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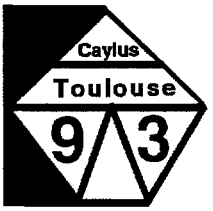

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Preface

As the term is most generally used, *knowledge acquisition* (KA) refers to the interdisciplinary study of problem solving models as well as life cycle and methodologies for knowledge-based systems. Knowledge acquisition is now recognized as an important research field that includes topics such as: elicitation; apprenticeship and learning systems; issues in cognition and expertise; knowledge acquisition from various media; context-dependent, dynamic knowledge; ontologies. This workshop focused on methodological guidelines for advanced system design.

Knowledge acquisition remains a crucial problem in artificial intelligence as well as in computer science and engineering in general. Each time a software system has to be developed, experience shows that the first step is always to state the problem that we want to solve! It seems that this common sense statement is not always a rule. Problem statement involves task analysis and end-user requirements definition. Knowledge acquisition enters into play when human know-how and heuristic knowledge need to be considered. This human factors viewpoint is becoming an issue in the knowledge acquisition community.

The Seventh European Knowledge Acquisition Workshop (EKAW '93) gathered a large variety of papers in this areas. Brian Gaines' introductory paper provides a very interesting scope of the previous Knowledge Acquisition Workshops and the emerging researches in the field. EKAW usually combines an open day meeting and a four-day closed workshop with a limited number of participants. In 1993, EKAW was held in Toulouse and Caylus, France. This volume reports the best papers presented during the workshop. The variety of these papers shows the diversity and maturity of the field.

Knowledge acquisition is often acknowledged as a modelling process. Brian Gaines explains how knowledge acquisition research came to this conclusion. He develops the current trends in this direction. As a complementary point of view, Guy Boy suggests a new direction of investigation for knowledge acquisition: the design of dynamic systems. His paper proposes a defintion of such systems and stresses their specificities and related knowledge acquisition issues.

Problem solving models

Characterizing knowledge acquisition as modelling defines a number of concepts and identified difficulties. Among them, problem solving models are essential. Building adequate models from specific expertise can be improved by the definition of guidelines and steps. Two papers are concerned with this objective. In *Steps in Constructing Problem Solving Methods* Akkermans[1] proposes a rational top-down

[1] Contributions are indicated only by first author's name for the sake of readability .

support for problem-solving methods construction, including conceptual refinement and operationalization. In *Modelling Artificial Legal Reasoning*, Breuker suggests a way of modelling legal reasoning that can be considered as an assesment task. He presents assesment models of problem-solving as well as an architecure for legal reasoning systems.

Another related research field is interested in the definition of support tools for knowledge modelling. The three following papers develop such works. In *A Machine Learning Tool Designed for a Model-Based Knowledge Acquisition Approach*, Thomas presents The ENIGME system a Machine Learning system that learns operative domain knowledge by exploiting a model of expertise as defined in the KADS methodology. *Systematic Building of Conceptual Classification Systems with C-KAT*, by Zacklad: C-KAT is an acquisition support method and tool dedicated to the design of a feature-oriented classification system. It uses a specialised problem-solving model: classification by structural shift. *Making Role-Limiting Shells More Flexible*, by Poek: Role-limiting methods shells are acknowledged as hardly wired. The authors analyse and decompose them into smaller mechanisms in order to enable new configurations of role-limiting methods and shells. This flexibility increases the applicability of methods and also reduces the cost of their development.

Several papers compare existing modelling approaches and environments. Such comparisons are the starting-point to better specify and define guidelines or modelling structures that should facilitate knowledge acquisition and knowledge-based system design. *Heuristic Control Knowledge*: From the study of control roles in problem solving methods in KADS and COMMET aproaches, Causse proposes an additional level of description for these models: the heuristic control level, where heuristic control knowledge is described. In *Generic Tasks in KEW*, Allemang relates an experiment in which generic tasks are cast in the KEW framework and formal language for model description. Its results not only prove the possibility of connecting the generic tasks and KADS-KEW approaches but it also leads to improvements in both of them. Linster's paper *A Review of Sisyphus 91 & 92: Models of Problem-Solving Knowledge* synthesizes the various contributions to the Sisyphus project in 1991 and 1992. A three-dimensional framework is presented to situate and to compare the approaches, highlighting the building blocks used to model and later implement a knowledge-based system.

Life cycle and methodologies

The second part of this volume gathers papers concerned with knowledge acquisition life-cycle and methodologies. This central part of knowledge acquisition research covers a wide set of dimensions: the specification of a refinement cycle during which knowledge is increasingly modelled, the definition of methodologies and workbenches as well as the study of dedicated elicitation techniques to be integrated as specific tools in these methodological frameworks.

Three papers propose to consider knowledge acquisition as an incremental process. They present methods and tools to support such a cycle. *Model Construction in MIKE*

(Model Based and Incremental Knowledge Engineering): The key dimension studied by Neubert in order to facilitate the incremental design of a knowledge model is knowledge representation. As an answer, the author promotes the combination of informal and semi-formal representations within an hypermedia environement, MIKE. *EXPECT: Intelligent Support for Knowledge Base Refinement*: As a response to the need of making knowledge acquisition tools easier to use for domain experts, Paris proposes to integrate explanations and new communication means in such systems. *CERISE: A Cyclic Approach for Knowledge Acquisition*, by Vicat: The CERISE workbench promotes a cyclic knowledge acquisition, firstly by refining a KADS model and secondly by validating and improving this model once it is made operational.

The following three papers provide different views on what a knowledge acquisition methodology should be, refering to psychological foundations, questionning knowledge analysis and modelling, or addressing the problem for specific kinds of knowledge. In *Personal Construct Psychology Foundations for Knowledge Acquisition and Respresentation*, Shaw gives an overview of personal construct psychology and its expression as an intensional logic describing the cognitive processes of anticipatory agents. These results are presented as a theory for knowledge acquisition and representation, as psychology offers the advantage of promoting a constructivist view when modelling human knowledge. In *Knowledge Acquisition Without Analysis*, Compton differentiates several kinds of KA methods. Some methods support knowledge analysis, based on a classification of ways of solving problems and providing adequate tools. Other methods focus on the addition of validated knowledge as long as mistakes are discovered by a system. Ripple down rules are presented as an illustration of this second kind of approach, which avoids analysing knowledge. In *Acquisition and Modelling of Uncertain, Incomplete and Time-Varying Knowledge*, Mengshoel proposes a methodology adapted to the acquisition of imperfect and temporal knowledge. A study of existing methodologies proves that this problem is not actually considered. Several propositions to extend them are presented as a solution.

The definition of workbenches is also a means of providing support for knowledge acquisition. Steps in using the workbench are often defined by a related methodology. The three following papers focus on particular aspects of different workbenches: the combination of tools, the status of the end-user and the design of a knowledge-based system as the result of using a workbench. In *The Emerging VITAL Workbench*, Domingue discusses the general framework of the VITAL workbench, focusing on the user interface and the control integration. The author also describes the tools supporting the tool management, the knowledge-level modelling as well as the model implementation. *Multis II: Enabling End-Users to Design Problem-Solving Engines via Two-Level Task Ontologies*, by Tijerino: The Multis II environment is an acquisition system that interacts with domain experts that want to make a model of their knowledge and generate a customized knowledge-based system. In *The Participatory Design of a Computer Assisted Knowledge Engineering Methodology and Tool: The ALADIN+ Project*, Muzard presents ALADIN+, a computer assisted knowledge engineering method and tool. It promotes participatory design in accordance with a cybernetic approach of the organisation and of the design process.

New elicitation techniques still need to be defined in order to acquire specific kinds of knowledge such as graphical representations, gradual knowledge, knowledge in texts. The last three papers in this volume propose answers to such needs. *Knowledge Acquisition With Visual Functional Programming*, by Addis: The CLARITY environment combines two approaches for knowledge acquisition: visual functional programming based on a functional database language and a graphical representation. *Acquisition of Gradual Knowledge*, by Dieng: Topoï are gradual inference rules. This paper proposes to use them as a knowledge representation for gradual and qualitative knowledge, both at the symbol and at the knowledge level defined by Newell. In *Acquisition and Validation: From Text to Semantic Network*, Biébow considers semantic networks as a convenient knowledge representation that facilitates domain knowledge acquisition from texts and its validation. Knowledge based engineering and natural language processing also form the kernel of DASERT, a tool to support knowledge acquisition from texts.

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Nathalie Aussenac and Guy Boy
on behalf of the editors

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