Knowledge-Based Expert Systems: 
A Brief Bibliography

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COMPUTER SCIENCE

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1. Introduction

A number of Artificial Intelligence (AI) systems have appeared in recent years whose approaches appear very fruitful for a wide variety of real-world tasks that are performed by knowledgeable (but not necessarily understanding) experts. In the interest of acquainting a wider audience to a representative sampling of these systems, and especially to the approaches they embody, the following selective reading list is proposed. These readings are not overly technical, and usually make their main points by way of examples of natural language dialog between a user and the expert AI system. Papers usually contain further references to related work and background material. The intended audience includes engineers (especially designers), social scientists, computer specialists without AI background, and other professionals.

In the following, I have grouped papers roughly into categories, some of which contain specific systems while others are broader overviews or even general introductions to the wider field of AI. In the interest of being representative, a number of systems of approximately equal significance to those given here have been omitted. The papers here do in fact refer to these others.

1.1. Expert Systems in General

[Feigenbaum 77]
[Waterman&Hayes-Roth 78]
[Micke 79]
[Nil 80]
[Newell 81]
[Winston 77]
[Simon 69]
[Nilsson 80]
[Boden 77]
[McCorduck 79]
[Erman&Lesser 78]

? Forthcoming: AI Handbook, by Barr and Feigenbaum

1.2. Electronics and Computers

[Brown&Burton 75]
[Sussman 77]
[Sussman&Steele 80]
[de Kleer 79]
[Borning 79]
1.3. Engineering Design in General

[Rieger & Grinberg 77]
[Freeman & Newell 71]
[Eastman 81]
[Bennett & Engelmore 79]
[Powers 72]
[Fenves & Norabhoompipat 78]

1.4. Other expert systems

[Davis & Buchanan & Shortliffe 77]
[Pople 81]
[Duda & Gaschnig & Hart 79]
[Nii & Aiello 79]
[Buchanan & Feigenbaum 78]
[Lindsay & Buchanan & Feigenbaum & Lederberg 80]
[Genesereth 78]
[Weiss & Kulikowski & Amarel & Safir 78]
[Waterman & Peterson 80]

1.5. Other Specific AI Techniques of Interest

[Clancey 79]
[Sacerdoti 75]
[Stefik 81]
[Lenat 75]
[Lesser & Erman 77]
[Davis 80]
[Hayes & Ball & Reddy 81]
[Teitelman & Masinter 81]

Acknowledgment. Allen Newell made many useful comments on preliminary versions of this paper.
2. Bibliography

[Bennett & Engelmore 79]
Bennett, J. S. and Engelmore, R. S.
SAcon: A knowledge-based consultant for structural analysis.
In Proc. Sixth International Joint Conference on Artificial Intelligence, pages 47-49.
Tokyo, 1979.
Advises users of a program, MARC, for analysis of physical structures

[Boden 77]
Boden, M.
Artificial Intelligence and Natural Man.
Chapters 1, 10, 12, 15 are pertinent to expert systems

[Borning 79]
Borning, A. H.
THINGLAB - A Constraint-Oriented Simulation Laboratory.
SOPHIE electronics lab simulation

[Brown & Burton 75]
Brown, J. S. and Burton, R. R.
Multiple representations of knowledge for tutorial reasoning.

[Buchanan & Feigenbaum 78]
Buchanan, B. G. and Feigenbaum, E. A.
DENDRAL and Meta-DENDRAL: their applications dimensions.
Chemistry (mass spectroscopy) and scientific inference

[Clancey 79]
Clancey, W. J.
Tutoring rules for guiding a case method dialogue.
Turning expert systems into teaching / tutorial ones; also 6th IJCAI (1979), pp. 155-161

[Davis 80]
Davis, R.
Meta-rules: reasoning about control.
There is a companion paper in the same issue, pp. 223-239

[Davis & Buchanan & Shortliffe 77]
Davis, R., Buchanan, B. and Shortliffe, E.
Production rules as a representation for a knowledge-based consultation program.
Discusses MYCIN, an expert on infectious diseases and treatments; see 6th IJCAI (1979), pp. 923-925
(MYCYCIN)

[de Kleer 79]
de Kleer, J.
Causal and Teleological Reasoning in Circuit Recognition.

[Director & Parker & Siewiorek & Thomas 81]
Director, S. W., Parker, A. C., Siewiorek, D. P. and Thomas, D. E.
A design methodology and computer aids for digital VLSI systems.
[Duda&Gaschnig&Hart 79]
Duda, R. O., Gaschnig, J. and Hart, P. E.
Model design in the Prospector system for mineral exploration.
See also [Waterman&Hayes-Roth 78], pp. 203-222

[Eastman 81]
Eastman, C. M.
Recent developments in representation in the science of design.
In Proc. 18th Design Automation Conference, IEEE Computer Society and ACM,
June, 1981.
(Forthcoming), Building design, geometric modelling, and integrity of design databases

[Erman&Lesser 78]
Erman, L. D. and Lesser, V. R.
System engineering techniques for artificial intelligence systems.
General system-building ideas

[Feigenbaum 77]
Feigenbaum, E. A.
The art of artificial intelligence: I. Themes and case studies of knowledge engineering.
Overview of a number of Stanford systems and their methods

[Fenves&Norabhoomipat 78]
Fenves, S. J. and Norabhoomipat, T.
Potentials for artificial intelligence applications in structural engineering design and detailing.
A view from outside AI

[Freeman&Newell 71]
Freeman, P. and Newell, A.
A model for functional reasoning in design.
Somewhat general, problem-solving approach

[Genesereth 79]
Genesereth, M. R.
The role of plans in automated consultation.
User consultant for MACSYMA

[Grinberg 80]
Grinberg, M. R.
A knowledge based design system for digital electronics.
Semi-Automatic Digital Designer (SADD)

[Hayes&Ball&Reddy 81]
Hayes, Phil, Ball, E. and Reddy, R.
Breaking the man-machine communication barrier.

[Lenat 75]
Lenat, D. B.
BEINGS: Knowledge as interacting experts.

[Lesser&Erman 77]
Lesser, V. R. and Erman, L. D.
A retrospective view of the HEARSAY-II architecture.

[Lindsay&Buchanan&Feigenbaum&Lederberg 80]
Lindsay, R. K., Buchanan, B. G., Feigenbaum, E. A. and Lederberg, J.
*Applications of Artificial Intelligence to Chemistry: The DENDRAL Project*.

[McCorduck 79] McCorduck, P.
*Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence*.
Chapter 12 is pertinent to expert systems

[McDermott,J 80] McDermott, J.
R1: an expert configurer.
Configures VAX computer systems. OPS language

*Expert Systems in the Micro Electronic Age*.
A recent collection of papers

[Newell 81] Newell, A.
How to view the computer.
(Forthcoming)

[Nii 80] Nii, H. P.
*Heuristic Programming Project 1980*.
Stanford University, Department of Computer Science, 1980.
Overview of a number of expert systems projects

[Nii&Aiello 79] Nii, H. P. and Aiello, N.
AGE (Attempt to Generalize): A knowledge-based program for building knowledge-based programs.
Nilsson, N. J.
*Principles of Artificial Intelligence.*
Chapters 1, 8, 9 and 10 are especially relevant to expert systems

Pople, H. E. Jr.
Heuristic methods for imposing structure on ill-structured problems: the structuring of medical diagnosis.
In *Artificial Intelligence in Medicine.* American Association for the Advancement of Science, 1981.
(Forthcoming), see also 5th IJCAI (1977): pp. 1030-1037

Powers, G. J.
Non-numerical problem solving methods in computer-aided design.
Discussion of AI techniques applied to design problems

Rieger, C. and Grinberg, M.
The declarative representation and procedural simulation of causality in physical mechanisms.
Complex interconnected systems simulated

Sacerdoti, E. D.
The nonlinear nature of plans.
Planning experiments in molecular genetics; also 1980 Stanford U. Ph.D. Thesis

Stefik, M. J.
Planning with constraints (MOLGEN: part 1).
Includes some general pointers; see also *Artificial Intelligence* 9: pp. 135-196, 1977 (EL)

Sussman, G. J.
Electrical design: a problem for artificial intelligence research.

Sussman, G. J. and Steele, G. L. Jr.
CONSTRAINTS - A language for expressing almost hierarchical descriptions.
[Teitelman&Masinter 81]
Teitelman, W. and Masinter, L.
The INTERLISP programming environment.
A flexible, responsive environment; issues of personal computing and user interfaces

[Waterman&Hayes-Roth 78]
Waterman, D. A. and Hayes-Roth, F. (Eds.).
Pattern-Directed Inference Systems.
Especially the first and last chapters; exhaustive references

[Waterman&Peterson 80]
Waterman, D. A. and Peterson, M.
Rule-based models of legal expertise.
Legal decision-making system (LDS); RITA and ROSIE languages

[Weiss&Kulikowski&Amarel&Safir 78]
Weiss, S. M., Kulikowski, C. A., Amarel, S. and Safir, A.
A model-based method for computer-aided medical decision-making.
CASNET expert on glaucoma; see also 6th IJCAI (1979), pp. 942-947 (EXPERT)

[Winston 77]
Winston, P. H.
Artificial Intelligence.
Addison-Wesley, Reading, MA, 1977.
Chapters 1 and 5 are the most relevant