

Maritime Piracy Situation Modelling with Dynamic Bayesian Networks

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Abstract

A generative model for modelling maritime vessel behaviour is proposed. The model is a novel variant of the dynamic Bayesian network (DBN). The proposed DBN is in the form of a switching linear dynamic system (SLDS) that has been extended into a larger DBN. The application of synthetic data fabrication of maritime vessel behaviour is considered. Behaviour of various vessels in a maritime piracy situation is simulated. A means to integrate information from context based external factors that influence behaviour is provided. Simulated observations of the vessels kinematic states are generated. The generated data may be used for the purpose of developing and evaluating counter-piracy methods and algorithms. A novel methodology for evaluating and optimising behavioural models such as the proposed model is presented. The log-likelihood, cross entropy, Bayes factor and the Bhattacharyya distance measures are applied for evaluation. The results demonstrate that the generative model is able to model both spatial and temporal datasets.