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# A Safety Analysis Method for Multi-Agent Systems

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**Abstract :** Safety analysis for multi-agent systems is complicated by the, potentially nonlinear, interactions between agents. This paper proposes a method for analyzing the safety of multi-agent systems by explicitly focusing on interactions and the accident data of systems that are similar in structure and function to the system being analyzed. The method creates a Bayesian network using the accident data from similar systems. A feature of our method is that the events in accident data are labeled with HAZOP guide words. Our method uses an Ontology to abstract away from the details of a multi-agent implementation. Using the ontology, our methods then constructs an “Interaction Map,” a graphical representation of the patterns of interactions between agents and other artifacts. Interaction maps combined with statistical data from accidents and the HAZOP classifications of events can be converted into a Bayesian Network. Bayesian networks allow designers to explore “what it” scenarios and make design trade-offs that maintain safety. We show how to use the Bayesian networks, and the interaction maps to improve multi-agent system designs.

**Keywords :** multi-agent system, safety analysis, safety model, integration map
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