

1stVision

Glossary of Terms

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8 bit grayscale	Images that contain 256 ($2^8=256$) possible shades of gray needed to represent most black and white photos accurately. 256 levels of gray is actually more shades of gray than the human eye can see.
10 GigE	10 gigabit Ethernet or 10GbE is the most recent (as of 2006) and fastest of the Ethernet standards. It defines a version of Ethernet with a nominal data rate of 10 Gbit/s, ten times as fast as gigabit Ethernet. 10GbE over fiber and InfiniBand "like" copper cabling are specified by the IEEE 802.3-2005 standard. 10GbE over twisted pair has been released under the IEEE 802.3an amendment.
24 bit color	24-bit color images are composed of three 8-bit color channels. When combined, the red, green and blue channels provide up to 16.7 million possible combinations (hence, colors). 24-bit color is also known as True Color and photo-realistic color.
36 bit color	36-bit color images are composed of three 12-bit color channels. When combined, the red, green and blue channels provide up to 68.7 billion possible combinations that translate into that many "colors." (This compares to 16.7 million colors for 24-bit scanners.) The extra amount of information that can be processed by 36-bit scanners translates to more vivid color reproduction, as the scanner is able to accommodate more subtle gradations of color approaching lifelike accuracy.

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Aberration	The failure of an optical lens to produce an exact point-to-point correspondence between the object and its resulting image. Various types are chromatic, spherical, coma, astigmatism and distortion.
Absorption	The loss of light of certain wavelengths as it passes through a material and is converted to heat or other forms of energy.
Accuracy	The extent to which a machine vision system can correctly measure or obtain a true value of a feature. The closeness of the average value of the measurements to the actual dimension.

Active Illumination	Lighting a scene with a light source coordinated with the acquisition of an image. Strobed flash tubes, pulsed lasers and scanned LIDAR beams are examples.
Active X Control	ActiveX Control is a Microsoft term that is used to denote reusable software components that are based on Microsoft Component Object Model (COM). ActiveX controls debuted in v4.0 of Visual Basic. ActiveX controls are simply glorified COM objects, so they can be written using Microsoft Foundation Classes (MFC), Active Template Library (ATL), C/C++, and Visual Basic.
AGC	Automatic Gain Control. A circuit for automatically controlling amplifier gain in order to maintain a constant output voltage with a varying input voltage within a predetermined range of input-to-output variation.
Airy Discs	Consist of small, concentric light and dark circles. The smaller the "Airy discs" projected by an objective in forming the image, the more detail of the specimen is discernible. Objectives of better correction produce smaller "Airy Discs" than do objectives of lesser correction. Objectives of higher numerical aperture (more on this to be explained) are capable of producing smaller "Airy Discs." For these reasons, objectives of high numerical aperture (N.A.) and better correction can distinguish finer detail in the specimen. The ability to distinguish (separate) clearly minute details lying close together in the specimen is known as resolving power.
Algorithm	A set of well-defined rules or procedures for solving a problem or providing an output from a specific set of inputs.
Alpha Risk (γ -risk)	The risk of rejecting good product.
Ambient light	Light which is present in the environment of the imaging front end of a vision system and generated from outside sources. This light, unless used for actual scene illumination, will be treated as background noise by the vision system.
Analog	A smooth, continuous voltage or current signal or function whose magnitude (value) is the information. From the word "analogous," meaning "similar to."
Analog-to-Digital Converter (A/D)	A device which converts an analog voltage or current signal to a discrete series of digitally encoded numbers (signal) for computer processing. Architecture for a vision system, the hardware organization designed for high speed image analysis.
Aperture	In television optics, it is the effective diameter of the lens that controls the amount of light reaching the photoconductive or photoemitting image pickup sensor.
Aperture Correction	Compensation for the loss in sharpness of detail because of the finite dimensions of the image elements or the dot-pitch of the

	monitor.
Area	Portion or area of the image to be analyzed. Area analysis measures the number of pixels which fall in a specified range of gray levels for the feature of interest.
Area Array Camera	A solid state imaging device with both rows and columns of pixels, forming an array which produces a 2D image.
Array Processor	A specially designed vision engine peripheral which attaches to the host to speed up arithmetical calculations by using parallel processing techniques. The host manages image data access and analysis results.
Artifact	An artificially created structure (by accident or on purpose), form or shape, usually part of the background, used to assist in measurement or object location.
Artificial Intelligence	The capability of a computer to perform functions normally attributed to human intelligence, such as learning, adapting, recognizing, classifying, reasoning, self-correction and improvement. Rarely found connected to vision systems.
ASIC	An acronym for Application Specific Integrated Circuit. All vision system elements including firmware can be integrated onto one ASIC.
Aspect ratio	The ratio of the width to the height of a frame of a video image. The U.S. television standard is 4:3 or 1.333
ASPI	Stands for Advanced SCSI Programming Interface. ASPI is a protocol or language developed by the Adaptec Corporation to allow communication between SCSI peripherals (like a scanner) and an interface card.
Astigmatism	A defect in a lens which causes blur or imperfect image results, since the rays from a given point fail to meet at the focal point.
Asynchronous	A camera characteristic which allows the return to top-of-frame to occur on demand, rather than synchronously following the 60 hz power line scanning frequency.
Attenuation	In general terms, a reduction in signal strength.
Attribute List	List of distinguishing features which are selected for IP calculation.
Auto Balance	A system for detecting errors in color balance in white and black areas of the picture and automatically adjusting the white and black levels of both the red and blue signals as needed for correction.
Autofocus	The ability of an imaging system to control the focus of the lens to

obtain the sharpest image on the detector. Edge crispness is a typical control variable.

Automatic Gain Control A process by which gain is automatically adjusted as a function of input or other specified parameter.

Automatic Iris Lens A lens that automatically adjusts the amount of light reaching the imager.

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Back Porch That portion of the composite picture signal which lies between the trailing edge of the horizontal sync pulse and the trailing edge of the corresponding blanking pulse.

Background The part of a scene behind the object to be imaged.

Backlighting Placement of a light source behind an object so that a silhouette of that object is formed. It is used where outline information of the object and its features is important rather than surface features.

Backpropagation A training technique which adjusts the weights of the hidden and input layers of a neural net to force the correct decision for a given feature vector data input set.

Baffle A type of shield that prohibits light from entering an optical system.

Bandpass Filter An absorbing filter which allows a known range of wavelengths to pass, blocking those of lower or higher frequency.

Bandwidth The number of cycles per second (Hertz) expressing the difference between the lower and upper limiting frequencies of a frequency band; also, the width of a band of frequencies.

Bar Code An identification system that employs a series of machine-readable lines of varying widths of black and white. Usually read with a laser scanner.

Bar Code (2D) An arrangement of rectangles and spaces that contains far more information than a traditional bar code.

Barrel Distortion An optical imperfection which causes an image to bulge convexly on all sides similar to a barrel.

Bayer Filter A Bayer filter mosaic is a color filter array (CFA) for arranging RGB color filters on a square grid of photosensors (e.g., CCD or CMOS sensors). The filter pattern is 50% green, 25% red and 25% blue, hence is also called RGBG or GRGB. The raw output of Bayer-filter cameras is referred to as a Bayer pattern image. Since each pixel is filtered to record only one of three colors, two-thirds of the color data is missing from each. To obtain a full-color image, various

demaicing algorithms are used to interpolate a set of complete red, green, and blue values for each point. This is either done on-camera via FPGA/DSP or via the host PC's CPU.

Alternatives include the CYGM filter (cyan, yellow, green, magenta) and RGBE filter (red, green, blue, emerald), which require similar demosaicing; the Foveon X3 sensor, which layers red, green, and blue sensors vertically rather than using a mosaic; or using three separate CCDs, one for each color, which is far more expensive.

Beamsplitter	An optical device which divides one beam into two or more separate beams. A simple coated piece of glass in the optical path might reflect 60% of the light down onto the object, while allowing the other 40% to pass.
Beta Risk	The risk of accepting bad or defective product.
Binary	An image with pixel values either one or zero.
Binary image	A black and white image represented as a single bit containing either zeros and ones, in which objects appear as silhouettes. The result of backlighting or thresholding.
Bit	An acronym for a Binary digit. It is the smallest unit of information which can be represented. A bit may be in one of two states, on or off, represented by a zero or a one.
Bit Map	A representation of graphics or characters by individual pixels arranged in rows and columns. Black and white require one bit, while fancy high definition color up to 32.
Blanking	The time during a raster scan retrace when the video signal is suppressed.
Blob	A single, connected region in a binary or grayscale image.
Blob Analysis	Identification of segmented objects in an image based on their geometric features (ie area, length, number of holes). (SRI)
Blooming	The defocusing of regions of the picture where the brightness is at an excessive level, due to enlargement of spot size and halation of the fluorescent screen of the cathode-ray picture tube. In a camera, sensor element saturation and excess which causes widening of the spatial representation of a spot light source.
Borescope	A device for internal inspection of difficult access locations such as pipes, engines, rifle barrels and pipes. Its long narrow tube contains a telescope system with a number of relay lenses. Light is provided via the optical path or fiber bundles. A 45 degree mirror at the end allows inspection of tube walls.
Boundary	The line formed by the joining of two image regions, each having a

different light intensity. The edge of a region or object.

Bounding Box	The four coordinates which define a box around the object parallel to the major and minor axis. (SRI feature)
Brewster's Angle	The angle at which incident light, by reflecting at a boundary between two mediums of different refractive indices (ie air/glass or air/water), becomes plane polarized. For air/glass it is about 67.4 degrees.
Brightness	The total amount of light or incident illumination on a scene or object per unit area. Also called intensity.
Brightness	The attribute of visual perception in accordance with which an area appear to emit more of less light. (Luminance is the recommended name for the photo-electric quantity which has also been called brightness.)
Bus	A local area network inside a computer which electrically connects all cards. They all hear the same information.
Byte	Eight bits of digital information. A byte has values from 0 to 255, and is the unit most common to represent the gray scale value of one pixel.

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Calibration	The act of relating X and Y pixel spacing to a known or predetermined pixels per unit length (ie inch, mm) factor. Often involves adjusting the imager position in setup.
CCD	Charge Coupled Device. A photo-sensitive image sensor implemented with large scale integration technology.
CCD	Frame Transfer CCD. The entire image is transferred from the sensing area to a storage area on chip. Data (charge) is read out from the storage area in a full frame mode. This workhorse of the industry is also capable of non-RS-170 operation.
CCD	Interline Transfer CCD. Data (charge) is transferred simultaneously out by odd and even lines or fields directly from the image sensors to their corresponding sensor registers. The output from the camera is always one field (frame) behind the image being captured.
Centroid	The center of mass of an object having a constant density, or of an object having varying density, weighted by the gray scale value.
Character	A single letter, digit or punctuation symbol requiring one byte storage.
Character	Imaging and recognizing individual characters in a scene. Also

Recognition (OCR)	called Optical Character Recognition.
Character Verification (OCV)	Imaging and verifying the correctness, quality and legibility of known characters in an image. Also Optical Character Verification.
Child	An object wholly contained within another object called the parent (SRI). A washer, including the hole, is the parent, and the hole is the child.
Chroma	The quality of a color including both the hue and saturation. Not present in gray.
Chromatic Aberration	An optical defect of a lens which causes different colors or wave lengths of light to be focused at different distances from the lens. It is seen as color fringes or halos along edges and around every point in the image.
Chromaticity	The color quality of light which is defined by the wavelength (hue) and saturation. Chromaticity defines all the qualities of color except its brightness.
Chrominance	A color term defining the hue and saturation of a color. Does not refer to brightness.
Chrominance Signal	That portion of the NTSC color television signal which contains the color information.
CID Charge Injection Device	A photo-sensitive image sensor implemented with large scale integration technology. Based on charge injection technology, a CID can be randomly addressed, non-destructively read, can be subscanned in a small region and is less susceptible to charge overflow from bright pixels to neighbors. The pixel structure is contiguous with maximum surface to capture incident light which is useful for sub-pixel measurement.
CIE	An acronym for a chromaticity coordinate system developed by the Commission Internationale de l'Eclairage, the international commission on illumination. In the CIE system, a plot of ratios (x, y and z) of the three standard primary colors (tristimulus values) to their sum. The most common diagram is the 2 dimensional CIE (x,y).
Classification	Assignment of image objects to one of two or more possible groups. Decisions are made by evaluating features either 1) structurally based on relationships or 2) statistically. For example, 1) a penny is round, a certain diameter (+/- a tolerance) and has a histogram of a mean value; or 2) statistically, the object is measured a number of times, then the average and standard deviation are recorded. After training the features are weighted based on significance in object identification. For multiple features, absolute values are used.

Closing	A dilation followed by an erosion. A morphological operator useful to close holes and boundaries.
C-mount	A threaded means of mounting a lens to a camera.
Coaxial Cable	A particular type of cable capable of passing a wide range of frequencies with very low signal loss. Such a cable in its simplest form, consists of a hollow metallic shield with a single wire accurately placed along the center of the shield and isolated from the shield.
Coaxial Illumination	Front lighting with the illumination path running along the imaging optical axis and usually introduced with a 45 degree angle beam splitter.
Coherent Fiber Optics	A bundle of optical fibers with the input and output spatial x-y relationship maintained, resulting in near spatially correct image transmission.
Collimate	To produce light with parallel rays.
Collimated Lighting	Radiation from a given point with every light ray considered parallel. In actuality, even light from a very distant point source (ie a star) diverges somewhat. Note that all collimators have some aberrations.
Color	A visual object attribute which may be described by a "coordinate system" such as hue, saturation and intensity (HSI), CIE or LAB. Wavelengths in the visible part of the electromagnetic spectrum to which retinal rods respond.
Color Burst	That portion of the composite color signal, comprising a few cycles of a sine wave of chrominance subcarrier frequency, which is used to establish a reference for demodulating the chrominance signal. Normally approximately 9 cycles of 3.579545 MHz.
Color calibration	The process of ensuring accurate reproduction of color for images. Full color calibration is usually a two-step process: calibrating your input device, such as a scanner or camera; and calibrating your output device, such as a printer or monitor. By calibrating input and output devices correctly, color is accurately captured by your scanner/camera and is reproduced faithfully on your monitor or printer as well.
Color Encoder	A device which produces an NTSC color signal from separate R, G, and B video inputs.
Color Saturation	The degree to which a color is free of white light.
Color Space	A two or three dimensional space used to represent an absolute color coordinate. RGB, HSI, LAB and CIE are all representations of color spaces.

Color Sync Signal	A signal used to establish and to maintain the same color relationships that are transmitted.
Color Temperature	A colorimetric concept related to the apparent visual color of a source, but not its actual temperature.
Colorimetry	Techniques used to measure color of an object or region and to define the results in a comparison or coordinate system.
Composite Video	A television signal which is produced by combining both a video or picture signal with horizontal and vertical synch and blanking signals.
Condenser Lens	Used to collect and redirect light for the purpose of illumination. Often used to collect light from a small source and project even light onto an object.
Connectivity Analysis	An SRI routine used to determine which pixels are interconnected and part of the same object or region. The results are used for blob analysis.
Contrast	The difference of light intensity between two adjacent regions in the image of an object. Often expressed as the difference between the lightest and darkest portion of an image. Contrast between a flaw or feature and its background is the goal of illumination.
Contrast Enhancement	Stretching of the gray level values between dark and light portions of an image to improve both visibility and feature detection.
Convergence	The crossover of the three electron beams of a three-gun tri-color picture tube. This normally occurs at the plane of the aperture mask.
Convolution	Superimposing a $m \times n$ operator (usually a 3×3 or 5×5 mask) over an area of the image, multiplying the points together, summing the results to replace the original pixel with the new value. This operation is often performed on the entire image to enhance edges, features, remove noise and other filtering operations.
Correlation	A mathematical measure of the similarity between images or areas within an image. Pattern matching or correlation of an X by Y array size template to the same size image, produces a scalar number, the percentage of match. Typically, the template is walked through a larger array to find the highest match.
CPU	An acronym for Central Processing Unit. A VLSI chip such as 80486 or Pentium.
Cross section	A 3D profile of a slice of an object.

Darkfield Illumination	Lighting of objects, surfaces or particles at very shallow or low angles, so that light does not directly enter the optics. Objects are bright with a dark background. This grazing illumination causes specular reflections from abrupt surface irregularities.
Data Reduction	The process of lowering the data content of an pixel or image such as thresholding or run length encoding.
dB	Basically, a measure of the power ratio of two signals. In system use, a measure of the voltage ratio of two signals, provided they are measured across a common impedance.
DCAM	Stands for "1394-based Digital Camera Specification" and defines the behavior and protocol of cameras that output uncompressed image data without audio. It is a standard, defined by the 1394 Trade Association. The IIDC (Instrumentation and Industrial Control Working Group) is in charge of it. IIDC is often used synonymously with DCAM.
Decision Tree	A structural classification technique based on relationships of feature measurements. Useful for differentiating a number of objects.
Dedicated System	Refers to a system which is configured for a specific application. Able to function when plugged in with no further development. Also called turnkey.
Depth of field	The range of an imaging system in which objects are in focus (the amount of focal tolerance in the object plane (frontal conjugate)).
Depth of focus	The amount of focal tolerance in the focal plane (rear conjugate).
Depth Perception (3D)	Measurement of the third dimension of an object or scene.
Dichroic Filter	A filter used to transmit light based on its wavelength, rather than on its plane of vibration. Transmits one color, while reflecting a second when illuminated with white light. Often used in heads-up displays.
Diffraction Pattern Sampling	Inspection by comparing portions of the interference pattern formed on a screen or special sensor from light waves diffracted by object edges.
Diffuse Reflection	Light which bounces off an object surface in many different directions. Light radiated from a matte surface is highly diffused.
Diffused lighting	Scattered soft lighting from a wide variety of angles used to eliminate shadows and specular glints from profiled, highly reflective surfaces.
Digital Camera	The newest generation of video cameras transform visual

information into pixels, then translate each pixel's level of light into a number in the camera.

Digital Image	A video image converted into pixels. The numeric value of each pixel's value can be stored in a computer memory for subsequent processing and analysis.
Digital Signal Processor (DSP)	A VLSI chip designed for ultra high speed arithmetic processing. Often imbedded in a vision engine. TI's TMS320C40 is the industry standard.
Digital to analog converter	A VLSI circuit used to convert digital computer processed images to analog for display on a monitor. DAC is the acronym.
Digitization	Sampling and conversion of an incoming video or other analog signal into a digital value for subsequent storage and processing.
Dilation	A morphological operation which moves a probe or structuring element of a particular shape over the image, pixel by pixel. When an object boundary is contacted by the probe, a pixel is preserved in the output image. The effect is to "grow" the objects.
Direct X	
Dispersion	Separation of a beam of light into its wavelength components, each of which travel at slightly different speeds. Also called chromatic dispersion.
Distribution Amplifier	A device that provides several isolated outputs from one looping or bridging input, and has a sufficiently high input impedance and input-to-output isolation to prevent loading of the input source.
Dpi	Stands for dots per inch, the measure of resolution. The greater the dpi number, the higher the resolution.
Dust	An environmental contaminant consisting of airborne particles to be dealt with in machine vision. Never use factory air to keep optical surfaces clean, since oil will deposit.
Dynamic Range	The measure of the range light sensitivity a sensor is able to reproduce, from the darkest to the brightest portion of a scene. Usually expressed in decibels.

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Edge	A change in pixel values exceeding some threshold amount. Edges represent borders between regions on an object or in a scene.
Edge Detection	The ability to determine the true edge of an object.
Edge Operator	Templates for finding edges in images.

Electrical Noise	Interference from various electrical devices which is present in the air as electromagnetic radiation or rides on the power lines and can introduce error into low voltage computations such as A/D conversion.
Electro	The total range of wavelengths, extending from the longest (audio) to the shortest (gamma rays) which can be physically generated. This entire spectrum is potentially useful for imaging, well beyond just the visible spectrum.
EMVA 1288	An emerging standard from the European Machine Vision Association (EMVA) for Standards in Characterization and Presentation of Specification Data for Image Sensors and Cameras. This standard is intended to establish test standards and guidelines for manufacturer's specifications of camera parameters and merits such as sensitivity, read-out noise, defective pixels, etc.
Encoder (Shaft or position)	Provides rotation information for control of image acquisition, especially for moving web processes. Outputs either pulses for counting or BCD parallel with absolute position information.
Endoscope	A medical instrument used to view inside the human body. It may use borescope optics or coherent fibers to relay the image to the eye or camera. Illumination is provided by a non-coherent bundle of optical fibers.
Erosion	The converse of the morphology dilation operator. A morphological operation which moves a probe or structuring element of a particular shape over the image, pixel by pixel. When the probe fits inside an object boundary, a pixel is preserved in the output image. The effect is to "shrink or erode" objects as they appear in the output image. Any shape smaller than the probe (ie noise) disappears.
Exposure	The amount of light in an image. The exposure of an image can be changed by increasing or reducing available light.
Extension Tube	A cylindrical threaded tube used to change the magnification, effective focal length and field of view of a lens when inserted between the lens and imaging sensor.

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F number or f stop	The ratio of the focal length to the lens aperture. The smaller the f-number, the larger the lens diameter and brighter the image and narrower the depth-of-field
Fast Fourier Transform	Produces a new image which represents the frequency domain content of the spatial or time domain image information. Data is represented as a series of sinusoidal waves.
Feature Extraction	Determining image features by applying feature detectors to

	distinguish or segment them from the background.
Feature Vectors	A set of features of an object (such as area, number of holes, etc) that can be used for its identification or inspection.
Features	Simple image data attributes such as pixel amplitudes, edge point locations and textural descriptors, center of mass, number of holes in an object with distinctive characteristics defined by boundaries or regions.
Fiber Optics	Light source or optical image delivery via a long, flexible fiber(s) of transparent material, usually bundled together. Light is transmitted via internal reflection inside each fiber. Coherent fiber optics are spatially organized so images can be relayed.
Fiberscope	An optical instrument similar to a borescope, but uses a flexible, coherent fiber or bundle (usually silicon), an objective lens and an eyepiece or camera.
Fiducial	A line, mark or shape used as a standard of reference for measurement or location.
Field	One of the two parts of a television frame in an interlaced scanning system. The odd plus the even field comprise one video frame. A field is scanned every 1/60th of a second.
Field of view	The 2D area which can be seen through the optical imaging system. (FOV)
File format	The way a graphic file is saved. Several file formats are available for use, and each one has its own advantages and disadvantages. The most popular file formats include JPEG, GIF, BMP, TIFF, PICT, EPS, and PCX. TIFF is the most widely used file format.
Filter	A device or process that selectively transmits frequencies. In optics, the material either reflects or absorbs certain wavelengths of light, while passing others.
Filtering	The use of an optical filter for picture or color enhancement in front of the camera lens or light source. Also analog or digital image processing (IP) operations to enhance or modify an image. May be linear & non linear.
Filters	Tools that allow you to apply or create special effects to your images. Filters in your software include Blur/Blur More, Sharpen/Sharpen More, Emboss, and Edge Enhancement.
Firmware	Software hard coded in non volatile memory (ROM), usually to increase speed.
Fixture	A device to hold and locate a workpiece during processing or inspection operations.

Fluorescence	The emission of light or other electromagnetic radiation at longer wavelengths by matter as a result of absorption of a shorter wavelength. The emission lasts only as long as the stimulating irradiation is present.
Focal Length	The distance from a lens' principal point to the corresponding focal point on the object.
Focal Plane	Usually found at the image sensor, it is a plane perpendicular to the lens axis at the point of focus .
Focus	The point at which rays of light converge for any given point on the object in the image. Also called the focal point.
Focus Following	A ranging and tracking technique that uses image processing to measure object range based on best focus.
Footlambert (FL)	A unit of luminance equal to 1/candela per square foot or to the uniform luminance at a perfectly diffusing surface emitting or reflecting light at the rate of one lumen per square foot. A lumen per square foot is a unit of incident light and a footlambert is a unit of emitted or reflected light. For a perfectly reflecting and perfectly diffusing surface, the number of lumens per square foot is equal to the number of footlamberts.
Fourier Domain Inspection	Evaluation of the fourier transform (frequency information) of a 2D spatial image for features of interest.
Frame	The total area scanned in an image sensor while the video signal is not blanked. In interlaced scanning, two fields comprise one frame. Frame rate is typically 30 Hz.
Frame Buffer	Image memory in a frame grabber.
Frame Grabber	A device that interfaces with a video camera and, on command, samples the video, converts the video image into digital values and stores that array of numbers in the computer's memory.
Frame Transfer	A CCD imager where an entire matrix of pixels is read into storage before being output from the camera. Differs from Interline Transfer where lines of pixels are output
Front End System	The object, illumination, optics and imager blocks of a vision system. Includes all components useful to acquire a good image for subsequent processing.
Front Lighting	The use of illumination on the camera side of an object so that surface features can be observed.

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Gaging In machine vision, non contact dimensional examination of an

	object.
Gamma (,)	The numeric value for the degree of contrast in a television picture. The exponent in the power law relating output to input signal magnitude. Non linear camera tube. Or simply, the contrast affecting the mid level grays or midtones of an image. Adjusting the gamma of an image allows you to change brightness values of the middle range of gray tones without dramatically altering the shadows and highlights.
GenICam	A standards group hosted by the European Machine Vision Association (EMVA). The goal of GenICam™ is to provide a generic programming interface for all types of cameras, regardless of interface technology (e.g., GigE Vision, CameraLink, 1394 DCAM). The objective of GenICam is to provide a common application programming interface (API) that is the same for all interface types, regardless of the camera type and image format. This approach makes it easy to connect cameras compliant with the GenICam standard without the need for camera-specific configurations. Also viewed as GenICam™.
GigE Vision	A camera interface standard developed by several leading multinational cameras manufacturers using the Gigabit Ethernet communication protocol. The GigE Vision™ standard, overseen by the AIA, allows for high-speed image transfer using low cost standard cables over very long lengths. The standard is based on a layered system as follow: <i>GigE Vision™ Control Protocol (GVCP)</i> , which runs on top of Universal Datagram Protocol (UDP) IPv4; <i>GigE Vision™ Stream Protocol (GVSP)</i> , which defines data types and describes how images are transmitted over GigE; <i>GigE Device Discovery Mechanism</i> , which defines how cameras and other compliant devices obtain IP addresses; and an <i>XML Description</i> file based on the emerging GenICam™ standard, which provides the equivalent of a computer-readable datasheet to allow access to camera controls and image stream.
Glints	Shiny, specular reflections from smooth objects or surfaces.
Global Method	An image processing operation uniformly applied to the whole image.
Global Shutter	An electronic shutter method used in CCD- and a few CMOS-based cameras. Generally considered the best method to use when rendering images of objects in motion. See Rolling Shutter for alternative methods.
Gradient	The rate of change of pixel intensity (first derivative).
Gradient Space	A matrix containing values for the rate of change of pixel values or gray level intensity of the image.
Gradient Vector	The orientation and magnitude of the rate of change in intensity at

a point or pixel location in the image.

Grating	An optical element with an even arrangement of rods or stripes with spaces between them for light to pass. Its ability to separate wavelengths is expressed in line pairs per millimeter, for example. A moire grating of parallel dark and light stripes is an example. Also used for structured light projection.
Gray level	A quantized measurement of image irradiance (brightness), or other pixel property typically in the range between pure white and black.
Grayscale Image	An image consisting of an array of pixels which can have more than two values. Typically, up to 256 levels (8 bits) are used for each pixel.
GUI	An acronym for Graphical User Interface. Pronounced "gooie." A Windows based user interface screen or series of screens allowing the user to point-and-click to select icons rather than typing commands.

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Halftone	A type of single bit image composed of a pattern of black dots that fool the eye into seeing shades of gray. Examples of halftone images are the pictures you see in a newspaper. These images usually look very coarse.
Halogen lamp	An incandescent lamp with a gas similar to iodine inside which is constantly evaporated then redeposited on the filament.
Hardware	Electronic integrated circuits, boards and systems used by the system.
HDTV	High Definition TV proposed broadcast standard to double the current 525 lines per picture to 1,050 lines, and increasing the screen aspect ratio from 12:9 to 16:9. The typical TV of 336,00 pixels would increase to about 2 million.
Height/Range	Object profile is usually measured by changes in range or distances from the sensor. 3D techniques are usually used.
High Pass Filter	Passes detailed high frequency image information, while attenuating low frequency, slow changing data.
High Speed Imaging	Image capture near, at or above 1800 parts per minute.
Histogram	A graphical representation of the frequency of occurrence of each intensity or range of intensities (gray levels) of pixels in an image. The height represents the number of observations occurring in each interval. A histogram skewed heavily to the left indicates a dark image, while a histogram skewed to the right indicates a light

image.

Histogram Analysis	Determination of the presence or absence of a feature or flaw based on the histogram values in a certain gray scale region.
Histogram Equalization	Modification of the histogram to evenly distribute a narrow range of image gray scale values across the entire available range.
Holography	Optically recording of the interference pattern from two coherent waves which forms a 3 dimensional record or hologram.
Hough Transform	A global parallel method for locating both curved and straight lines. All points on the curve map into a single location in the transform space.
HSI	An acronym for the Hue, Saturation and Intensity color representation. A mathematical conversion from RGB. Often used for machine vision analysis.
HSI Conversion	A mathematical conversion from the color RGB space to hue, saturation and intensity values.
Hue	One of the three properties of HSI color perception. A color attribute used to express the amount of red, green, blue or yellow a certain color possesses. White, gray and black do not exhibit any hue.
Hueckel Operator	An edge finding operator which fits an intensity surface to the neighborhood of each pixel and selects surface gradients above a specified threshold.
Hybrid Electro	Optic Sensor A silicon sensor fabricated in a configuration to match spatial information generated by the imaging system, such as a PSD (position sensitive detector), concentric rings, pie shapes and others.
Hz	An abbreviation for Hertz or cycles per second. Often used with metric prefixes such as kHz or MHz for kilohertz and megahertz respectively.

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I/O	An acronym for Input/Output data either entering or leaving a system.
IIDC	The IIDC (Instrumentation and Industrial Control Working Group) in charge of the DCAM standard -- "1394-based Digital Camera Specification" that defines the behavior of cameras that output uncompressed image data without audio
Illumination	Normally a wavelength or range of wavelengths of light or visible used to enhance a scene so the detector, normally a camera, can

	produce an image.
Image	Projection of an object or scene onto a plane (ie screen or image sensor).
Image Analysis	Evaluation of an image based on its features for decision making.
Image Capture	The process of acquiring an image of a part or scene, from sensor irradiation to acquisition of a digital image.
Image Distortion	A situation in which the image is not exactly true to scale with the object scale.
Image Enhancement	Image processing operations which improve the visibility of image detail and features. Usually performed for humans.
Image Formation	Generation of an image of an object or scene on the imaging sensor. It includes effects from the optics, filters, illumination and sensor itself.
Image Intensifier	Usually an electron tube equipped with a light sensitive electron emitter at one end and a phosphor screen at the other. Used to provide electron gain for imaging in low light conditions such as night vision.
Image Memory	An internal, high speed, large capacity storage area on a frame grabber card or in a computer dedicated to image retention.
Image Plane	The plane surface of the imaging sensor, perpendicular to the viewing direction, at which the optics are focused.
Image Processing	Digital manipulation of an image to aid feature visibility, make measurements or alter image contents.
Impedance (input or output)	The input or output characteristic of a system component that determines the type of transmission cable to be used. The cable used must have the same characteristic impedance as the component. Expressed in ohms. Video distribution has standardized on 75-ohm coaxial and 124-ohm balanced cable.
Incandescent lamp	An electrical lamp in which the filament radiates visible light when heated in a vacuum by an electrical current.
Incident Light	Light which falls directly onto an object.
Index of Refraction	A property of a medium that measures the degree that light bends when passing between it and a vacuum.
Infrared	The region of the electromagnetic spectrum adjacent to the visible spectrum, just beyond red with longer wavelengths.
Infrared Imaging	Image formation using wavelengths just below the visible

spectrum.

Intensity The relative brightness of a portion of the image or illumination source.

Interlaced Scanning A scanning process in which all odd lines then all even lines are alternately scanned. Adjacent lines belong to different fields. Generally considered to be advantageous in situations where greater sensitivity is required. (See non-interlaced).

Interline Transfer A technology of CCD design, where rows of pixels are output from the camera. The sensor's active pixel area and storage register are both contained within the active image area. This differs from "frame transfer" cameras that move all active pixels to a storage register outside of the active area.

Interpolated resolution Resolution enhanced through software; thus also known as software enhanced resolution. For instance, if your optical resolution is 300 dpi, you may be able to enhance images up to 600 dpi through software interpolation. Interpolated resolution may capture less detail than the optical, but it is useful for certain tasks, such as scanning line art or enlarging small originals.

Iris An adjustable aperture built into a camera lens to permit control of the amount of light passing through the lens.

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LAB An acronym for the LAB color coordinate system.

Laplacian Operator The sum of the second derivatives of the image intensity in both the x and y directions is called the Laplacian. The Laplacian operator is used to find edge elements by locating points where the Laplacian is zero.

Laser Illumination Lighting an object with a laser source for frequency selection, pulse width (strobe) control or for accurate positioning.

Laser Radar See LIDAR.

LED Light emitting diode. Often used as a strobe for medium speed objects.

Lens A transparent piece of material, usually glass or plastic, with curved surfaces which either converge or diverge light rays. Often used in groups for light control and focusing.

Lens Speed Refers to the ability of a lens to transmit light, represented as the

ratio of the focal length to the diameter of the lens. A fast lens would be rated $<f/1.4$; a much slower lens might be designated as $> f/8$. The larger the f number, the slower the lens.

Lens Types	The lenses most commonly used in machine vision are: 35mm, CCTV, Copying, Cylindrical, Enlarger, Micrographic, Video, and Wide Angle.
LIDAR	An acronym of Light Detection And Ranging. A system that uses light instead of microwaves for range and tracking measurements. LADAR uses a laser light source to measure velocity, altitude, height, range or profile
Light	Electromagnetic radiation detectable by the eye, ranging in wavelength from about 400 to 750 nm.
Light Tent	An arrangement of diffusing surfaces above the object to create a horizon to horizon diffuse illumination.
Lighting	See illumination.
Lightpen	A pen on a cable used to select items from a display screen.
Line art	A type of single bit image that is just purely black and white, such as a pencil or ink sketch. Line art may also include one color images, such as mechanical blueprints or drawings.
Line Scan Camera	A solid state video camera consisting of a single row of pixels. Also called a linear array camera.
Line(s) of Light	One or more light stripes projected at a known angle onto the object. Deformation of this type of structured light results in 3D information in a 2D image.
Linear Array	see Line Scan Camera.
Location	The point in X and Y image space where a recognized object is found.
Look Up Table (LUT)	High speed digital memory used to transform image input values to outputs for thresholding, windowing and other mappings such as pseudo color
Low Angle Illumination	See darkfield. Very useful to enhance and highlight surface texture features.
Low Pass Filter	A digital or optical filter which passes slow changing, low frequency information, while attenuating high frequency, detailed edge information.
Lumen (LM)	The unit of luminous flux. It is equal to the flux through a unit solid angle (steradian) from a uniform point source of one candela

or to the flux on a unit surface of which all points are at a unit distance from a uniform point source of one candela.

Lumen/FT ²	A unit of incident light. It is the illumination on a surface one square foot in area on which a flux of one lumen is uniformly distributed, or the illumination at a surface all points of which are at a distance of one foot from a uniform source of one candela.
Luminance	Luminous intensity (photometric brightness) of any surface in a given direction per unit of projected area of the surface as viewed from that direction, measured in footlamberts (fl).
Luminance Signal	That portion of the NTSC color television signal which contains the luminance or brightness information.
Lux	International System (SI) unit of illumination in which the meter is the unit of length. One lux equals one lumen per square meter.

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Machine Vision	The use of devices for optical non-contact sensing to automatically receive and interpret an image of a real scene, in order to obtain information and/or control machines or processes.
Magnification	The relationship between the length of a line or size of a feature in the object plane with the length or size of the same in the image plane.
Mask	1) Setting portions of an image ate neighbors to a constant value; 2) A filter matrix used as a convolution operator; 3) A logical or physical structure placed in an optical system to prevent viewing or passing of information in a certain spatial or frequency region.
Material Handling	Hardware systems that provide motion, indexing and/or orientation both during manufacture and the inspection process.
Matrix Array Camera	See Area Array Camera.
Median Filter	A method of image smoothing which replaces each pixel value with the median grayscale value of its immediate neighbors.
Megapixel Lens	A term that generally classifies the quality of an optical lens. Such lenses possess very low optical distortion and therefore are suitable for use with high resolution cameras (over 1 megapixel). Megapixel lenses generally feature 100~200lp/mm (line pairs/mm) resolution power and low color aberration. Such lenses are generally designed for optical peak at 100~500nm and can thus be used for industrial applications and for macro photography.
Memory	The internal, high speed, large capacity working storage in a computer where data and images may be both stored and retrieved.

Micron	One millionth of a meter also called a micrometer.
Microscopy	A method of studying material through a microscope.
Midtones	The parts of an image between the lighter and darker areas, at around 50% gray.
MIPS	Millions of Instructions per Second measure for computer processing speed.
Mirror	A smooth, highly polished surface, for reflecting light. It may be plane or curved. Mirrors are fabricated by depositing a thin coating of silver or aluminum on a glass substrate. First surface mirrors are coated on the top surface, thus avoiding a second ghost image produced when light is reflected off the back surface after passing through the glass twice.
Modulation Transfer Function (MTF)	The ability of a lens or optical system to reproduce (transfer) various levels of detail (modulation) of an object to the image as the frequency (usually sinusoidal) increases.
Moire Interferometry	A method to determine 3D profile information of an object or scene, using interference of light stripes. Two identical gratings of known pitch are used. The first creates a shadow of parallel lines of light projected on the object. The second is placed in the imaging train, and superimposed on the shadow cast by the first grating, forming a moire fringe pattern. Distance between the fringes or dark bands is directly related to range or profile. Varying the gap between the lines changes the sensitivity.
Moire Pattern	A pattern resulting from the interference of light when gratings, screens or regularly spaced patterns are superimposed on one another. Two stacked window screens create this effect.
Moire Topography	A contour mapping technique in which the object is both illuminated and viewed through the same grating. The resulting moire fringes form contour lines of object elevation or profile.
Monochromatic	Refers to light having only one color or a single wavelength of radiation.
Monochrome	Refers to a black and white image with shades of gray but no color.
Morphology	Image algebra group of mathematical operations based on manipulation and recognition of shapes. Also called mathematical morphology. Operations may be performed on either binary or gray scale images. Parallel processors are useful to implement.
MOS Array	Metal Oxide Semiconductor camera array sensor with random addressing capability, rows and columns of photodiodes and charge sent directly from the photodiode to the camera output..

Mouse A hand operated pointing device used to select items from a display screen. Cousin of a rodent known to abandon the ship when a vision system doesn't work properly.

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ND Filter or Neutral Density Filter A filter that attenuates light evenly over the visible light spectrum. It reduces the light entering a lens, thus forcing the iris to open to its maximum.

Neural Networks A computing paradigm which processes information based on biological nervous systems. No programming is involved as in artificial intelligence. Rather decisions are made based on weighted features analyzed by interconnected nodes of simple processing elements using analog computer-like techniques.

Noise Irrelevant or meaningless data resulting from various causes unrelated to the source. Random, undesired video signals.

Non-Composite Video A video signal containing all information except sync.

Non-Interlaced Scanning A scanning process in which all lines are read out sequentially versus in odd and even fields. This scanning method is most advantageous when imaging objects that are moving around. (See Progressive Scan).

Normalized Correlation Removes the absolute illumination value from a traditional correlation, making the algorithm less sensitive to light variations.

NTSC Abbreviation for National Television Systems Committee. A committee that worked with the FCC in formulating standards for the present day United States color television system. Or some people may say "**N**ever **T**he **S**ame **C**olor"

Numerical Aperture (N.A.) The ability of a microscope objective to include or "grasp" the various rays coming from each illuminated part of the specimen is directly related to the angular aperture of the objective. Objectives with lower angular aperture can include only a narrower cone of light as compared to objectives with higher angular aperture.

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Object The 3D item to be imaged, gauged or inspected.

Object Features Any characteristic that is descriptive of an image or region, and useful for distinguishing one from another. A feature may be any measurable item such as length, size, number of holes, surface texture amount or center of mass.

Object Plane An imaginary plane at the object, which is focused by the optical system at the image plane on the sensor.

Oblique Illumination	A lighting direction at an angle which emphasizes object features by shadows produced.
OCR	Stands for Optical Character Recognition, the process of scanning an image and converting the image into text format.
OEM	Original Equipment Manufacturer that supplies components to another for resale.
Off the shelf	Refers to a general purpose system, readily available for immediate shipment, which is not configured for a specific application.
Oil mist	An environmental contaminant which builds up on vision optical surfaces.
Opaqueness	Degree to which an object does not transmit light.
Opening	An erosion followed by a dilation, it is the opposite of the closing morphological operator.
Optical Computing	Performing operations usually handled by electronic, serial computers with optical or photonic circuits/elements in parallel at near the speed of light.
Optical resolution	The true resolution of a camera and the key factor in determining the amount of detail visible in an image. Optical resolution is one type of resolution; the other is interpolated resolution.
Orientation	The angle or degree of difference between the object coordinate system major axis relative to a reference axis as defined in a 3D measurement space.

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Pantone Matching System (PMS)	A system of describing colors by assigning numbers.
Parallax	The change in perspective of an object when viewed from two slightly different positions. The object appears to shift position relative to its background, and also appears to rotate slightly.
Parallel Processor	A redundant hardware design using a number of processors so multiple pixels may be processed at the same time.
Parent	An object which wholly contains another object called a child. (SRI)
Pattern Recognition	A process which identifies an object based on analysis of its features.
Perceptron	The basic processing element used in neural networks. A simple

	analog circuit with weighted inputs and a nonlinear decision element such as a hard limiter, threshold logic or sigmoid nonlinearity.
Photodiode	A single photoelectric sensor element, either used stand alone or a pixel site, part of a larger sensor array.
Photometry	Measurement of light which is visible to the human eye (photopic response).
Photopic Response	The color response of the eye's retinal cones.
Pinhole	A small, sharp edged hole, acts as a lens aperture which produces a soft edged image, is distortion free, with a wide field of view and large depth of field.
Pixel	An acronym for "picture element." The smallest distinguishable and resolvable area in an image. The discrete location of an individual photo-sensor in a solid state camera.
Pixel Counting	A simple technique for object identification representing the number of pixels contained within its boundaries.
Polarized Light	Light which has had the vibrations of the electric or magnetic field vector typically restricted to a single direction, in a plane perpendicular to its direction of travel. It is created by an type of filter which absorbs one of the two perpendicular light rays. Crossing polarizers theoretically blocks all light transmission.
Polarizer	An optical device which converts natural or unpolarized light into polarized light by selective absorption of rays in one direction, and passing of rays perpendicular to the polarizing medium. Usually fabricated from stretched plastic sheets with oriented, parallel birefringent crystals. The first polarizers were constructed with parallel wires.
Positioning Equipment	Used to bring the part into the field of view, or to translate when multiple images or views are required.
Precision	The degree of spread or deviation between each measurement of the same part or feature. Repeatability.
Prism	An optical device with two or more non parallel, polished faces from which light is either reflected or refracted. Often used to redirect light as in binoculars.
Processing Speed	A measure of the time used by a vision system to receive, analyze and interpret image information. Often expressed in parts per minute.
Profile	The 3D contour of an object.

Progressive Scan The progressive scan format outputs data from the camera (the signal) in sequential order as it is scanned. The scan format produces a full frame of video in a continuous stream, rather than half the image per output sequence in traditional RS-170 CCD cameras. Standard RS-170 video is interlaced and output in two separate fields, generating essentially half the image at a time. With newer Progressive Scan Cameras, a new, full image is output from the camera every 1/60th second, making it ideal for machines to more quickly process and display information, or act according to programmed instructions.

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Radiometry Measurement of light within the entire optical spectrum.

RAM An acronym for Random Access Memory for storage and retrieval of data.

Random Access The ability to read out chosen lines or windows of information from an imager as needed, without following the RS-170 standards.

Range Measurement Determination of the distance from a sensor to the object.

Raster Scan A scanning pattern, generally from left to right while progressing from top to bottom of the imaging sensor or the display monitor. Generally comprised of two fields composed of odd and even lines.

Real Time Processing In machine vision, the ability of a system to perform a complete analysis and take action on one part before the next one arrives for inspection.

Reflection The process by which incident light leaves the surface from the same side as it is illuminated.

Refraction The bending of light rays as they pass from one medium (ie air) to another (ie glass), each with a different index of refraction.

Region Area of an image. Also called a region of interest for IP operations.

Registration The closeness of the part to the actual position expected for image acquisition.

Reject A mechanism used on a manufacturing line to remove defective or sample product from the main stream or conveyor. Reject design is usually customized to the process.

Repeatability The ability of a system to reproduce or duplicate the same measurement. See precision. The total range of variation of a dimension is called the 6-sigma repeatability.

Resolution (horizontal)	The amount of resolvable detail in the horizontal direction in a picture. It is usually expressed as the number of distinct vertical lines, alternately black and white, which can be seen in a distance equal to picture height.
Resolution (vertical)	The amount of resolvable detail in the vertical direction in a picture. It is usually expressed as the number of distinct horizontal lines, alternately black and white, which can theoretically be seen in a picture.
Resolution, Feature	The smallest object or feature in an image which may be sensed.
Resolution, Image	The number of rows and columns of pixels in an image.
Resolution, Measurement	The smallest movement measurable by a vision system.
Resolution, Pixel Grayscale	The number of resolvable shades of gray (ie 256).
Resolution, Spatial	A direct function of pixel spacing. Pixel size relative to the image FOV is key.
Reticle	An optical element with a pattern located in the image plane to assist in calibration, measurement or alignment of a system or instrument. Examples are cross lines or grids.
RGB	An acronym for the Red, Green and Blue color space. This three primary color system is used for video color representation.
Ringlight	A circular lamp or bundles of optical fibers arranged around the perimeter of an objective lens to illuminate the object in the field below it. A wide variety of sizes are available on both a stock and custom basis.
RoHS	Restriction of Hazardous Substances Directive (RoHS) was adopted in February 2003 by the European Union. The RoHS directive took effect on July 1, 2006, but is not a law; it is simply a directive. This directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE) which sets collection, recycling and recovery targets for electrical goods. RoHS is often pronounced "R-O-H-S", "ross", "rosh", "rose" or "row-haws".
Rolling Shutter	An electronic shutter method used in CMOS-based cameras. Can result in incorrect rendering of image motion. See Global Shutter for alternative methods.
Rotation	Translation of a part about its center axis from the expected orientation in X and Y space. Expressed in degrees.

RS-170	The Electronic Industries Association (EIA) standard governing monochrome television studio electrical signals. The broadcast standard of 30 complete images per second.
RS-232c	The Electronic Industries Association (EIA) standard governing serial communications over a twisted pair. Good to about 150 feet.
RS-330	Standard governing color television studio electrical signals.
RS-422; RS-423; RS-449	The Electronic Industries Association (EIA) standards for serial communication protocols intended to gradually replace the widely used RS-232-C standard.
Run Length Encoding	A data reduction method to code a binary image. For each line in an image, data is stored denoting only the starting location of a blob and object and the length of the run of that line over the object.

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Saturation	The degree to which a color is free of white. One of the three properties of color perception along with hue and intensity (HSI).
Scanner (galvo & polygon mirror)	An image sensor which uses a swept or scanned beam of light (usually a laser) to generate or acquire a one or two dimensional grayscale reflectance pattern.
Scattering	Redirection of light reflecting off a surface or through an object. See diffuse.
Scene	The object and a background in it's simplest form. A portion of space imaged by a vision system for investigation or measurement.
Scene Analysis	Performing image processing and pattern recognition on an entire image.
SCSI	Stands for Small Computer System Interface, a format for interfacing hardware.
SCSI chain	A chain that links SCSI devices on your system. A SCSI chain may include such devices as a scanner, a CD-ROM drive, an external hard drive, and a tape drive. Each SCSI device on the chain must have its own SCSI ID number, or conflict will ensue.
Segmentation	The process of dividing a scene into a number of individual objects or contiguous regions, differentiating them from each other and the image background.
Sensitivity	In television, a factor expressing the incident illumination upon a specified scene required to produce a specified picture signal at the output terminals of a television camera.

Shading	The variation of the brightness or relative illumination over the surface of an object, often caused by color variations or surface curvature.
Shape	An object characteristic, often referring to its spatial contour.
Shape from Shading	A 3D technique that uses shadows from interaction of the object and the light source to determine shape.
Sharpening	An IP operation which enhances edges. An unsharp mask adds a low pass filtered image to the original, resulting in edge enhancement.
Shutter	An electrical or mechanical device used to control the amount of time the imaging surface is exposed to light. Often used to stop blur from moving objects.
Siblings	In SRI terminology, several child objects within a parent object are siblings.
Signal-to-Noise Ratio	The ratio between useful television signal and disturbing noise or snow.
Silhouette	A black and white image of an object illuminated by backlighting.
Simple Lens	A lens with only a single element.
Single	bit: Single-bit images use just one bit of data to record each pixel - either black or white.
Sinusoidal Projection	Use of a grating in which the dark stripes vary in their density sinusoidally across each one, rather than constant black. Improved profile or range discrimination is possible when used in a moire type configuration.
Size	An object characteristic typically measured by x and y dimensions. Size may be expressed in pixels, the system calibrated units of measure or classes or size groups.
Smart Camera	A new term for a complete vision system contained in the camera body itself., including imaging, image processing and decision making functions .
Sobel Transform	A 3x3 convolution used for edge enhancement and locating.
Solid state Camera	A camera which uses a solid state integrated circuit chip to convert incident light or other radiation into an analog electrical signal.
Span	The allowance of gray level acceptance for thresholding, adjustable from black to white from 0 to 100%.
Spatial Light	A transparent screen used in optical computer systems to

Modulator	introduce an image into the optical processing path. Similar to liquid crystal computer display screens, their resolution approaches 512x512 and grayscale imaging 8 bits. Also SLM.
Spectral Analysis	Evaluation of the wavelength composition of object irradiance.
Spectral Characteristics	The unique combination of wavelengths of light radiated from a source or transmitter or reflected from an object.
Spectral Response	The characteristic of a sensor to respond to a distribution of light by wavelength in the electromagnetic spectrum.
Specular Reflection	Light rays that are highly redirected at or near the same angle of incidence to a surface. Observation at this angle allows the viewer to "see" the light source.
Speed	An object characteristic expressed in distance moved per unit time. Velocity. Image blur may be caused by high speeds unless strobes or shutters are used to "stop motion."
Spherical Aberration	Light passing through a convex lens will be brought to different foci depending upon whether the light passes through near the center of the lens or closer to the periphery. Lens designers strive to correct this kind of zonal aberration to bring peripheral and near-central rays to a common focus.
SRI Algorithms	A rich set of routines used for geometric analysis and identification developed at the Stanford Research Institute in the early 1970s. Four main steps are: 1) Convert the image to binary; 2) Perform connectivity analysis to identify each blob or object; 3) Calculate the core statistical features for image objects; and 4) Calculate additional user selected features.
Stadimetry	A range measuring technique based on the apparent size measurement of a known size object in the field OF VIEW
Statistical (Theoretic) Pattern Recognition	Statistical analysis of object features to perform recognition and classification.
Stereo (Passive)	For imaging, the use of two cameras, offset by a known distance and angle, to image the same object and provide range, depth or 3D information. Active stereo uses a controlled or structured light source to provide 3D data.
Stereo Photogrammetry	See Shape from Shading.
Stereoscopic Approach	The use of triangulation between two or more image views from differing positions. Used to determine range or depth.
Strobe Duration	The amount of time, expressed in microseconds, during which the

flash lamp (strobe) is at 90% intensity.

Strobed Light	Brief flashes of light for observing an object during a short interval of time, typically used to "stop" movement and resulting image blur. Strobes may use xenon flash tubes, banks of LEDs or a laser to illuminate the scene.
Structural (Syntactic) Pattern Recognition	Evaluation of the relationship of object features in a specific order, ie decision trees, to perform recognition and classification.
Structured Light	Points, lines, circles, sheets and other projected configurations used to directly determine shape and/or range information by observing their deformation as it intersects the object in a known geometric configuration.
Subpixel Resolution	Mathematical techniques used on gray scale images to resolve an edge location to less than one pixel. A one tenth pixel resolution is reasonable in the factory.
Synch Pulse	Timing signals used to control the television scanning and display process. The horizontal synch triggers tracing of a new line from left to right, while the vertical synch initiates the start of a new field.
Synchronous	A camera characteristic denoting operation at a fixed frequency locked to the AC power line (typically 60 or 50Hz).
Syntactic PR	See Structural Pattern Recognition
System Performance Measures	Accuracy, precision or repeatability, and alpha and beta risk for a given throughput rate specify the performance of a vision system.
Systems Integration	The art of assembling hardware, software, components, mounts and enclosures to produce a system that meets a customer's specification.

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Tail End System	The operator interface, I/O and communications blocks of a vision system. Includes all aspects of information display and handling. Is often overspecified.
TDI Camera	Time Delay Integration. Similar to a line scan, a TDI camera is comprised of a number of rows of pixels. As an object such as a web moves, the charge from one row is passed to the next row, synchronously continuing the integration. Requires far less illumination intensity than the standard line scan.
Template	An artificial model of an object or a region or feature within an object.

Template Matching	A form of correlation used to find out how well two images match.
Terminator	A special resistor pack or a block of resistors that tells the computer where the end of the SCSI or video chain is and ensures the electrical integrity of the signals. Terminators act as a filter to clear out electrical "noise" caused by multiple cables and devices.
Texture	The degree of smoothness of an object surface. Texture affects light reflection, and is made more visible by shadows formed by its vertical structures.
Thickness	The measurement in the third dimension (length and width being the other two) from one object surface to another using one or two 3D range sensors or other technique.
Thresholding	The process of converting gray scale image into a binary image. If the pixel's value is above the threshold, it is converted to white. If below the threshold, the pixel value is converted to black.
Throughput Rate	The maximum parts per minute inspection rate of a system.
Top Hat	A morphological operator comprised of an opening followed by a subtraction of the output image from the original input image.
Trackball	A stationary ball used as a pointing device to select items from a display screen.
Transition	For an edge in a binary image, the location where pixels change between light and dark.
Translation	Movement in the X and/or Y direction from a known point.
Translucent	An object characteristic in which part of the incident light is reflected and part is transmitted. The transmitted light emerges from the object diffused.
Transmittance	The ratio of the radiant power transmitted by an optical element or object to the incident radiant power.
Transputer	A type of computer architecture with several CPUs connected in parallel.
Triangulation	A method of determining distance by forming a right triangle consisting of a light source, camera and the object. The distance or range can be calculated if the camera to light source distance and the incident to reflected beam angle are both known. Based on the Pythagorean relation.
Tube Type Camera	A camera in which the image is formed on a fluorescent screen, then read out sequentially in a raster scan type pattern by an electron beam for conversion to an analog voltage proportional to incoming light intensity.

TWAIN A software industry standard that allows software applications and hardware imaging devices to communicate directly.

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Ultrasonic Imaging Use of ultrasound waves as the imaging "illumination" source.

Ultrasound Low frequency radiated acoustical waves just above human sound perception which are useful for penetration and "illumination" for inspection of solid objects.

Ultraviolet The region of the electromagnetic spectrum adjacent to the visible spectrum, but of higher frequency (shorter wavelength) than blue ranging from 1 to 400 nm. UV A ranges from 320 to 400 nm while UV B falls between 280 and 320 nm.

User Interface Includes display, operator, user controls and a means to access and modify custom user programming. See operator interface.

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Validation A rigid set of tests to verify that a system performs as documented.

Variable Scan Input Frame grabber capability to accept a variety of non RS-170 input formats from a variety of cameras. Allows operation above the 30 Hz limit.

Vertical Resolution The number of horizontal lines that can be seen in the reproduced image of a television pattern.

VESA Video Electronics Standards Association. A 32 bit display or other hardware card.

VGA An acronym for Video Graphics Array. The IBM video display standard of 16 colors.

Video Visual information encoded in a specific bandwidth and frequency spectrum location originally developed for television and radar imaging.

Video Signal (Non-Composite) The picture signal. A signal containing visual information and horizontal and vertical blanking (see also Composite Video Signal) but not sync.

Vidicon A generic name for a camera tube of normal light sensitivity. It outputs an analog voltage stream corresponding to the intensity of the incoming light.

Visible Light The region of the electromagnetic spectrum in which the human retina is sensitive, ranging from about 400 to 750 nm in wavelength.

Vision Engine Analyzes the image and makes decisions, using a very fast processor inside a computer. It performs dedicated evaluation of the pre-processed image data to find features and make measurements. Unlike a personal computer, the vision engine is built for speed, not flexibility.

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Wavelength The distance covered by one cycle of a sinusoidally varying wave as it travels at or near the speed of light. It is inversely proportional to frequency.

WDM Windows Driver Model (WDM) is a framework for device drivers that was introduced with Windows 98/2000 to replace VxD. WDM exists in the intermediary layer of Windows 2000 kernel-mode drivers and was introduced to increase the functionality and ease of writing drivers for Windows. A.K.A. Win32 Driver Model.

Well A morphological operator comprised of a closing followed by a subtraction of the output image from the original input image.

Window A selected portion of an image or a narrow range of gray scale values.

Windowing Performing IP operations only within a predefined window or area in the image.

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Xenon Strobe A gas filled electronic discharge tube, useful for high speed, short duration illumination for inspection.

X-ray A portion of the electromagnetic spectrum beyond the ultraviolet with higher frequency and shorter wavelengths. Able to penetrate solid objects for internal, non-destructive evaluation.

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Y Signal A signal transmitted in color television containing brightness information. This signal produces a black and white picture on a standard monochrome receiver. In a color picture it supplies fine detail and brightness information.

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Zoom Lens A compound lens which remains in focus as the image size is varied continuously. May be motorized or manually operated.