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Utilization of Game Theoretic and Bayesian Network Models in Air Combat Simulation Analysis

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We present the application of game theoretic and Bayesian network models to the analysis of simulation data produced using a discrete event air combat simulation model. First, statistical techniques are applied to estimate games from the simulation data. The validity of the simulation model is assessed by comparing the properties of the games to actual practices in air combat. The games are also applied for analyzing the effectiveness of tactics as well as of aircraft, weapon and hardware configurations. Second, the simulation data is reconstructed into a dynamic Bayesian network. It gives a compact probabilistic representation that describes the progress of the simulated combat and allows efficient computing for the study of potential courses of the combat. This capability is used in what-if type analysis that investigates the effects of air combat events on the evolution and outcome of the combat. The utilization of the proposed modeling approaches is illustrated by analyzing data produced with a simulation model called X-Brawler.