Practical applications of controlled natural language with description logics and OWL. FluentEditor and OASE.

Paweł Kapłański ¹
Anna Wróblewska, PhD ¹,²
Aleksandra Zięba, PhD ¹,³
Paweł Zarzycki ¹

¹ Cognitum

² Institute of Computer Science, Warsaw University of Technology

³ Institute of Political Science, University of Warsaw
Agenda

• Crisis (Emergency) Management – Controlled Natural Language Component
• Ontorion – Semantic Knowledge Management Framework
• OASE - semiotic framework for software development
Problems Addressed – Emergency, Crisis Management (EM)

- activity of public administration, a part of national security management
- dealing with the strategic organizational management processes (an integrated rescue system) used to
  - *prevent* critical situations (crises),
  - *prepare* to assume control of crises by way of planned activities,
  - *respond* in case of emergencies, remove their effects and *restore* the resources and critical infrastructure
EM Characteristics

- Clearly defined organizational structure
- Legislative issues and documentation
- Different kinds of information: time (information can vary in time), space
- Different requirements to information accessibility & presentation (by different actors)
- Rescue actions: time pressure, usually lack of necessary resources
# Two Kinds of Knowledge

<table>
<thead>
<tr>
<th>Meta-ontology</th>
<th>Ontology / Fact-base</th>
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<tr>
<td>- General knowledge derived from legislative issues, procedures, disasters etc.</td>
<td>- Geo &amp; topological information, location of rescue units, etc.</td>
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<td>- Communication via <strong>CNL</strong></td>
<td>- Communication via graphical language, e.g. maps, building plans etc. (advanced <strong>GIS</strong> system)</td>
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<tr>
<td>- Actors: management experts</td>
<td>- Rescue actors</td>
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EM Knowledge Management System - Objectives

• Comprehensive services enriched by posting / insertion of additional information from the environment
• The system should allow for the identification and analysis of new risks
• Coordination and exchange of information between the coordinator, e.g. at the municipal level or at the regional level, emergency services and citizens
• Informative issues involving the public: alarm system, forums, educational platform, opinion monitoring, surveys
• Training & simulation platform

• EM-KMS accessed via spectrum of CNL (Controlled Natural Language) interfaces can be seen as a communication platform that allows for constant contact between coordination actors without additional UI layer (and training)
• It is expected that CNL will force actors of coordination to use the precise statements as well as strictly defined and standardized terminology and therefore this tool will have great impact on the organizational culture itself
EM – what knowledge needs to be managed?

- What procedures need to be applied?
- What actions/tasks are undertaken within the process?
- What actors are involved in certain actions (actors’ dependencies, division of responsibilities) ?
- Geo related issues:
  - What is the location of the emergency or crisis event?
  - Where are the rescue teams during crisis events?
  - What environmental factors influence the course of crisis events?
  - Where to find shelter during the crisis event?
EM Concepts Captured – Meta-ontology (1)

- **Organizational structure**: roles (actors and units) and their relationships
- **Responsibilities of actors** for certain tasks in a particular situation
- **Alerts** about crisis situations and dangers
- **Information** about crisis events, effects, risks and dangers
- **Activities / Procedures** that are performed in specific situations during prevention, preparation, response to crisis and recovery
- **Resources**, devices and equipment useful for performing rescue actions
EM Concepts Captured (2)

Treatment system

- Infrastructure (resources)
- Communication & coordination (actors, procedures, tasks)

Crisis characterization

- Crisis events, effects, risks, dangers

Studied world

- Environment (people, natural sites, goods)
EM Meta-ontology

Rules:

Actor(?xa), Crisis(?xc), Effect(?xe), People_Group(?xpg), concerns(?xe, ?xpg), induces(?xc, ?xe), victims(?xpg, true), SameAs (?xa, emergency_medical_service) -> needs_actor(?xc, ?xa)

Actor(?xa), Crisis(?xc), Crisis_Type(?xct), has_type(?xc, ?xct), reacts_to_type(?xa, ?xct) -> needs_actor(?xc, ?xa)


Description: Crisis

Equivalent classes

Superclasses

- Circumstance
- has_type some Crisis_Type
- is_triggered_by some Trigger

Inherited anonymous classes

Members

- tanker_accident_X

Keys
A tanker truck (containing unknown toxic substance) had an accident. Several children of the near kindergarten (outside when the accident happened) feel sick.

- What are the dangers?
- What services we need to call?
If Z is an actor and if a crisis has-type a crisis-type and if Z reacts-to-type the crisis-type then the crisis needs-actor Z.

If Z is an actor and if an effect causes a danger and if a crisis induces the effect and if Z assumes a procedure and if the procedure reduces the danger then the crisis needs-actor Z.

If Z is an actor and if an effect concerns a people-group and if a crisis induces the effect and if it is true that the people-group has-victims and if Z is Emergency-Medical-Service then the crisis needs-actor Z.
Reasoned Conclusions

CNL results:

Tanker-Accident-X must need-actor Police.
Tanker-Accident-X must need-actor Fire-Brigade.
Tanker-Accident-X must need-actor Emergency-Medical-Service.
Performed Tasks & Future Works

- **English** CNL for OWL - done
- Working on **SWRL rules in CNL**
- **GIS & meta** knowledge integration
- Collecting emergency management procedures to be coded in CNL
- Working on **CNL for Polish**
- Working on **CNL dedicated** for other disciplines: UE policy coordination process on national level, oncology medical guidelines
Ontorion Semantic Knowledge Management Framework

Reasoner: Hermit Pellet Racer ...

modularizator

Abox Tbox Rules

Executors

CNL Console (Desktop or Web)

Automatic UI (Desktop or Web)

Windows Azure

amazon web services

Hyper-V Cloud

Cassandra

MySQL

Oracle

www.cognitum.eu/semantics
CNL user interface
noSQL implementation
Distributed approach
Ontology-Aided Software Engineering (OASE) is a semiotic framework for software development. It extends the existing methodologies with an ability to express the supporting knowledge in (controlled) natural language called OASE-English.
OASE-Annotator

OASE-Annotations and OASE-Assertions allow for the protection of the programmer from breaking the design-time or runtime assumptions and can be checked by the reasoning services (OWL-Reasoner) in terms of consistency and preservation of logical constraints.
OASE-Diagrammer adds the ability to use the UML, together with the OASE framework. OASE-Diagrammer is dual to OASE-Annotator. It allows to draw the UML representations of software entities and supports OASE-Annotations.
Every animal and every plant are different.
Every plant-parts is-proper-part-of a plant.
Every tree is a plant.
Every grass is a plant.
Every palm-tree is a plant.
Every carnivorous-plant is a plant.
Every tasty-plant is a plant.
Every omnivore and everything (that eats an animal and eats a plant and eats a thing (that i
Every carnivore and everything (that eats nothing-but animal or eats nothing-but thing (that
Every herbivore and everything (that eats nothing-but plant or eats nothing-but thing (that
Every berry is a fruiting-body.
Every carnivorous-plant eats an animal.
Every elephant is an herbivore.
Every fruiting-body is a
Every impala is an animal
Every omnivore is an animal
Every palm-tree has-part
Every phloem is a plant-part
Every phloem is-proper-part
Every root is a plant-part
Every stem is a plant-part
Every twig is a plant-part
Every warthog is an animal
Every warthog is something
Every xylem is a plant-part
Every xylem is-proper-part
Every branch is a plant-part
Every branch is-part-of a
Every carnivore is an animal.
Every giraffe is an animal.