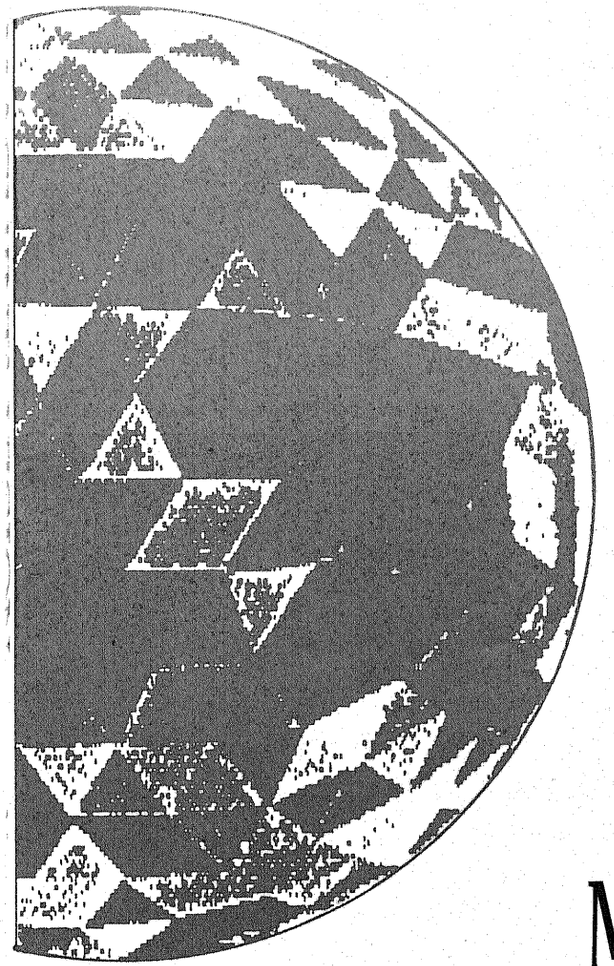
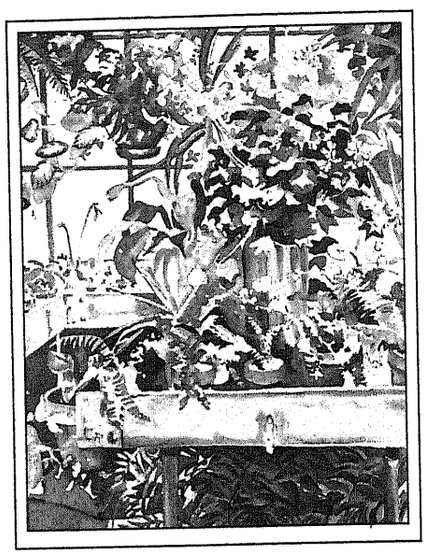


David Vernon

MACHINE VISION

Automated Visual Inspection and Robot Vision



Machine Vision

Machine Vision

Automated Visual Inspection and Robot Vision

David Vernon
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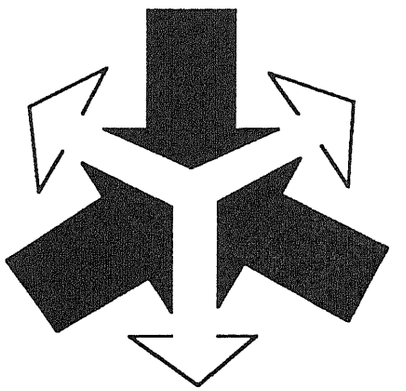

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Everything that I can spy
Through the circle of my eye,
Everything that I can see
Has been woven out of me;
I have sown the stars, and threw
Clouds of morning and of eve
Up into the vacant blue;
Everything that I perceive,
Sun and sea and mountain high,
All are moulded by my eye:
Closing it, what shall I find?
– Darkness and a little wind.

James Stephens
The Hill of Vision

Contents

Preface

Machine vision is a multi-disciplinary subject, utilizing techniques drawn from optics, electronics, mechanical engineering, computer science, and artificial intelligence. This book is intended to be an in-depth introduction to Machine Vision which will allow the reader quickly to assimilate and comprehend the essentials of this evolving and fascinating topic. Significant emphasis will be placed on providing the reader with a solid grounding in the fundamental tools for image acquisition, processing, and analysis; a range of techniques, dealing with very simple two-dimensional systems, through more sophisticated robust two-dimensional approaches, to the current state of the art in three-dimensional robot vision, will be explained in some detail. Both application areas of automated visual inspection and robot vision are addressed. Recognizing that machine vision is just a component of a larger automation system, a brief introduction to robot programming will be provided, together with an explanation of the mechanisms by which robot vision modules interact with the programming language. It is important to recognize that the discipline of machine vision is presently undergoing a maturing process, with sophisticated techniques drawn from current research being exploited more and more in industrial systems. Without doubt, there is a long way to go, but the die is well cast. Acknowledging this trend, the last chapter of the book is devoted to the more research-orientated topics of three-dimensional image understanding and early visual processing (e.g. stereopsis and visual motion). It would indeed be foolhardy to attempt an exhaustive treatment of these areas; each deserves a volume on its own. However, if the essence of the philosophy of robot vision in its broadest sense is cogently imparted to the reader, then the exercise will have been successful and worth while.

The book is directed at final-year undergraduate and first-year graduate students in computer science and engineering, and at practising industrial engineers; the fundamental philosophy being to impart sufficient knowledge so that the reader will be competent to begin the implementation of a simple vision system and to enable him/her to study each issue independently in more depth. To that end, care

is taken to provide adequate references to supporting texts, reports, and research papers. In this way the book may be viewed both as a self-contained introductory text and as a spring-board to more detailed and specific study.

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