

ACKNOWLEDNET – Active Knowledge Manager Using Dynamic Self-Modifying Knowledge Models

KEYWORDS

Knowledge management, organisational innovation

PROJECT WEBSITE

[http://www.tupaisystems.co.il/Acknowlednet Site/](http://www.tupaisystems.co.il/AcknowlednetSite/)



AIM

The ultimate vision of ACKNOWLEDNET is to develop a software device that can integrate knowledge from widely disparate sources, represent it in a consistent and active form, and make it available for deployment in multiple applications. By using a single, consistent and uniform environment, the proposed solution will enable pieces of knowledge arriving from different domains, and expressed in different forms, to interact with and enrich each other.

Specifically, a software object will be created which can hold the following forms of knowledge in a common integrated form:

Analytic – typified by value passing structures

Experiential – typified by learning from data

Topological – organisational structure

Knowledge best captured in semantic nets

New concepts with initially unknown

relevance introduced in free form text

The envisioned solution is well-suited for complex knowledge-based decision

support in areas as diverse as e-Commerce,

Customer Relationship Management,

Finance, Insurance, Telecommunications,

Aerospace, Health, and many more.

The ACKNOWLEDNET feasibility study

aimed at the development of a system

prototype for earthquake risk analysis in

the re-insurance domain in order to prove

the viability of the core concepts of the

approach.

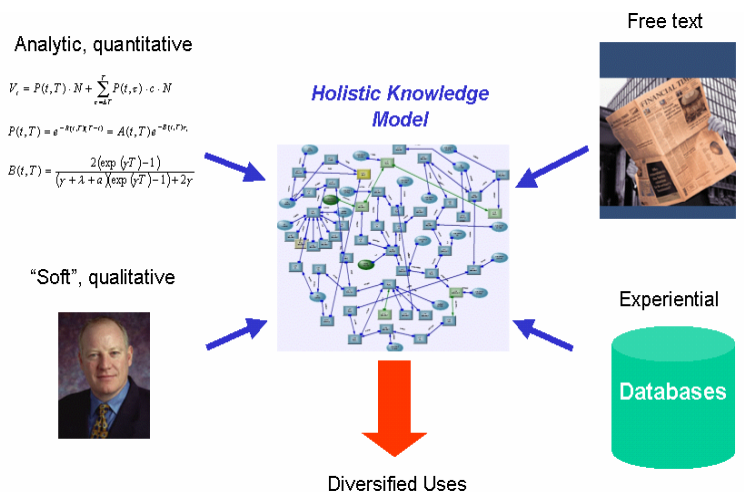
SUMMARY

The 6-month feasibility study ACKNOWLEDNET demonstrates the strengths and potentials of an innovative knowledge representation and handling approach. An autonomous network (software structure) of nodes and operators facilitates easy, explicit representation of complex, interdependent knowledge structures. The propagation mechanisms enable active behaviour and self-adaptation. The close integration with innovative text analysis supports automatic incorporation of new knowledge. ACKNOWLEDNET has been applied to the re-insurance domain. A prototype for earthquake risk analysis has been implemented which demonstrates the feasibility of the approach.

PROBLEM

Building knowledge-based systems to support complex knowledge-intensive decisions is faced with two main difficulties: The knowledge necessary for the task at hand is very often only partially expressible in symbolic knowledge representation formalisms – complex influences, interrelations, and dependencies are difficult to capture and to maintain. A long-term adaption of the knowledge base to dynamic changes of the domain knowledge is difficult and expensive. Consequently, an approach is needed which allows the integrated handling of different forms of knowledge together with their complex interactions, while facilitating at least semi-automatic adaptation to changes and new input.

Diverse knowledge types are reflected in the re-insurance earthquake model



TECHNICAL APPROACH

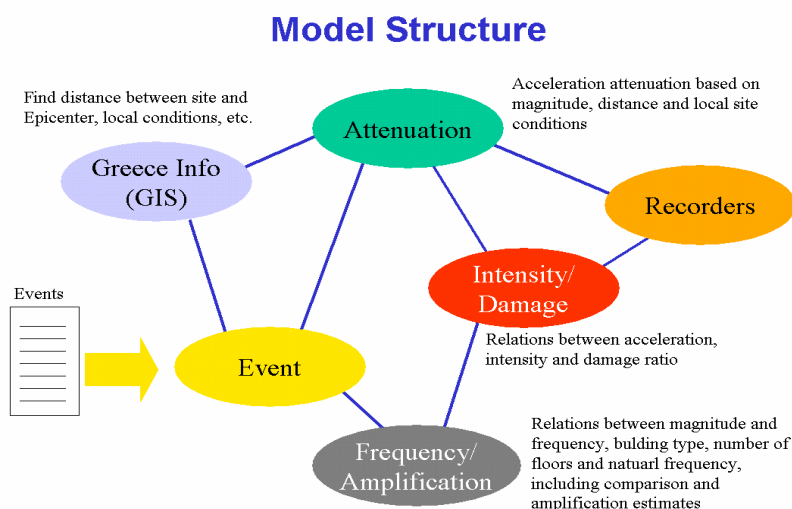
Tupai's eCognition software realizes the knowledge representation core of the AcKnowNet system. eCognition is a software tool implementing a specific kind of semantic networks, so-called "Active Knowledge Networks", AKN.

The overall approach of the system is the formalization of knowledge that is only partly or implicitly known in an application scenario. The characteristic of the eCognition approach is the use of a network-based knowledge representation formalism with a propagation-oriented processing which allows efficient reasoning for using the knowledge and for finding deficiencies of the currently acquired knowledge (automated reasoning), and easy modification and partly automatic adoption of the acquired knowledge in order to overcome detected deficiencies (knowledge representation).

Based on this technology, a prototypical holistic knowledge model for earthquake risk analysis has been implemented that combines the diversified knowledge aspects involved, including Seismological, Geographical, Structural, Statistical and Economical knowledge, both analytical and probabilistic. When activated, this model is suitable to support the different usage scenarios typical in the application example, running from user-initiated risk calculation to expert-triggered extension of knowledge.

The AKN technology has been integrated with Cognit's CORPORUM text analysis and information management technology and combined with information extraction components. The resulting semantic analyzer automatically extracts relevant knowledge chunks from textual input and feeds them into the Active Knowledge Network, thus augmenting the knowledge base. The main information source processed in the prototype is the Lloyd's list of earthquake event-related information.

Structure of the ACKNOWLEDGE earthquake risk model



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- DFKI GmbH, Germany
- Munich Re, Germany (associated application partner)

RESULTS ACHIEVED

ACKNOWLEDGE reached its aim by demonstrating the core topics: An Active Knowledge Networks model has been built in the selected area – earthquakes in the reinsurance context. The model combines analytical and experiential knowledge from diversified domains – Seismology, Geography, Structural Mechanics and Economy. The model was validated by MunichRe's earthquake expert. The prototype has demonstrated enriching of the knowledge model by new knowledge captured from real-life free text documents, Lloyds event reports, both semi-structured and unstructured. Both scientific evaluation and end-user comments emphasize the viability of the ACKNOWLEDGE approach.

Additionally, during the study, the state-of-the-art in Information Extraction from free-text was found insufficiently reliable for the tasks intended. Therefore, a new high-accuracy information extraction paradigm has been designed, implemented and demonstrated. Its reliability goes far beyond the state-of-the-art.