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Analysis of the Schiphol Cell Complex fire using a Bayesian belief net based model

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Abstract

In the night of the 26 and 27 October 2005, a fire broke out in the K-Wing of the Schiphol Cell Complex near Amsterdam. Eleven of 43 occupants of this wing died due to smoke inhalation. The Dutch Safety Board analysed the fire and released a report 1 year later. This article presents how a probabilistic model based on Bayesian networks can be used to analyse such a fire. The paper emphasises the usefulness of the model for this analysis. In additional it discusses the applicability for prioritisation of the recommendations such as those posed by the investigation board for the improvements of fire safety in special buildings. The big advantage of the model is that it can be used not only for fire analyses after accidents, but also prior to the accident, for example in the design phase of the building, to estimate the outcome of a possible fire given different possible scenarios. This contribution shows that if such a model was used before the fire occurred the number of fatalities would have not come as a surprise, since the model predicts a larger percentage of people dying than happened in the real fire.

Keywords

Bayesian belief networks; Fire safety; Schiphol Cell Complex

Figures and tables from this article:

Fig. 1. K wing of Schiphol Cell Complex.

Figure options

Fig. 2. Human damage in building fire model.

Figure options

Fig. 3. Factors' values provided in the accident report.

Figure options

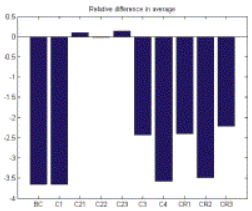

Fig. 4. Relative change in the mean of percentage of deaths for the simulation cases (comparing with the general case, for which average percentage of deaths is 15.24%).

Figure options

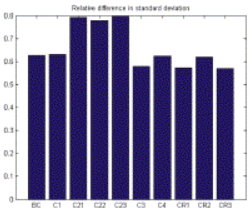

Fig. 5. Relative change in the standard deviation of percentage of deaths for the simulation cases (comparing with the general case, for which standard deviation of percentage of deaths is 28.72%).

Figure options

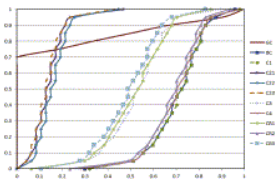

Fig. 6. Cumulative distribution function for percentage of deaths—all cases.

Figure options

Table 1. Variables for which marginal distributions are taken from literature.

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Table 2. Functional nodes.

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Table 3. Values for model variables for which certain information derived from the accident report.

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Table 4. Information for model variables which lead to approximated values or distributions.

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Table 5. Simulation cases.

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