By Alex Zelinsky

Learning OpenCV—Computer Vision with the OpenCV Library

Gary Rost Bradski and Adrian Kaeller, O' Reilley Media, http://oreilly.com/catalog/9780596516130/, September 2008. ISBN 10: 0-596-51613-4 | ISBN 13: 9780596516130.

This is an introductory textbook for teachers, students, professionals, and hobbyists who want to learn the basics of computer vision. The book is completely based around the OpenCV library, an open source project that started in 1999 by the computer-vision community. The authors of the text are among the principal contributors to this real-time library that has developed in C/C++ to run Linux, Windows, and Mac OS X. With more than 500 functions implemented and updates released biannually, the library has reached a level of sophistication that makes it usable for the development of significant systems with commercial application. The OpenCV is popular around the world with large user communities in Europe, United States, and Asia. The Yahoo group's forums on the OpenCV have more than 20,000 members. The textbook is timely given the increased interest in OpenCV. Although it is unashamedly a promotion for the open-source library, it is still a worthy educational text.

The real strength of this book is that it is written in a straightforward, no-nonsense manner. The explanations are concise and to the point. The book states upfront that it is not a formal text. Rather, it gives readers an intuitive guide on how the algorithms work and does not seek to provide a mathematical formalism to the methods described. However, references to further reading are provided.

The OpenCV offers a free and easy way for people to get started in computer vision. It creates a way to grow the developer community and encourages innovation in a space where many of the algorithms and methods for computer vision systems are locked behind the corporate and R&D laboratory doors. The textbook explains how to install the software and gets you started with simple examples with single images and then onto video, and working with the all important graphical user interface (GUI). The textbook addresses the education market by providing an extensive set of exercises at the end of each chapter. The degree of difficulty for the exercises is not entirely uniform, but it is evident that the authors have been thoughtful in their choice of exercises.

This book covers the basics of computer vision. It starts with the basics of image processing: smoothing, image morphing, thresholding, image pyramids, and classic convolution image processing. It also covers edge operators such as Sobel, Canny, Hough and moves on to image manipulation. Stretching, shrinking, warping, and rotation are well described. A good treatment of histograms, contours methods, and image segmentation is provided as well. The text also tackles the complicated challenges of tracking algorithms, camera calibration, three-dimensional (3-D) vision, and machine learning. The last sections are difficult areas to deal with suitable depth given that considerable R&D in these topics is also underway. The depth of treatment of topics is spotty. Some areas such as optical flow are well described, whereas others such as condensation tracking and face detection using methods such as Viola-Jones are given superficial treatment. Another drawback of the book is that because it entirely relies on the OpenCV library, it does not necessarily report on alternate algorithmic approaches. For example, the performance of block-matching methods is strongly influenced by the underlying correlation methods. The OpenCV library relies on sum of absolute differences and does not discuss normalized cross-correlation that yields superior performance. A visual drawback of the textbook is that the example images and video sequences that have been selected are not great, and they are not very effective at readily showing the effect of various algorithms.

On balance, the textbook makes a solid contribution to the field of computer vision education. Despite a few minor shortcomings, this book has a deserved and welcomed spot on my bookshelf. I have no doubt that just like the open-source revolution, with subsequent editions, this textbook will only improve.

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