Electrical Engineering Colloquium
Dallas Chapter of IEEE Signal Processing Society Presents

Image Enhancement of a Flying Probe Tester

Dr. Mukul Shirvaikar
Department of Electrical Engineering
University of Texas at Tyler

Wednesday, April 5, 2006
ECSS 2.311, 11:00am

This talk presents the possibility of enhancing a Flying Probe Tester (FPT) with an Automated Optical Inspection (AOI) module. The testing and inspection of Printed Circuit Boards (PCBs) involves a tradeoff between cost and performance. The goal is to decrease setup and testing time while maximizing fault coverage. To this end, there have been some efforts recently, to enhance commercial FPT systems with an AOI component, but with limited success. This can be largely attributed to the fact that typically AOI systems operate independently using a "Golden Board" approach for system training. This approach is sensitive to variations in lighting, process, scale, component rotation and shifts, as well as problems with equipment vibrations. Consequently, reliable setup of an AOI system becomes a time consuming and tedious process, quickly abandoned by operators. The AOI system proposed in this research utilizes the Principal Component Analysis (PCA) of images to classify component defects. It is implemented in a fashion similar to the eigenface decomposition methods for face recognition. Several sub-images of components are extracted from the global image of a printed circuit board (PCB). System training has been performed with a partial set of these component images, which represent different classes like capacitors, resistors and unpopulated slots. Testing has been performed on a wide range of component images and the effects of noise, occlusion, translation, rotation and lighting variation, have been studied to characterize system performance. The results are promising when compared to the template-matching approach. A scheme to use the FPT in conjunction with AOI is also proposed. It makes use of board manufacturing data and FPT result feedback to enhance test coverage. It is envisioned that a deployed system will achieve a wider range of defect detection and decrease inspection times.

Mukul Shrivaikar received the Ph.D. degree in Electrical and Computer Engineering from the University of Tennessee in 1993. He is currently an Associate Professor of Electrical Engineering at the University of Texas at Tyler. He has also held positions at Texas Instruments and the University of West Florida. His research interests include real-time imaging, embedded systems, pattern recognition, and dual-core processor architectures. At the University of Texas he has started a new real-time systems lab using dual-core processor technology. He is also the principal investigator for the “Back-To-Basics” project aimed at engineering student retention.

For more information on the Dallas Chapter and directions to UTD, please refer to
http://www.utdallas.edu/~kehtar/ieee-sp