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A Guided Tour of Computer Vision: A Review

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A Guided Tour of Computer Vision, Vishvjit S. Nalwa, Addison-Wesley, Reading, Massachusetts, 1993, 361 pp., ISBN 0-201-54853-4.

A *Guided Tour of Computer Vision* by Vishvjit S. Nalwa is a remarkable work. In one short volume, the author covers the entire field of computer vision, from basic optics, geometry, edge detection, shading, and texture through stereo, motion, and shape representation. The book is lucid and up to date and should serve as the new standard text for upper-level undergraduate and introductory graduate courses in this field.

I find this book to be plainly superior to Dana Ballard and Christopher Brown's *Computer Vision* (Prentice-Hall, Englewood Cliffs, New Jersey, 1982) because it is cleanly edited and proofread and has good coverage of the mathematics underlying computer vision. It does not rival Berthold Horn's *Robot Vision* (MIT Press, Cambridge, Massachusetts, 1986) for mathematical explanation or depth, nor would one expect it to because these are Horn's singular advantages. However, Nalwa's explanations are easier to follow, and the book has more breadth, in spite of being much shorter.

A Guided Tour of Computer Vision is well illustrated, with many nontechnical but striking images to demonstrate points: For example, the picture of the model's face on page 160 serves as a good introduction to the chapter on shading. Henry Moore's sketch of one of his sculptures on page 74 is the only picture I have seen in which a human's professional view of the important edges in the scene, rather than a computer's output, is shown.

Nalwa sometimes takes a disappointingly provincial view for a work with such a broad scope, for example, when he extensively discusses his own work with Binford on edge detection and compares it to others. I can understand his desire to include this technical material, which is obviously well thought out, but it is too specific given the context of his broad, sweeping discussion.

Nalwa generously defines many terms in common use in computer vision, such as *local, additive,* and *stable* when referring to a surface representation. This information is useful for the computer vision community, but I think he would better serve the student if he included references for these terms, especially where there are different views of the correct meanings. This problem actually exists throughout the work; except for the dispute over edge detectors, Nalwa does not present the multiple points of view that are so common in our field, preferring instead to simply survey the various research results.

An important function of a book such as this should be to serve as a starting point for investigation of other, related fields, such as Azriel Rosenfeld and Avi Kak do in their still-useful *Digital Picture Processing* (Academic Press, San Diego, California, 1982). Here, Nalwa falls somewhat short. For example, there are no pointers to the fields of photometry and photogrammetry, and the references to the interesting field of ill-posed problems are limited to pointers to Tomaso Poggio's work.

Nalwa would have done well to include some thoughts on the future of this field. It is, after all, the future that students using this work would have the most interest in. I would also have appreciated more historical context; Nalwa presents the research results without giving their context,

comparing techniques developed years apart without the background needed to understand their origin and motivation.

In summary, I find this an extremely useful work. It serves as a broad, elementary introduction to computer vision, which has been lacking in recent years. It performs useful work for the field in defining many terms in common use. It also serves as an excellent reference to much contemporary work. However, it does not encourage the reader to explore the field in greater depth, except by turning to computer vision publications; the many related fields that have contributed so much to computer vision are slighted. It also does not convey well the multitudinous points of view still present in this rich field.

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