Situated Reasoning for Next Generation Risk Modelling

Beth Cardier, Griffith University, Trusted Autonomous Systems Defence CRC, Eastern Virginia Medical School,

Beth Cardier[1], Ted Goranson[2], Mathew Hancock[3] and Benjamin Seligmann[3]

[1] Griffith University, Trusted Autonomous Systems Defence CRC, Eastern Virginia Medical School
[2] Sirius-beta
[3] Minerals Industry Safety and Health Centre, Sustainable Minerals Institute, The University of Queensland, Brisbane, Queensland, Australia

We are currently experiencing a pace and scale of technological advancement unparalleled in human history. The volatility, uncertainty, complexity, ambiguity of risks faced by society is outstripping the capacity of traditional techniques for modelling risk.

In this presentation we share our work to develop next generation risk modelling tools and technology using situated reasoning methods, building on foundations set in the Intelligence community. Situated reasoning includes representations of context and influence in the analysis of facts, processes and their ontologies. Our formal approach leverages category theoretic two-sorted reasoning. This paper explores how category theoretic two-sorted reasoning can be used in tandem with the Causal Network Topology Analysis (CaNeTA) framework to model open world systems and risk. We explore the application of situated reasoning to a simple change of context of a truck modified for risk in a particular situation, tracking how those risks change when it drives to a different worksite.

The immediate goal is to reason about both the meaning of facts in front of us and the range of possible logical futures these facts imply. The larger goal is to include the unique circumstances and context surrounding a particular situation in the generation of actionable risk models. We will assess the logical effectiveness of control and response options. The path forward for this sort of technology and its wider potential applications will also be discussed.

We believe that as humankind continues to push the boundaries of technological advancement, it is critical to develop new and innovative approaches to managing risk that can keep pace with these changes. Situated reasoning offers a promising avenue for achieving this goal, by providing a more dynamic and adaptable way of modelling risk that takes into account the unique circumstances and context of each situation.