

Automatic Generation of Large Causal Bayesian Networks from User Oriented Models

Jürgen Ziegler

Bastian Haarmann

IABG Dept. CC30-C4ISR
Einsteinstr. 20 GE-85521 Ottobrunn
jziegler@iabg.de

Fraunhofer Institute for Communication,
Information Processing, and Ergonomics
Neuenahrer Straße 20, 53343 Wachtberg
Bastian.haarmann@fkie.fraunhofer.de

Abstract: Bayesian networks (BN) are a valid method to analyze causal dependencies with uncertainties and to calculate inferences based on evidences. This paper describes a method to enable domain experts to configure and use large causal Bayesian networks without the help of BN experts. For this the structure of the domain model is defined together with the domain expert. The dependencies of the domain model are weighted qualitatively. After that the domain model is translated into a well-defined BN. Within the BN the usual causal and diagnostic inferences can be calculated. The results are translated back into the domain model and presented to the user. The back translation also allows the presentation of the reasons of the inference results by using the causal dependencies of the BN. The translation processes allow translating user hypothesis by generating and calculating different BNs. As a benefit the method allows to generate and use large BN (with hundred of nodes) without excessive effort. Obviously in this approach probabilities are used in a special way. To motivate this, Bayesian probability concept is discussed before introducing the method. The method is illustrated by the example „Recognition of asymmetric or terroristic threats”. At the end of the paper it is illustrated that the method can be used for different domains by a short description of the method’s possible application to the domain „medical diagnosis”. This paper does not deal with the theory of Bayesian Networks but with their efficient use.