

ELLIS HORWOOD SERIES IN DIGITAL AND SIGNAL PROCESSING

PRACTICAL DIGITAL IMAGE PROCESSING

Rhys Lewis



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RHYS LEWIS B.Sc., Ph.D.
IBM, UK Scientific Centre, Winchester, Hants



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To Angela, Peter and especially Andrew

And to Joan and Alvin, for making everything possible

Preface

A large number of books have been written about digital image processing in the 30 or so years since the subject's inception. There are a number of classic works, written by eminent people in the field and containing vast amounts of detailed information. You might well be forgiven, therefore, for questioning the need for yet another title covering the basic subject material.

Image processing is, by its very nature, intensely mathematical. The major works on the subject are written by mathematically literate authors for a mathematically literate readership. They tend to take an academic approach to the subject, concentrating on the derivation and proof of important results. There is nothing wrong with that, particularly as mathematics provides a very precise way of defining the detailed concepts involved. However, the presence of a large amount of formalism means that many works on image processing are inaccessible to readers without the necessary mathematical skills.

This book is an attempt to describe image processing without the reader being required to understand complex mathematical formalism. It does contain formulae, but in the main these are used to augment explanations rather than being fundamental to them. It is, I suppose, the book I would like to have read when I started working in image processing some years ago. A background in the biological sciences meant that my mathematics were never of the strongest. A period of several years, spent writing commercial computer software, dulled still further my recollection of university maths courses. My subsequent tussle with the image processing literature was enough to convince me of the need for a book dealing with the subject by description and by example rather than by definition and derivation — a book describing the subject in easily assimilable form — a book aimed at people who use image processing systems, rather than those who implement them. This is my attempt to produce such a book. It is for others to decide how successful I have been.

The book came about as a result of more than six years spent working at IBM's United Kingdom Scientific Centre (UKSC), located in Winchester, England. During

my time there, I took part in a number of medical research projects involving digital image processing. More importantly, from the point of view of the book, I became heavily involved in the development of two interactive image processing systems, one of which (IBM IAX Image Processing) is now marketed by IBM.

A number of people have helped me directly, during preparation of the book, through discussion and by providing material. I would like to thank Gavin Brelstaff, David Prendergast, Mike Ibison, Peter Elliot, John Ibbotson, and especially Ricky Turner, for the principal components analysis code. I would also like to thank Terry Harris, John Knapman, Colin Bird and Eric Janke who reviewed the manuscript in its various stages.

The IBM UK Scientific Centre has given me considerable support by making equipment available for creation of the numerous figures, which the book contains, and for preparation of the camera ready copy. I would like to thank John Knapman, Rodger Hake and Dave Steventon for making these facilities available.

I would like to thank Dave Slogett, my editor, for his invaluable suggestions, and Sue Horwood and her team, at Ellis Horwood Ltd., for their advice and assistance.

Many people have offered me help, guidance and education whilst I have been working in image processing. It would be quite impossible to mention them all. However a few names do stand out. My thanks go to Paul Jackson, Mike Cowlshaw, Steve Davies, Mike Cocklin, Myron Flickner, Mark Lavin, Peter Muller, Wayne Niblack, Rick Simpson and Virginia Hetrick. To all my friends and colleagues involved in image processing, both inside IBM and elsewhere, thank you. You have all contributed in some way to this book.

Finally, and feeling a little like someone giving the acceptance speech for a media award and trying, breathlessly, to ensure that everyone in the production company gets a mention, I must thank my sons Andrew and Peter for putting up with a father who hid himself away and typed at every opportunity and my wife Angela for keeping everything running smoothly at home throughout the preparation of the manuscript.