Ken McGarvey
565 Electric Ave
Walla Walla, Wa. 99362
509-529-6972
ken@horizonimaging.com

Work History

Software Engineer*:* Over 30 years of working experience in machine vision, high-speed image processing, pattern recognition algorithms, 3D measurement systems, metrology, and real-time embedded systems.

Ventek, Inc. June 06 to March 12
Software Contractor: Worked on a "moisture meter" to classify veneer sheets based on moisture content. Developed a real-time inspection system using an NIR spectrometer. Multivariate algorithms used to predict the strength of a sheet of plywood from NIR hyperspectral data. Implemented a vision system to read serial numbers on plywood sheets. Systems deployed using PC-104 stacks and Windows Embedded XP.

Kachemak Research Development, Inc. April 05 to Dec 09
Software Contractor: Developed imaging software for an undercarriage vehicle inspection system. Algorithms were developed to stitch camera views together. Developed under-vehicle-inspection algorithms to detect anomalies.

Advanced Biometrics, Inc. May 00 to Sep 00
Software Contractor: Supported the development a biometric system that used neural networks and wavelets to recognize palm prints.

Key Technology, Inc. June 93 to present
Principal Software Engineer: Designed and developed real-time imaging software for optical inspection systems. Applications developed in food and pharmaceutical industries. Worked on product development of numerous vision systems. Received Key Technology Technical Excellence Award in 1995. Patent issued: 6,923098 B2.

SRC Vision, Inc. Feb 88 to Jan 93
Senior Staff Engineer: Designed real-time imaging software for Kroma-Sort™ belt sorter. Imaging software implemented on parallel TMS 34010 Graphics System Processors. Developed a statistical color segmentation algorithm, and other color teaching techniques. Patents issued: 5,085,325 and 5,305,894.

Technical Arts Corporation July 83 to Jan 88
Software Engineer: Developed math and image analysis algorithms for high-accuracy 3D measurement systems using lasers. Worked on numerous systems including the Rockwell Cavity Scanner, the Honeywell Liner Inspection System, and the Cascade Gas Chart Reader. Research and development included 3D camera calibration, correction of lens aberrations, and robot path planning. Numerical algorithms used to smooth laser data for accuracy to a ten-thousandths of the camera field-of-view.

Boeing Aerospace Corporation July 81 to July 83
Designed and implemented real-time simulations of Command, Control and Communications systems. Built a computer model of a Synthetic Aperture Radar that was integrated into war game simulations.

Boeing Aerospace Corporation July 80 to June 81
Testing and certification of software for the Air Launched Cruise Missile Program.

Education

M.S in Computer Science (1987), University of Washington
M.S in Mathematics (1980), Western Washington University
B.S in Mathematics (1978), Western Washington University

Algorithms

Color vision: Color segmentation algorithms have used: neural networks, self-organizing maps, and statistical analysis. Color space transforms include: LAB, YUV and HSI.

Camera calibration: Color calibration of a RGB camera using a Macbeth color chart and least squares regression. Worked on a system to correct for optical aberrations of camera lens. On another system, least squares regression was used to correct for the perspective distortion of a line-scan camera that has been tilted. Developed color channel alignment algorithms for RGB camera.

Hyperspectral Imaging: Multivariate analysis applied to hyperspectral images for classification and prediction. Algorithms include Principal Components Analysis (PCA), Principle Components Regression (PCR), and Partial Least Squares Regression (PLSR).

Edge detectors: Used edge detectors for various applications. Edge detectors include gray-scale Sobel filters, directional Sobel filters, and Laplacian-of-Gaussian. Edge detectors deployed on real-time vision systems using software libraries. Also developed color edge filters.

Image Filters: Nonlinear filters developed for edge enhancements and noise suppression. Developed filters to suppress misalignment between color channels.

Morphology: Skeletonization algorithm used for classification of elongated objects. Thin filters used for finding thin features in food products. Euclidean distance map and water shed segmentation used to separate touching objects.

Metrology: Linear least squares B-splines used for smoothing of laser speckle data. Least squares fit of 3D conic and planar surfaces for various applications in metrology. FFT developed for measuring the pitch of lead screws. PCA transform used to measure the bend angle between tubes.

Neural Networks: Used a combination of Self Organizing Map (unsupervised network) and Radial Basis Functions (supervised network) for classification with images. Worked on palm classification system using Wavelets and a Back Propagation neural network.

Pattern Recognition Algorithms: Classification algorithms include Support Vector Machines, Linear Discriminant Analysis, Ada-boost and others.

Real-time inspection: Recognition of defects based on color or shape. Feature extraction included: thinness, length, width, roundness, and corners. Developed various algorithms that separate touching pieces

Pharmaceutical inspection: Inspection of blister packs for missing pills, wrong color pills and broken tablets. Software was built compliant to FDA regulations (CFR 21).

Hardware

Sensor technologies: Algorithms developed for color images, gray-scale images, hyperspectral images, laser triangulation data, laser images, ultrasonic sensors, and Ocean Optics spectrometers.

Frame Grabbers: Implemented applications using frame grabbers from Matrox, Coreco, Arvoo and others. Have interfaced to both 2D matrix and line-scan cameras. Experience with Camera Link, Firewire (1394), and Gigabit Ethernet interfaces.

Embedded Processors: Systems built using TI C40 DSP, Analog Devices Sharc DSP, and TI 34010 Graphics processor. More recently, embedded systems have been implemented on industrial PCs using both PC-104 and PCI bus.

Software Environments

Operating systems: Image processing algorithms are rapidly prototyped and demonstrated in C++, Matlab or Python. Imaging algorithms may then ported to the real-time embedded system. Real-time imaging systems have used QNX, Linux, Embedded XP, and Windows Embedded 7.

Libraries: The Intel Performance Primitives Library (IPP) has been used to accelerate image processing algorithms. Imaging algorithms rapidly developed with Open Computer Vision library (OpenCV).

Tools: Rapid prototyping of algorithms using Matlab, Python, R, Open CV, IPP and C++.
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