

EXPERT SYSTEMS

*The Technology of
Knowledge Management
and Decision Making
for the 21st Century*

VOLUME I



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Knowledge Management
and Decision Making
for the 21st Century*

VOLUME I

Edited by

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PREFACE

Artificial Intelligence (AI) has expert systems as one of the areas in its domain. AI almost defines itself as the replication, to some degree of human intelligence by the utilization of computers, sensor systems, and other technologies, in the performance of useful or interesting tasks. While application of AI to areas such as natural language translation, original composition of music or prose, vision, and other diverse tasks which are more in keeping with human facilities is problematic, restriction of AI to some of its generally regarded subset areas may provide useful solutions. In particular, delimiting artificial intelligence to the area of expert systems has proven to offer many significant capabilities and applications. As in other cases, there are no doubt many possible definitions of expert systems. One such effective definition of expert systems is that an expert system is a knowledge-based computer system which emulates the decision making ability of a human expert.

It seems the primary role of expert systems is to perform their functions, where it is appropriate to do so, under the supervision or monitoring of the human that is being supported. That is, the primary role of expert systems would appear to be supporting the human or humans who are using them. A classic example of where this relationship failed and resulted in near catastrophic economic consequences, was computerized stock trading (a flawed expert system at the time). On Monday, October 19, 1987, a malfunctioning expert system resulted in the worst stock market crash in history. Indeed, it was noted at the time that stock traders watched in helpless shock as the “bottom dropped out of the stock market” because proper monitoring measures were not put in place, to say nothing of the fact that the system itself had design flaws. Of course, these flaws have since been corrected, and research continues to produce improvements so that this catastrophe

will not be repeated. Incidentally, stock trading is an example of “forward chaining” expert systems, i.e., a cause (various economic indicators) produces a certain effect (stock trading).

The “flip side” of the 1987 collapse of the stock market due to computerized trading is the Chernobyl disaster which occurred April 26, 1986. In this instance, it has been observed that this disaster which occurred at 1:15 AM was probably, if not indeed, due to operator fatigue. These operators were not supported by an expert system, which very likely would have avoided this disaster. This would be an example of a “backward chaining” expert system, i.e., effects (reactor performance indications) resulting in correction of causes by making proper control changes.

In the case of the stock market collapse, the situation was an expert system which was neither properly designed nor had adequate provision for human intervention. In the case of the Chernobyl disaster, the system operators did not have the support of an expert system, which very likely could have averted this major disaster. In both cases, the wrong thing was done at times which just aggravated the respective situations. At the bottom, it is most important to be aware of this still relatively new and growing technology of expert systems, which can permeate virtually every area of human endeavor, so that it can be appropriately and necessarily utilized. Indeed, one more noteworthy example involves the two chess matches that world class champion Garry Kasparov played against IBM’s expert system known as “Big Blue.” The first match was a tie and Kasparov lost the second match! In any event, this is a particularly appropriate time to treat the issue of expert systems techniques and applications.

This set consists of six well-integrated volumes on the broad subject of expert systems techniques and applications. It is appropriate to mention that each of the six volumes can be utilized individually. The great potential pervasiveness of this broad field of major significance certainly suggests the clear requirement for an adequately comprehensive treatment. All of the contributors to this work are to be highly commended for their splendid contributions that will provide a significant and unique reference for students, research workers, practitioners, computer scientists, and others on the international scene for years to come.

Cornelius T. Leondes

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