Appendix A. The conditional PDFs in the Gibbs sampler

In the Bayesian network, a random variable is independent with other variables given its Markov blanket consisting of its child nodes, parent nodes and other parent nodes of its child nodes (e.g. Pearl, 1988). For *μ*m, its Markov blanket is composed of , ***t*a** and ***t*c**, leading to the simplification of the conditional PDF of *μ*m as

(A1)

Eq. (A1) has a conjugate form where *μ*m remains conditional normal with the conjugate prior distribution adopted in the Bayesian network. According to Eq. (4), it can be inferred that the distribution of *t*a*j* - *t*c*j* conditional on *μ*m and is a normal distribution as:

(A2)

where N(*μ*, *σ*2) denotes the normal distribution whose mean and variance are *μ* and *σ*2, respectively. When , ***t*a** and ***t*c** are given, *μ*m can be seen as the mean of *t*a*j* - *t*c*j*, which is normally distributed with a known variance of . Then the conditional PDF of *μ*m can be derived through the property of the conjugate prior distribution as follows (e.g. Murphy, 2007):

(A3)

Similarly, it can be derived that the other conditional PDFs required in the Gibbs sampler are as follows:

(A4)

(A5)

(A6)

(A7)

**Reference**

Murphy, K.P., 2007. Conjugate Bayesian analysis of the Gaussian distribution. Computer Science, the University of British Columbia. https://www.cs.ubc.ca/~murphyk/Papers/bayesGauss.pdf. (Accessed 25 April 2019).