Corrigendum to "Tackling uncertainty in security assessment of critical infrastructures Dempster-Shafer Theory vs. Credal Sets Theory" (Safety Science (2018) 107 (62–76), (S0925753517318611), (10.1016/j.ssci.2018.04.007))

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Corrigendum

Corrigendum to "Tackling uncertainty in security assessment of critical infrastructures: Dempster-Shafer Theory vs. Credal Sets Theory" [Saf. Sci. 107 (2018) 62–76]

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The authors regret that an imprecise statement was made in this article, and wish to offer this Corrigendum as clarification. The authors would like to apologise for any inconvenience caused.

Imprecise statement: Misuri et al. (2018, pp. 70) state in their work: "*Differently from EN [evidential network], CN [credal network] can be used both to conduct forward analysis and to update probabilities*". This statement implies that EN cannot be used for belief updating and should be mapped into a corresponding CN for that purpose.

Correction: The foregoing statement may be correct for conventional ENs that are based on Dempster's combination rule, but does not hold true for the EN developed by Simon and co-workers (2008, 2009) based on Bayesian network (BN) inference algorithms (herein, BN-based EN).

Simon and Weber (2009) explicitly mention in their work that the developed EN can be used for belief updating: "*The computation mechanism is based on the Bayes theorem, which is extended to the representation of uncertain information according to the framework of Dempster-Shafer theory. Specific evidence (Hard evidence) is modeled by a mass of 1 on one of the focal elements of the frame of discernment. Non-specific evidence (Soft evidence) corresponds to a mass distribution on the focal elements of the frame of discernment.*"

Proof: Fig. 1 displays the BN-based EN developed in Misuri et al. (2018) for security vulnerability assessment of a process plant where the belief masses have been updated given the evidence "Attack = Success".

Misuri et al. (2018) used the BN-based EN for predicting the prob-

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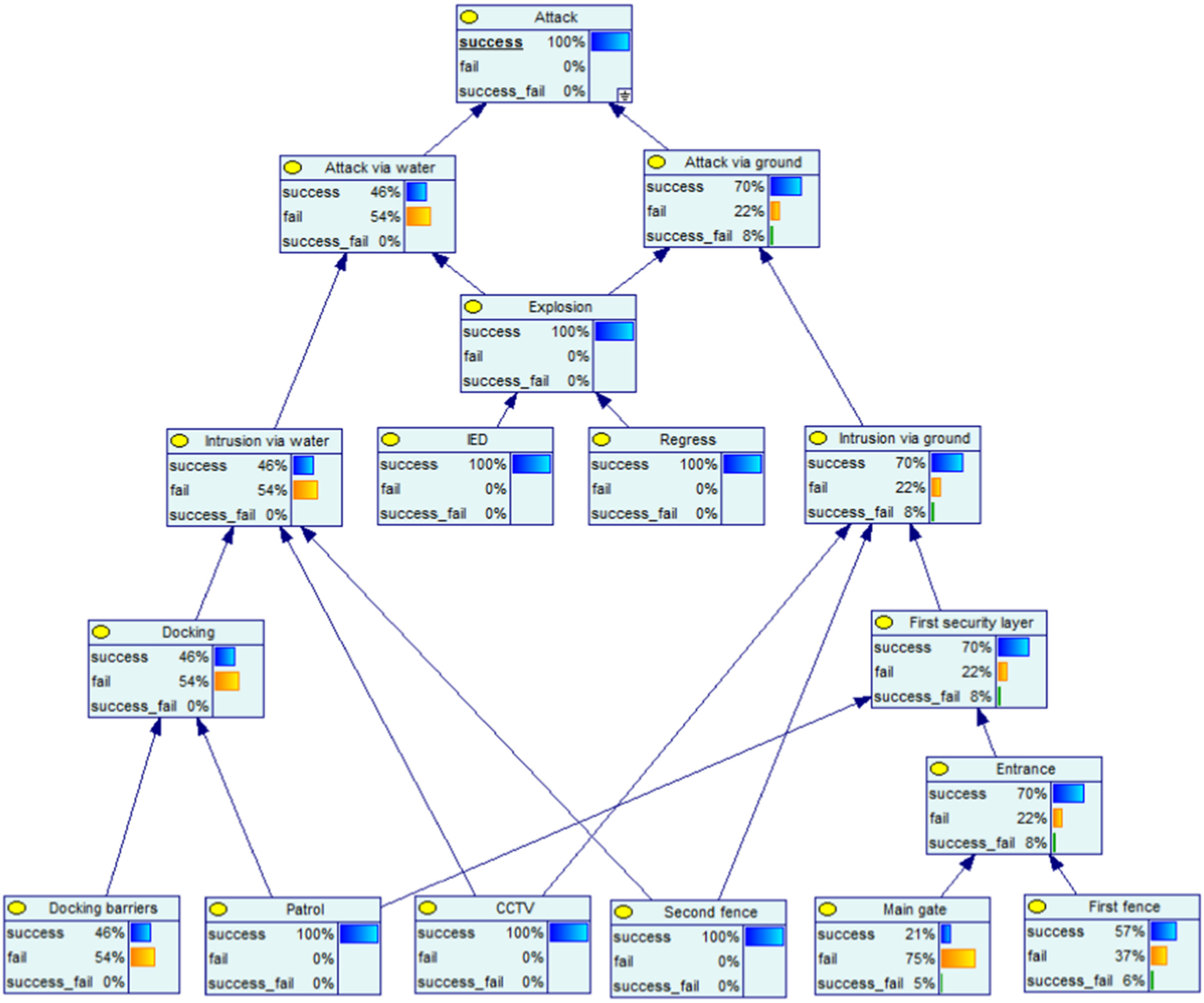

Fig. 1. Updated belief masses given "Attack = Success". Prior belief masses can be found in Misuri et al. (2018).

Table 1
Updated probabilities calculated using CN and BN-based EN.

X	P (X = Success | Attack = Success)	
	CN (modeled in JavaBayes)	BN-based EN (modeled in GeNIe)
Main gate	0.161 ≤ P ≤ 0.362	0.21 ≤ P ≤ 0.26
First fence	0.493 ≤ P ≤ 0.704	0.57 ≤ P ≤ 0.63
Patrol	P = 1	P = 1
CCTV	P = 1	P = 1
Second fence	P = 1	P = 1
IED	P = 1	P = 1
Regress	P = 1	P = 1
Docking barriers	0.325 ≤ P ≤ 0.537	P = 0.46

ability of a successful attack (forward analysis), but to update the probabilities (backward analysis) they mapped the BN-based EN into an equivalent CN and calculated the updated probabilities given "Attack = Success". They used two packages, JavaBayes and GL2U, to implement the CN, concluding that JavaBayes results in more consisting updated probabilities with regard to the evidence (the 2nd column in Table 1).

In the present corrigendum, we used the BN-based EN (Fig. 1) for belief updating given "Attack = Success". The updated beliefs were subsequently used to calculate updated probability intervals (the 3rd column in Table 1), showing a good agreement between the results of CN and BN-based EN.

Conclusion: The EN developed by Simon and co-workers (2008, 2009) based on BN can be used for belief mass updating the same way BN can be used for probability updating, with no need for using CN.