THE IMAGE PROCESSING MARKETPLACE

R. C. Gonzalez
Perceptics Corporation & University of Tennessee
Knoxville, Tennessee

Invited Paper

HISTORICAL PERSPECTIVE

Interest in gray-scale digital image processing techniques dates back to the early 1920's, when digitized pictures of world news events were first transmitted between New York and London via the Bartlane cable picture transmission system. Pictures were coded for cable transmission and then reconstructed at the receiving end by specialized printing equipment. Use of the Bartlane system reduced the time required to transport a picture across the Atlantic from more than week to less than three hours.

Although improvements on processing methods for transmitted digital pictures continued to be made over the next thirty-five years, it took the combination of large-scale digital computers (the technology) and the space program (the need) to bring into focus the elements of what we refer to as modern digital image processing.

Work on using computer techniques for improving images from a space probe began at the Jet Propulsion Laboratory in 1964, when pictures of the Moon transmitted by Ranger 7 were processed by a mainframe computer to correct various types of image distortion inherent in the on-board television camera. These techniques served as the basis for improved methods used in the enhancement and restoration of images from such familiar programs as the Surveyor missions to the Moon, and the Mariner series of flyby missions to Mars. The digital image processing systems in these early applications were used primarily for image display, and were based on rotating-disk technology which was, at the time, the most economical and practical way to achieve the data transfer rates needed to refresh a TV screen at 30 frames/sec.

The next major step in image processing hardware took place in the early 1970's, with the appearance of new image processing system designs based totally on solid-state technology. One of the keys to this technology was the availability of 16K RAM's that were both inexpensive and fast enough to allow in-memory storage and display of large (512 x 512 x 8 bits) images at 30 frames /sec. This, along with the availability of relatively inexpensive minicomputers such as the DEC PDP-11 series, brought complete image processing capability to a large number of users in academic and research institutions. This new breed of users made significant contributions to the field, and provided the theoretical and applied foundation of image processing through the 1970's.

Although the memory address space of early minicomputers and peripheral storage media for these systems were grossly inadequate by today's standards, a number of new application areas with commercial potential began to appear, ranging from medical imaging to remote sensing. This growth in the field was further fueled by the appearance of "superminicomputers," such as DEC's family of VAX computers. These machines, with their virtual addressing architectures, were ideally-suited for data intensive applications involving large data arrays such as those found routinely in digital image processing. When coupled with supporting peripheral equipment (principally large magnetic disks) and image processing systems with capabilities for on-board hardware processing, virtual machines provided a processing environment which was the