AppliedComputing

KNOWLEDGE-BASED

IMAGE PROCESSING

SYSTEMS

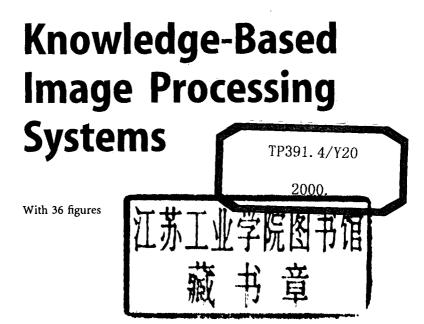
Deryn Graham

and Anthony Barrett

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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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Part 1 Knowledge-Based Systems: An Overview

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