CPS EAGER: Intelligent Agent Incident Command System (ICS) Augmentation - #1528550

Wright State University

Research Contributions

Making interactions visible and understandable to decision makers

Demonstration of effectiveness of information presentation and transparency in situations where agents can support and enhance human decision-making

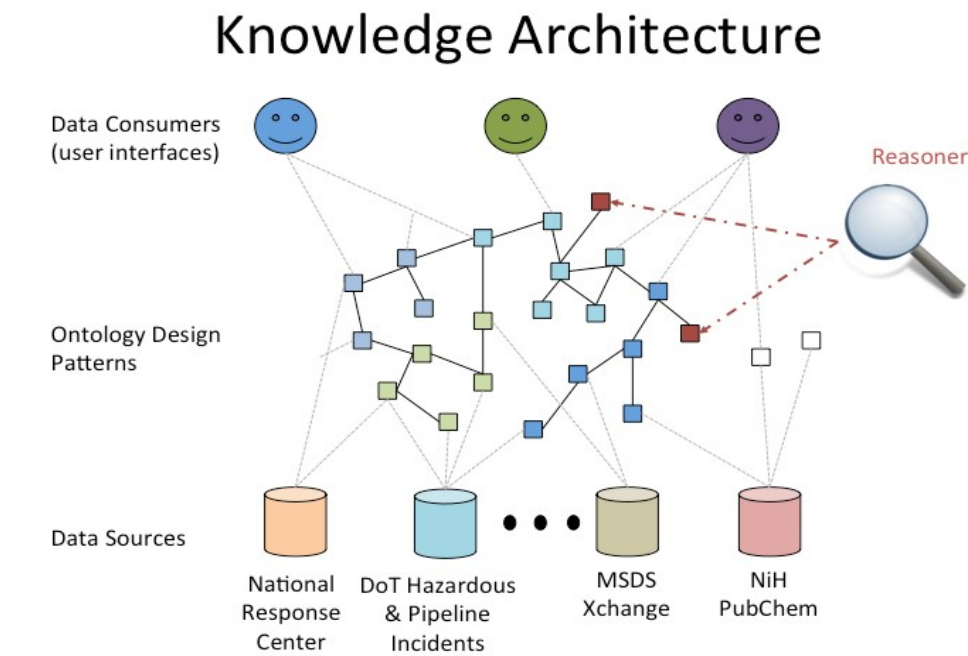*Extracting existence and character of invisible interactions from observation/data*

Development of ontology design patterns to allow effective reasoning during crisis situation

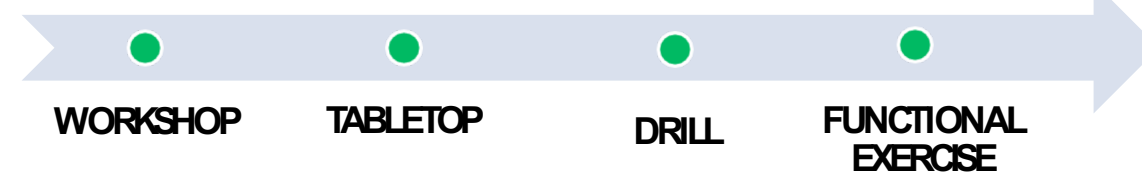*Optimizing the ground activities to find invisible interactions implied, but not anticipated*

Development of model consistency tools for automatic update of causal models

Scenario

- **Aircraft crash and explosion in a chemical plant causes chemical hazard**
- Scenario complexity is varied by changing the chemicals and levels of toxicity
- Several potential, and partial list of unintended consequences occur, such as:
  - Undetected ground water run-off contamination affects children swimming in nearby creek.
  - The nursing home must leave behind the corpse of a recently deceased resident.
  - Too much focus on the plane crash may distract law enforcement from identifying the secondary device.
- Testing with Emergency Responders using real-virtual simulations

ICS

Limiting span-of-control protects against cognitive overload and mental fatigue, but it **also limits span-of-knowledge** w.r.t complex feedback loops that involve causes and effects separated by more than one level of hierarchy
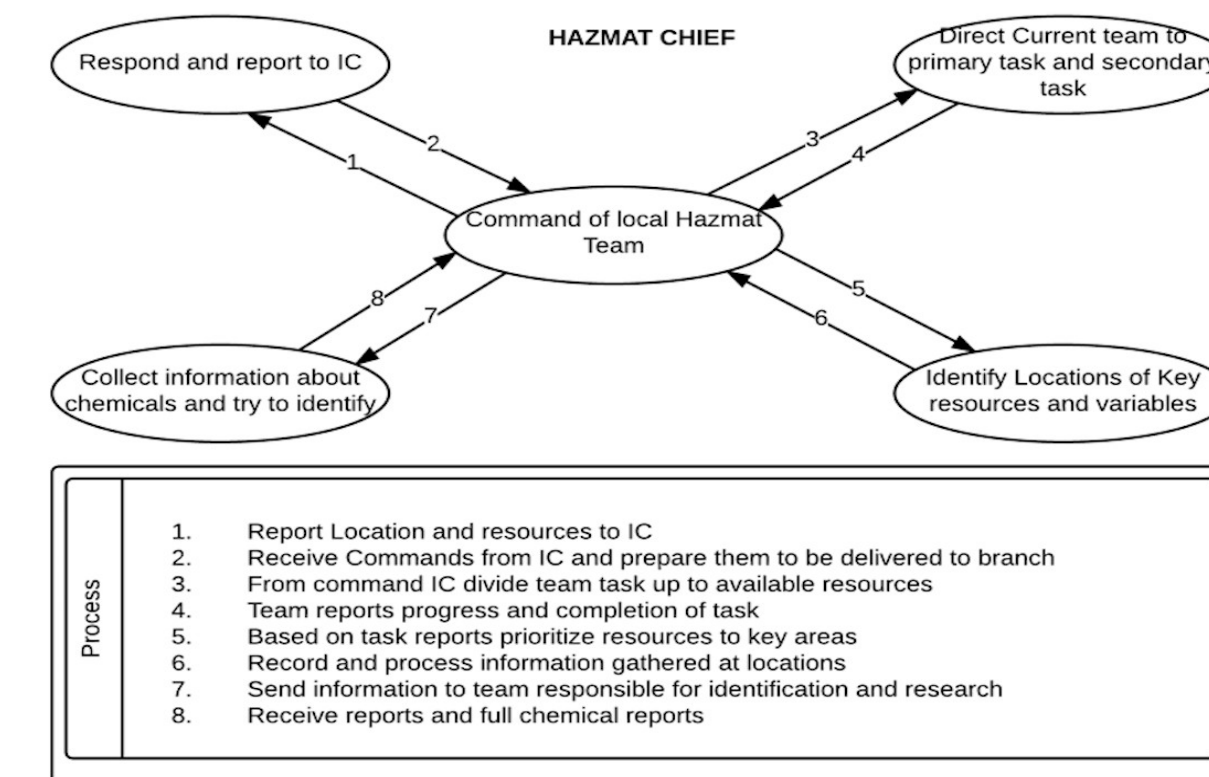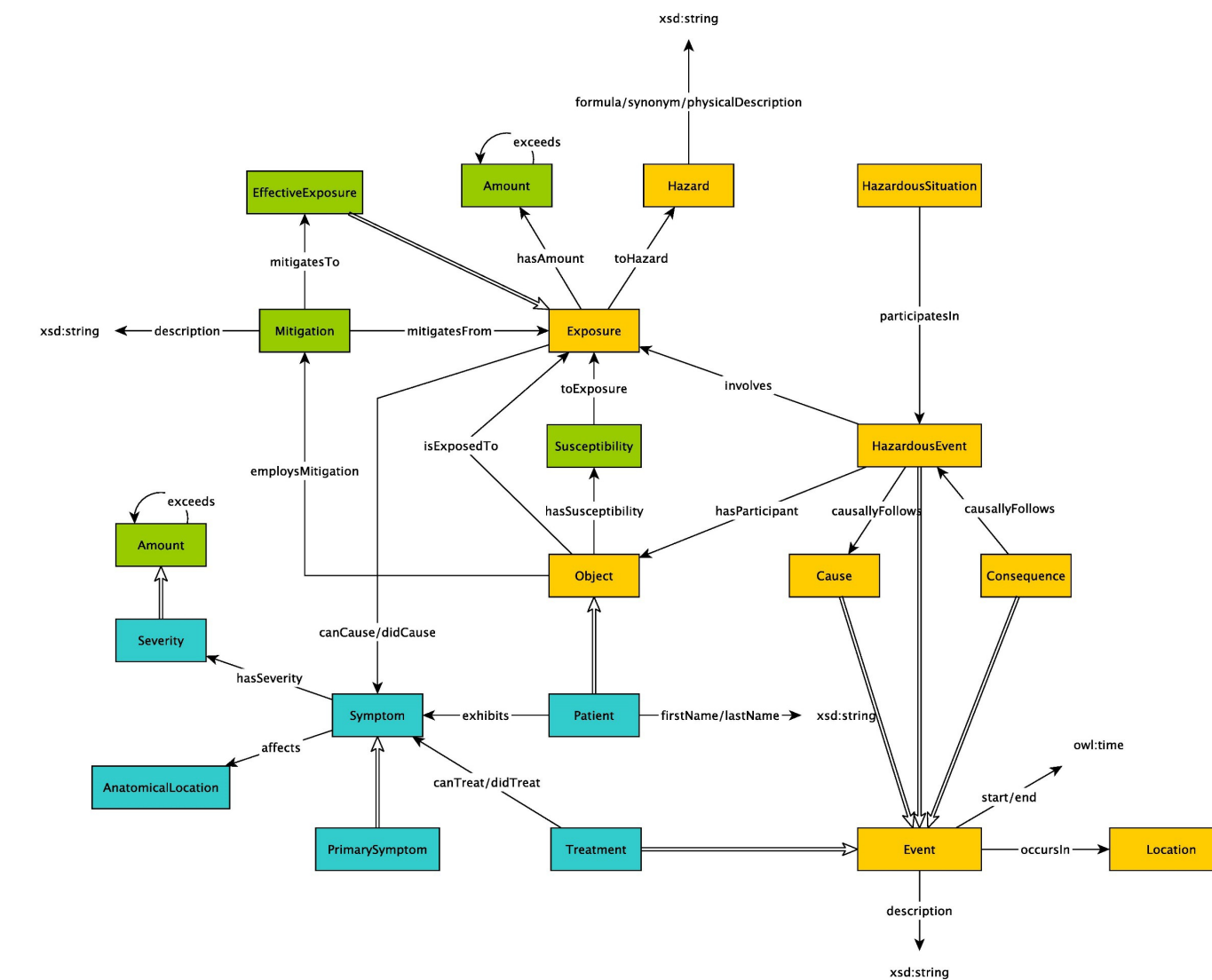
Knowledge Architecture

OFM Model[1]

HAZMAT CHIEF

Process
1. Report Location and resources to IC
2. Receive Commands from IC and prepare them to be delivered to branch
3. From command IC divide team task up to available resources
4. Team reports progress and completion of task
5. Based on task reports prioritize resources to key areas
6. Record and process information gathered at locations
7. Send information to team responsible for identification and research
8. Receive reports and full chemical reports

- Mental processes of a Hazmat Chief using operator function model
- Comprises operator control functions to solve the decision problems.

HSEEP Activities

WORKSHOP   TABLETOP   DRILL   FUNCTIONAL EXERCISE

ICS Ontology

1. Wood, D., Nagarajan, M., Opp, A., Ganapathy, S., Cheatham, M., Gallagher, J., & Gruenberg, J. (In Press, 2016). Using Model-Based Simulation for Augmenting Incident Command System for Disaster Response. Proceedings of the 2016 Winter Simulation Conference. Virginia

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