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KNOWLEDGE-BASED IMAGE PROCESSING SYSTEMS

Deryn Graham
and Anthony Barrett

基于知识的图像处理系统

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Preface

Knowledge-based systems and *Expert systems*, are systems developed as a result of work in Artificial Intelligence. An expert system is a knowledge-based system with an evaluated level of performance, close to that of an expert. Knowledge-based systems and expert systems are often not distinguished i.e. if an expert is involved, then usually the implication is that it is an expert system. An expert system may be defined as a computer program applied to problem solving associated with a significant degree of human expertise. Such a program uses knowledge and some form of inference mechanism to achieve this.

Image Processing can be considered as consisting of two components. The first deals with the application of a range of mathematical transformations to an image such as a satellite picture or an x-radiograph for example stored in a digital form on the computer. The purpose of the application is to improve the quality of the image and where possible, to render the image so that features not visible to the eye in the original become visible within the rendered or transformed image. The second component, deals with the extraction of features from within the image for subsequent analysis. Image Processing currently plays an important part in many scientific, engineering and commercial environments.

Knowledge-based systems or Expert systems have been applied to numerous application domains e.g. medicine. Likewise, Image Processing has also been applied to many domains, however, although both fields may often address common application areas, this has been to a large extent mutually independent. A combined knowledge-based systems and image processing approach is appropriate to many of the problems each field is independently addressing. Few systems currently exhibit a truly combined approach, most likely due to research communities often working in isolation from each other.

In themselves, each field requires several hundred pages to cover sufficient material necessary to provide a definitive text. In the space available therefore, we have been obliged to select topics specific to each area in order that a reader of limited familiarity with either knowledge-based systems or image processing should acquire a working knowledge of both fields.

This book is aimed at final year and postgraduate students with some background in computer science, and researchers requiring a brief introduction to either area: knowledge-based systems or image processing. The book is in three parts, parts 1 and 2 are designed to provide overviews of each of the areas (each part equating to a half semester course), part III gives a report on current work in which the two converge before describing some of the issues involved in designing future knowledge-based image processing systems. Sample questions are also provided for parts 1 and 2 in an appendix (A).

This book attempts to give an insight into the two areas of research and current systems, and suggests a way forward for designing future systems.

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Deryn Graham
Anthony Barrett

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Contents

Preface v

Acknowledgements vii

Contributors xiii

Part 1: Knowledge-Based Systems: An Overview
D. Graham and D. Martland

1 **Introduction to Knowledge-Based Systems** 3
1.1 Background to Knowledge-Based Systems 3
1.1.1 Search Strategies 6
1.2 What is a Knowledge-Based System? 8
1.2.1 Basic Architecture 9
1.2.2 Characteristics of an Expert System 10
1.2.3 Explaining Solutions 10
1.2.4 Uncertainty 12
1.2.5 Evaluating Expert Systems Generally 13

2 **Knowledge-Based System Architectures and Applications** . 15
2.1 Knowledge-Based System Tools and Architectures . . . 15
2.1.1 Expert System Shells 16
2.1.2 High-Level Programming Languages 17
2.1.3 Hybrid Systems 17
2.1.4 Skeletal Systems 18
2.1.5 Truth Maintenance Systems 19
2.1.6 Current Research Problems in Expert Systems 20
2.1.7 Professional Issues 21
2.2 Knowledge-Based System Applications 22
2.2.1 Early Systems 22
2.2.2 Current Systems 25

3 **Knowledge Elicitation** 27
3.1 Knowledge Acquisition and Knowledge Elicitation . . . 27

3.2 Stages of Knowledge Acquisition 28
3.3 Knowledge Acquisition Methodologies 30
3.3.1 Machine-Aided Knowledge Acquisition 32
3.3.2 Human-Labour Oriented Approaches to Knowledge Elicitation 33
3.4 Knowledge Elicitation Techniques 35
3.5 Knowledge Elicitation Issues 36
3.6 Knowledge Acquisition Tools: TEIRESIAS and OPAL 38

4 Knowledge Representation 41
4.1 Schemes for Representing Knowledge 41
4.2 Issues in Knowledge Representation 42
4.3 Logical Representation Schemes 42
4.4 Procedural Representation Schemes: Production Systems 44
4.5 Network Representations: Semantic Networks 46
4.6 Structured Representations 51
4.6.1 Conceptual Dependency Theory 51
4.6.2 Frames 52
4.6.3 Scripts 53
4.6.4 Objects 54

5 Neural Networks 57
5.1 Introduction 57
5.2 Background to Neural Networks 57
5.2.1 Motivation 58
5.2.2 Biological Neurons 59
5.3 Feed-Forward Networks 64
5.4 Applying Neural Network Methods 69
5.5 Feed-Back Networks 70
5.5.1 Lateral Inhibition 70
5.5.2 Hopfield Networks 71
5.6 Kohonen Networks 74
5.7 Software Support for Neural Networks 76
5.8 Hardware Support for Neural Networks 77
5.9 Image Processing Applications 77
5.10 Strategies for Developing Applications 78

Part 2: Image Processing: An Overview
A. Barrett

6 Introduction to Image Processing 83
6.1 Background 83

6.2 What Exactly is Image Processing? 83
6.3 Image Representation 84
6.4 Image Acquisition 84
6.5 Image Storage 86
6.6 The Human Eye and Recognition 87
6.7 Use of Colour 87
6.8 Image Sampling 88
6.9 Image Processing Overview 90

7 Frequency Space Analysis 91
7.1 The Fourier Transform 91
7.2 Formulation of the Fourier Transform 94
7.3 The Fast Fourier Transform 97
7.4 Computing the Fourier Transform of an Image 99
7.5 Convolution and Correlation 101
7.6 Evaluation of the Inverse Transform 103
7.7 Sampling 104

8 Image Enhancement in Real Space 105
8.1 Histogram Processing 105
8.2 Histogram Equalisation 107
8.3 Histogram Specification 109
8.4 Gray Level Thresholding 111
8.5 Image Smoothing 113
8.5.1 Neighbourhood Averaging 113
8.6 Image Sharpening 114

9 Image Segmentation and Analysis 117
9.1 Detection of Points, Lines and Edges 118
9.1.1 Detection of Isolated Points 119
9.1.2 The Hough Transform 120
9.2 Image Texture 122
9.2.1 Statistical Methods for Texture Description . . 123
9.2.2 Fourier or Spectral Methods for Texture Description 125

Part 3: Knowledge-Based Systems and Image Processing:
D. Graham and A. Barrett

10 Introduction 131
10.1 Fundamental Stages of Knowledge-Based Systems Development and Image Processing 131
10.2 Linking Basic Steps in Image Processing and Knowledge-Based Systems 132

11 Current Knowledge-Based Image Processing Systems. . . 133
11.1 Knowledge-Based Systems and Image Processing . 133
11.1.1 Basic Concepts 133
11.1.2 Image Understanding and Image Processing Problems 134
11.1.3 Issues to Consider 134
11.2 Correlating Knowledge-Based Systems and Image Processing. 136
11.2.1 Knowledge Types. 136
11.2.2 Five Methods of Linking Image Processing and Knowledge-Based Systems through Image Interpretation 138
11.3 Applications 139
11.3.1 Early Applications 141
11.3.2 Fields of Impact 141
11.3.3 General 141
11.3.4 Geographical Uses 142
11.3.5 Remote Sensing. 142

12 Knowledge-Based Image Processing: The Way Forward . 143
12.1 The Impact of Knowledge-Based Systems on Image Processing 143
12.2 Current Research Issues 143
12.3 Summary 144

13 Summary and Conclusions 147
13.1 Knowledge-Based Systems 147
13.2 Knowledge-Based Systems and Image Processing . 148
13.3 Knowledge-Based Systems and Image Processing in the Biomedical Domain. 148
13.4 Conclusions 149

Appendix A: Exercises and Further Reading 151

References 161

Author Index 169

Subject Index 173

Part 1
Knowledge-Based Systems: An Overview

D. GRAHAM and D. MARTLAND

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