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Expert Systems

A Practical Introduction

Peter S. Sell

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Preface

Expert systems represent a new opportunity in computing. They open up avenues of application so far closed and allow new problems to be tackled. Although the ideas underpinning the technique are still in ferment, the techniques they employ have been in use for two decades or more. Nevertheless, it was only recently that they achieved prominence in the public eye and started to be exploited by commerce and industry. One result of their neglect is that practical information on the subject is hard to come by and, as is often the case with a little-known territory, the subject appears more mysterious and forbidding than its nature warrants. It is true that, in the large area that expert systems span, complex and powerful techniques can be found at work. Nevertheless, the theme of this book is that in at least one mode of use, namely that of the so called 'single shot' advisory systems, the appropriate techniques used to give form to such systems lie close to the mainstream of software engineering. What is undoubtedly difficult and new is how to give them content, how to imbue them with knowledge. The situation will remain thus until generally applicable methods of knowledge acquisition are found.

This book is aimed at the advanced undergraduate or new practitioner. I have assumed that he (by which term I mean here and all through the book 'he or she') is a competent programmer who is familiar with the software development life cycle, at home with basic data structures, and conversant enough with high-level languages not to balk at notation that is eclectic but whose meaning, I hope, is self-evident. I also assume that he has at least a nodding acquaintance with compilers and what they can do. The book is meant to give the reader sufficient insight and practical guidance to enable him to construct an expert system

shell using his favourite programming language. To allow the latter, I have refrained from using some powerful facilities - such as 'eval' - which could simplify the algorithms but could create problems in implementation if not provided by the host language.

The first three chapters introduce the topic through an overview of Artificial Intelligence, a brief history and characterisation of expert systems. Chapter 4 addresses the question of how to develop and maintain these systems. Chapters 5 and 7 tackle the technical issues. They concentrate on problems unique to the field and touch lightly on matters that the reader may already be familiar with or can obtain information on from other, specialist sources. The last chapter gives some help with assessing new applications. In my experience, there is never a shortage of ideas for using expert systems, so what is needed is not a catalogue of possibilities but advice on how to assess them. There are a few questions to test the reader's understanding and, where there is material for further reading, I give references after each chapter. An aggregate list of these is given at the end of the book. I have limited references to those available to the general public.

I am, of course, responsible for the words and ideas but, like any author, I owe indebtedness to many others - too many to name them all. I would like to express my appreciation to members of the Knowledge Engineering Group of SPL for their help, to my superiors and colleagues for their encouragement, to SPL-Insight for acting as a sounding board, but most of all to my wife, Frances, for correcting my more egregious errors and for continuing to treat with love and patience her husband turned lodger.

Finally, because so much is still in the melting pot, this book can hope to be no more than a snapshot of what we know today. I hope, nevertheless, that it will help those who wish to get their feet wet, and provide for others at least a clearly focused target for refutation and growth.

Southmoor, 1984.

Peter S. Sell