Solutions for Bayesian networks and decision graphs (second edition)

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Solution for exercise 5.1

Solution for exercise 5.2

Solution for exercise 5.3

Solution for exercise 5.4

Solution for exercise 5.5

Solution for exercise 5.6

Solution for exercise 5.7

(i) As Hugin does not support variable propagation, we have to perform the calculation differently. A straight forward way would be as follows: add an offspring variable for each possibloe couple, propagate and read the probabilities. See the Hugin network.

(ii) Sum-propagation yields that the following horses have a larger probability of being carrier than pure: Ann, Dorothy, Gwen, Henry, Irene. Max-propagation yields a configuration with the following carriers: Brian Dorothy, Eric, Henry, Irene.

(iii) The probabilities are fractional expressions

(iv) Note that the question is changed

Solution for exercise 5.8

(i) Using max-propagation we see that the most probable word transmitted is **baaba**.

Solution for exercise 5.9

Solution for exercise 5.10

The parameter t can be modelled explicitly as shown in the Hugin network, where the two values **0** and **1** are given prior probabilitites $\frac{1}{2}$. by entering the evidence **0** we get $P(e, \mathbf{0}) = 0.00027059$. As $P(\mathbf{0}) = \frac{1}{2}$ we have $P(e)(0) = P(e|\mathbf{0}) = 0.000540118$. We get $P(Besthand = myhand|e)(0) = 0.276$. By entering the evidence **1** we get $P(e)(1) = 0.0055625$ and $P(Besthand = myhand|e)(1) = 0.9297$.
Using $P(e)(0) = b$ and $P(e)(1) = a + b$ we determine $P(e)(t) = 0.0050224t + 0.000540118$.
Using $P(Besthand = myhand|e)P(e) = P(Besthand = myhand, e)$ we also determine $P(Besthand = myhand)(t) = 0.0010332t + 0.00050211$.
We solve the equation $0.67 = \frac{P(Besthand=myhand,e)(t)}{P(e)(t)}$ and get $t = 0.128$.

Solution for exercise 5.11

Solution for exercise 5.12

Solution for exercise 5.13