

CIM: Cybernetic Incident Management

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CIM project

Problems

- Incident Management usually involves many parties having to cooperate, it has a distributed multi-agent character.
- Specific type of errors is likely to occur in the interaction and coordination between these parties. Causes:
 - Procedures have low accessibility.
 - People involved often lack experience.
 - Analysis and reconstruction difficult due to chaos.

Proposed solution

- Create a constantly adapting system that processes information in an adaptive, interactive and intelligent fashion to support human decisions.
- Knowledge is contained in communication structures and supporting software in the form of distributed agents.
- Maintenance and evolution of the system by performing simulations and training sessions.

Contribution of VU

Main contribution Vrije Universiteit Amsterdam:

- The analysis of disaster case-studies in order to obtain traces.
- Develop methods to provide automated support for analysis of cause of failure in traces.
- In the future traces can also be obtained from the system itself.

Informal

Hercules disaster

(1) Incorrect information

(2) Incomplete information

(3) Use of different protocols

Dakota disaster

(4) Exception Handling

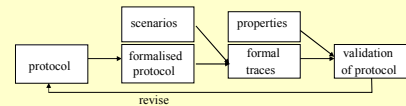
(5) Contradictory information

(6) Work Overload

Formal

Why formalise a trace?

- The properties that should hold within a trace can be formally verified.
- The cause why a property isn't satisfied can be given, also when caused by a chain of events.
- It is possible to develop/verify a protocol:



The trace of the Hercules disaster:

Technology

Validation

(P2) At any points in time t_1 and t_2 , $t_2 \geq t_1$, if ATC generates information to AFD about the plane crash at t_1 , and the number of passengers is more than 10 at t_2 then at a later point in time t_3 AFD declares scenario 3.

not satisfied

(P4) At any point in time t_1 , if AFD receives information from ATC about the plane crash, then at a later point in time t_2 , a MAC will join AFD, and at a still later point in time t_3 will come to the disaster area in less than 3 minutes upon the plane crash information reception

satisfied

Formalisation

$\forall t_1, t_2, x [t_2 \geq t_1 \Rightarrow [\text{state}(\gamma, t_1, \text{input}(\text{AFD}))] = \text{communication_from_to}(\text{ATC}, \text{AFD}, \text{inform, crash}) \ \& \ x > 10 \ \& \ \text{state}(\gamma, t_2, \text{input}(\text{AFD}))] = \text{communication_from_to}(\text{ATC}, \text{AFD}, \text{inform, amount}(\text{people, } x))] \Rightarrow \exists t_3 > t_2 \ \& \ \text{state}(\gamma, t_3, \text{output}(\text{AFD}))] = \text{communication_from_to}(\text{AFD}, \text{AFD}, \text{declare, scenario3})]$

