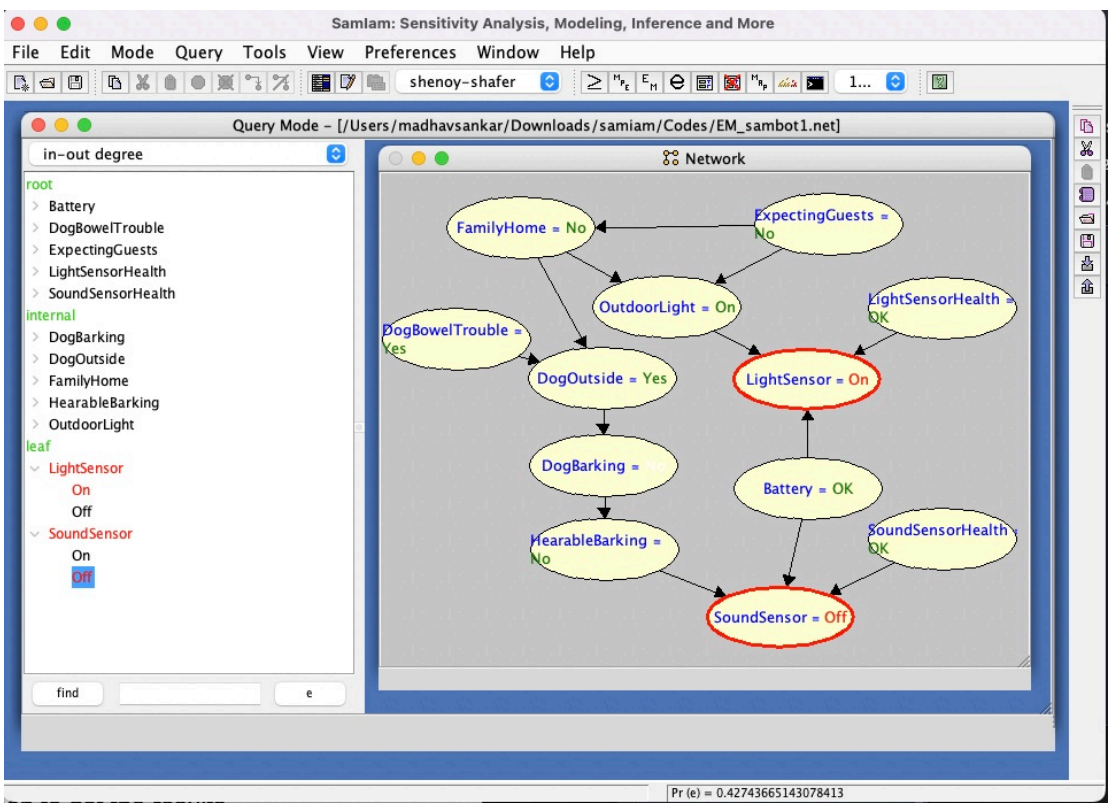
Sambot has sensed the light to be on but has sensed no bark. Sambot senses them through the respective sensors.

So we know

LightSensor = On

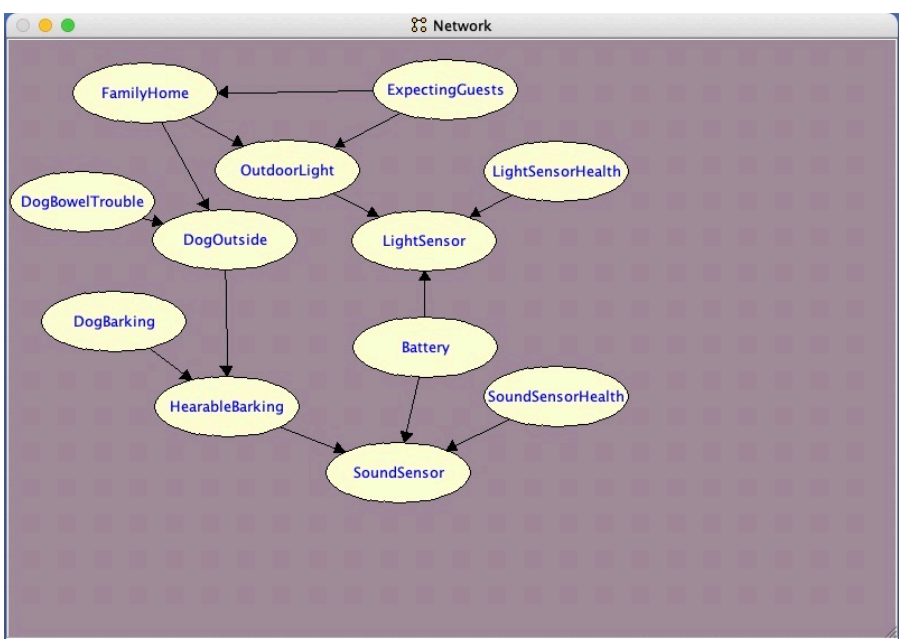
SoundSensor = off.

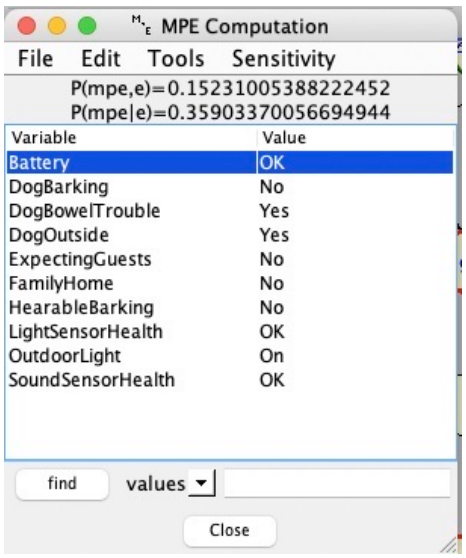
we run the MPE after setting these variables.



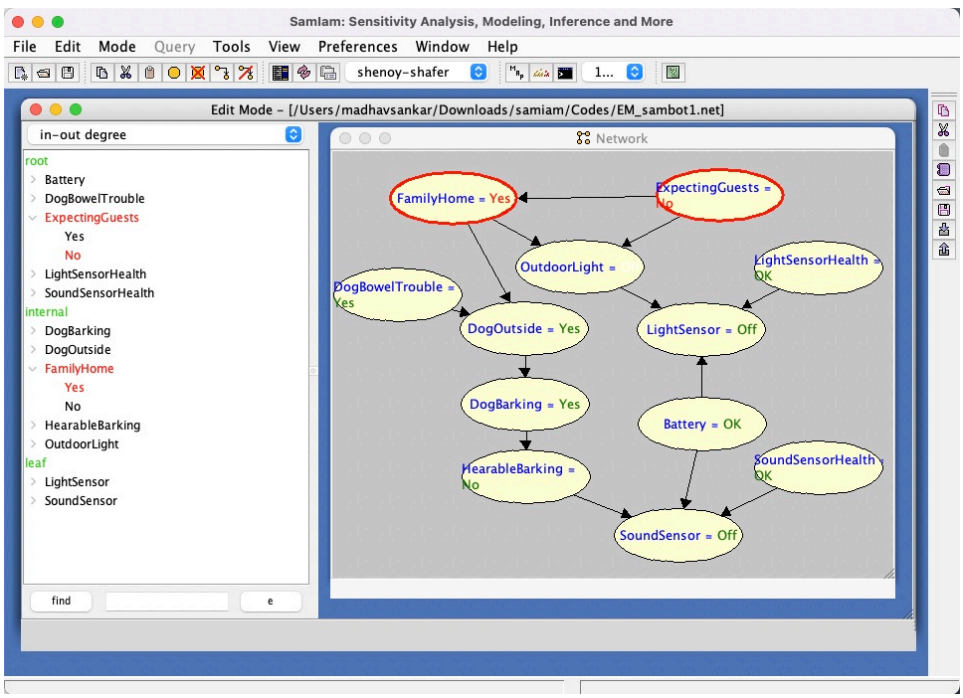
The most likely instantiation of all variables obtained:

DogBarking can also be seen as any DogBarking and not just our dog. In this case:



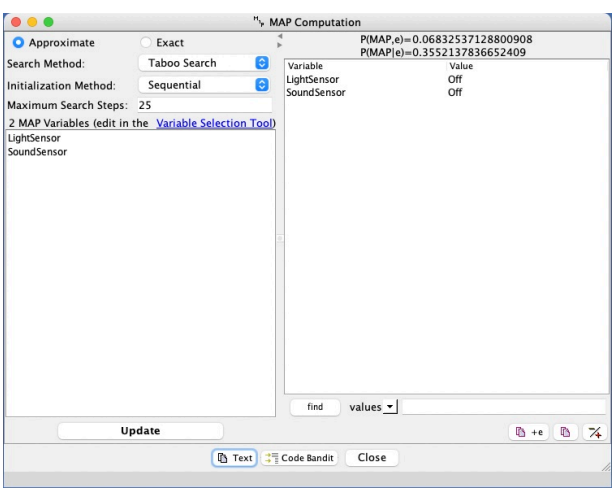

MPE Computation
File
Edit
Tools
Sensitivity
P(mpe,e)=0.15231005388222452
P(mpe|e)=0.35903370056694944
Variable
Value
Battery
OK
DogBarking
No
DogBowelTrouble
Yes
DogOutside
Yes
ExpectingGuests
No
FamilyHome
No
HearableBarking
No
LightSensorHealth
OK
OutdoorLight
On
SoundSensorHealth
OK
find
values
Close

b. We are given that Family is home and no guests are expected. So we first set, FamilyHome = Yes and ExpectingGuests = No.

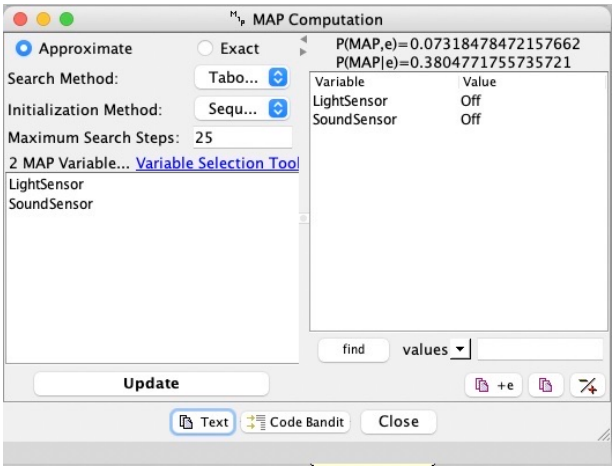


We then run the MAP computation. We select LightSensor and SoundSensor as the MAP variables using the Variable Selection Tool.

The most likely instantiation obtained:

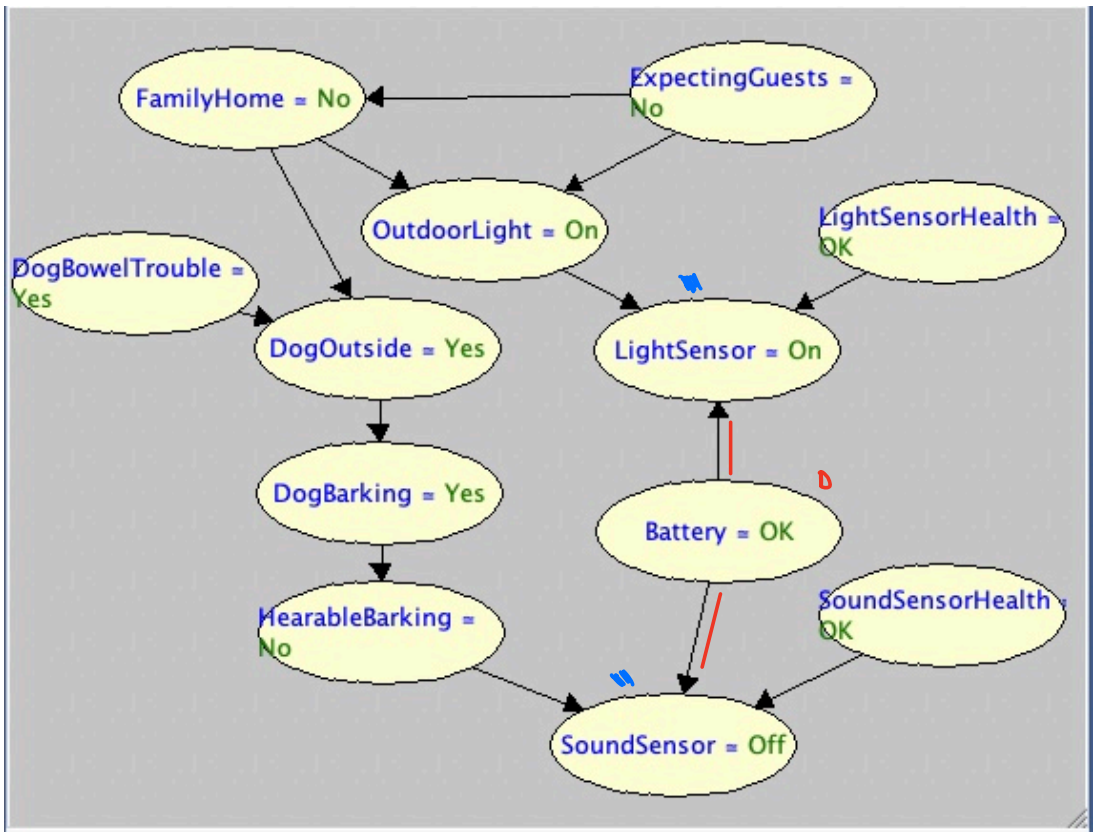


DogBarking can also be seen as any DogBarking and not just our dog. In this case:



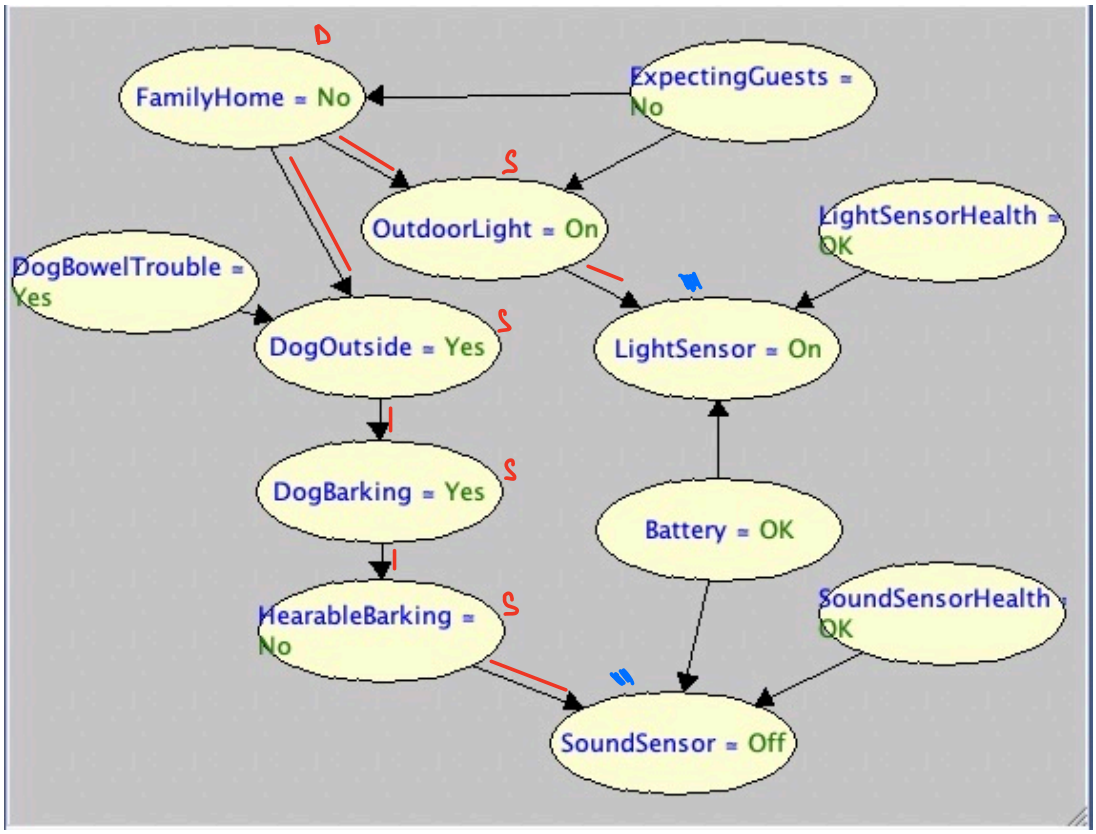
C.

PATH 1:



Battery is Divergent valve. So Battery will be closed iff Battery $\in Z$ and this path will be closed.

PATH 2:

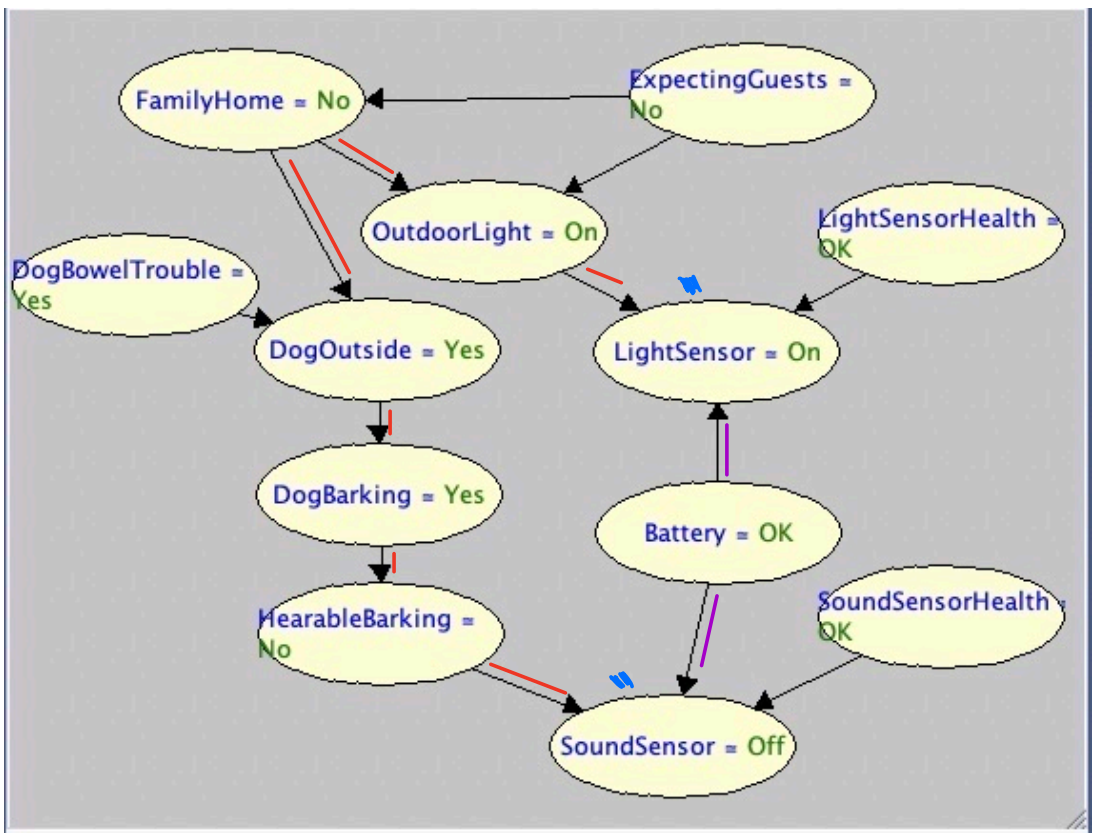


FamilyHome is Divergent valve. So FamilyHome will be closed iff FamilyHome $\in Z$ and this path will be closed.

So if $Z = \{Battery, FamilyHome\}$, then all paths between the sensors are blocked, making them d-separated, given Z. This makes them independent, given Z.

Other answers: {Battery, OutdoorLight}, {Battery, DogOutside}, {Battery, DogBarking}, {Battery, HearableBarking}.

d. It is a multiply-connected network as there is atleast one pair of nodes that have more than one path.



eg: Two paths between Light Sensor and Sound Sensor.