CLASS 382, IMAGE ANALYSIS

SECTION I - CLASS DEFINITION

GENERAL STATEMENT OF THE CLASS SUBJECT MATTER

This is the generic class for apparatus and corresponding methods for the automated analysis of an image or recognition of a pattern*. Included herein are systems that transform an image for the purpose of (a) enhancing its visual quality prior to recognition, (b) locating and registering the image relative to a sensor or stored prototype, or reducing the amount of image data by discarding irrelevant data, and (c) measuring significant characteristics of the image.

(1) Note. Automated document pattern* analysis or verification, which includes detection of alphanumerics, is classified in this class.

(2) Note. To be classified herein, no actual recognition or identification need be performed. It is sufficient that substantial digital image processing, such as a coding, enhancement, or transformation process, be performed on the image data for classification herein.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

Pattern* analysis or verification limited to the intrinsic properties of a document is classified elsewhere. Documents that are analyzed or verified by information content, such as pattern*s or alphanumeric characters, are classified in this class (382). Document verification limited to a photocell system is classified elsewhere. See References to Other Classes, below.

Alphanumeric characters and other pattern*s are to be distinguished from coded indicia. Coded indicia are designed specifically to facilitate reading by machine and are not intended to be read by humans (e.g., the Universal Product Code on grocery items). Reading or sensing of coded indicia which does not include the recognition of any alphanumeric character or pattern* is classified elsewhere. However, reading or sensing of pattern*s or alphanumeric characters in combination with coded indicia is classified in this class (382). Example: Reading a credit card that contains a printed name plus a magnetic code is classified in Class 235 if only the magnetic code is read. Otherwise, if both the printed name and the magnetic code are read, classification is herein.

The images analyzed and processed herein are images that are representative of a "real" scene (such as images obtained by a camera, scanner, or image detector), including obtained images of people, places, and things, wherein the image represents the actual scene. The presentation or generation of images that are (a) computer generated or otherwise artificial, or (b) a combination of computer-generated images and real images is properly classified elsewhere, including for computer graphics and control of data presentation with creation or manipulation of graphic objects or text performed by a computer or processor, and operator interfaces. See References to Other Classes, below.

The specific processing of television pictures and signals, where a television system is an integral part of the system, is properly classified elsewhere. See References to Other Classes, below. When images generated by a television camera are processed, and the television system is not an integral part of the overall system, and the system is either disclosed or claimed in an environment with substantial digital image processing or in a pattern* recognition* environment, proper classification is herein.

For systems directed to the processing of a displayed image, where the processing is directed to the altering of the display image or of the display system itself, proper classification is elsewhere. See References to Other Classes, below.

The testing or measuring of distances, areas, volumes, thicknesses, or defects in objects is excluded from this class. However, where the measurements of these parameters are either disclosed or claimed in an environment with substantial digital image processing or in a pattern* recognition* environment, classification is in this class.

Image analysis* having specific and significantly claimed utility in art environments external to this class is classified in the appropriate external classes unless it is specifically excluded therefrom. For example: radar, facsimile, color facsimile, coded record sensor; and purely optical systems for image processing are all excluded from this class. See references to Other Classes, below.

Subcombinations specific to image analysis* or pattern* recognition are classified herein.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 488+ for mechanically determining speed and acceleration; subclass 865.4 for mechanical signature verification instruments.

178, Telegraphy, subclasses 18.01+ for writing elements and detectors.

209, Classifying, Separating, and Assorting Solids, subclasses 509+ for sorting paper money, mail pieces, bottles, and other objects.

235, Registers, subclasses 435+ for coded record sensors; subclasses 487+ for coded records.

250, Radiant Energy, subclasses 201.2+ for autofocus control of photocell circuits; subclass 223 for optical inspection of bottles using radiant energy; subclass 271 for subject matter that includes infrared of ultraviolet light for pattern analysis or verification; subclasses 455+ for tomography; subclasses 548, 559+, and 571+ for web and sheet inspection using a photocell system; and subclass 556 for document verification that is limited to a photocell system.

340, Communications: Electrical, subclasses 5.2 through 5.74 for intelligence comparison and authorization or identification of personnel using communications system, particularly subclasses 5.52-5.53 and subclasses 5.82-5.84 for authorization or authentication, respectively, by biometrics: subclasses 907-932.1 and 933-943 for specific vehicle detection and traffic control.

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 104+, 115+, or 147+, for radar.

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 581 through 618 for visual display of images; subclasses 649-659 for rotation of a displayed image; subclasses 660-671 for control of the size of a displayed image; subclasses 419-427 for three-dimensional presentation; 582-588 for determining and using texture in computer graphics and display; and 619-689 for transformation of computer-generated images.

348, Television, for specific processing of television pictures and signals, where a television system is an integral part of the system, subclass 62 and 63 for aids for the blind; subclasses 86-95 for manufacturing where a television system is an integral part of the system; subclasses 125-134 for flaw detection where a television system is an integral part of the system; subclasses 135-142 for object and scene measurements where a television system is an integral part of the system; subclass 161 for object comparison where a television system is an integral part of the system; subclasses 384.1-440.1 for bandwidth compression of analog television signals where a television system is an integral part of the system; subclasses 571-721 for image processing specific to television where a television system is an integral part of the system.

351, Optics: Eye Examining, Vision Testing and Correcting, subclasses 200+ for optical measurements of the eye.

356, Optics: Measuring and Testing, subclass 3 for range finding and stereoscopic optical mea; subclasses 27 for optically determining velocity; subclass 71 for document pattern* analysis or verification if visible light is used (otherwise, classification is elsewhere); subclass 625 for optical measuring of the physical properties of an object; subclasses 388 for optical configuration comparison; subclass 429 for inspection of webs and threads; subclasses 237.1 for optical inspection for flaws and imperfections; subclasses 39 for visible-light blood analyzing instruments.

358, Facsimile and Static Presentation Processing, subclasses 400 through 304 for facsimile systems and subclasses 500-540 for natural color facsimile.

359, Optics: Systems (Including Communications) and Elements, subclasses 1+ for holos:graphic systems; and subclasses 559+ for optical Fourier transforms, convolution, and correlation.

367, Communications, Electrical: Acoustic Wave Systems and Devices, appropriate subclasses for extraction and processing of seismic samples and borehole samples.

369, Dynamic Information Storage or Retrieval, subclass 103 for storage of holos:graphic images.

375, Pulse or Digital Communications, subclasses 240.01 through 240.29 for digital television bandwidth compression system.

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 10+ for blood cell counters.

378, X-Ray or Gamma Ray Systems or Devices, subclasses 21+ for tomography; subclass 37 for mammography; and subclasses 62+ for imaging.

380, Cryptography, appropriate subclasses for encryption of data including character data.

396, Photography, subclasses 89+ for automatic focus control or rangefinding in a camera environment.

428, Stock Material or Miscellaneous Articles, subclasses 224+ for the processing of textiles.

434, Education and Demonstration, subclasses 112+ for reading aids for the handicapped.

600, Surgery, subclasses 300+ for various diagnostic devices.

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 2 through 7 for the use of plural processors in a computer generic control system; and subclasses 95-212 for use of computers in manufacturing; particularly subclasses 130-144 for computer controlled manufacturing of textiles, and subclasses 245-264 for data processing of robot control systems.

702, Data Processing: Measuring, Calibrating, or Testing, subclass 37 for flow or defect detection by video imaging, subclasses 66+ for electrical waveform analysis, and subclass 192 for noise removal or suppression in a measured video or image signal.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation and Audio Compression/Decompression, subclasses 200+ for artificial intelligence systems that process speech signals.

705, Data Processing: Financial, Business Practice, Management, or Cost/price Determination, subclasses 401+ for a postage meter.

706, Data Processing: Intelligent Processing Systems and Methods, subclasses 15+ for artificial intelligence applications of neural networks.

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 200+ for computer implemented conversion of data; subclasses 300+ and 819 for computer-implemented filters; subclasses 400+, 813+, and 820+ for transforms (Fourier, correlation, convolution) implemented by computer.

714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclasses for digital data error in general.

715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 200 through 277 for document processing performed by a computer for presentation.

901, Robots, appropriate subclasses for the details of a robot.

902, Electronic Funds Transfer, subclasses 3 through 7 and 25+ for identification of individuals, such as with biometrics and bank cards, in a funds transfer system.

SECTION IV - GLOSSARY

IMAGE ANALYSIS*

For the purpose of this class, image analysis* is defined as a systematic operation or series of operations performed on data representative of an observed image with the aim of measuring a characteristic of the image, detecting variations and structure in the image, or transforming the image in a way that facilitates its interpretation.

IMAGING SYSTEM*

For the purpose of this class, an imaging system is any means which acquires an image. For example, it includes video cameras, CCD arrays, scanners, etc.

PATTERN*

For the purpose of this class, a pattern* is any form in an image having discernable characteristics that provide a distinctive identity when contrasted with other forms. For example, the character "A" has a distinctive identity when contrasted with all other letters of the alphabet.

PATTERN* RECOGNITION*

For the purpose of this class, pattern* recognition* is defined as any procedure for ascertaining differences, as well as similarities, between pattern*s under observation and partitioning the pattern*s into appropriate categories based on these perceived differences and similarities; or any procedure for correctly identifying a discrete pattern*, such as an alphanumeric character, as a member of a predefined pattern* category.

PIXEL*

The smallest distinguishable and resolvable area in an image.

SUBCLASSES

100 APPLICATIONS:

This subclass is indented under the class definition. Subject matter wherein the image analysis* is disclosed as being designed for or utilized in a diverse art device, system, process, or environment.

(1) Note. For classification herein, there must be significant claim recitation of an image analyzing system. Where the claims recite significant structure of the external art environment, classification is in the appropriate external art class.

(2) Note. In view of the subject matter included herein, the classification schedule for the diverse art or environment should be considered for proper search.

SEE OR SEARCH CLASS:

128, Surgery, subclass 922 for image analysis.

209, Classifying, Separating, and Assorting Solids, appropriate subclasses for sorters operating on various items such as mail, paper currency, and bank checks.

235, Registers, subclasses 375+ for systems controlled by a coded record, and subclasses 435+ for coded record sensors.

246, Railway Switches and Signals, appropriate subclasses for systems which identify trains or indicate their positions.

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for object detection and positioning using radar.

348, Television, subclasses 61+ for specific uses of television in image analysis*, where a television system is an integral part of the system.

358, Facsimile and Static Presentation Processing, subclasses 426.01 through 426.16 for image analysis applied to the problem of data compression in facsimile systems; and subclasses 500-540 for data processing and compression in color facsimile systems.

380, Cryptography, appropriate subclasses for encryption of data including character data.

101 Mail processing:

This subclass is indented under subclass 100. Subject matter wherein the image is sensed from materials, such as letters and packages, handled in a postal system.

(1) Note. Included are locating of stamps and address blocks on a mail piece as well as codes on a mail piece that are outside of the address block and the reading thereof.

SEE OR SEARCH CLASS:

209, Classifying, Separating, and Assorting Solids, subclasses 584 and 900 for sorting of mail.

705, Data Processing: Financial, Business Practice, Management, or Cost/price Determination, subclasses 401+ for postage meters.

102 ZIP code:

This subclass is indented under subclass 101. Subject matter wherein the image sensing is limited specifically to finding and reading a series of numbers that indicate the general location where the mail piece is to be sent (e.g., a ZIP code or postal code).

103 Target tracking or detecting:

This subclass is indented under subclass 100. Subject matter wherein an object is located, recognized, or followed (tracked) by an imaging system*.

(1) Note. The object may be either stationary or moving with respect to the imaging system*. The types of objects include, but are not limited to, planes, military vehicles, stars, and similar pattern*s.

SEE OR SEARCH CLASS:

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for object detection and positioning using radar.

348, Television, subclasses 169+ for object tracking using television, where a

television system is an integral part of the system.

104 Vehicle or traffic control (e.g., auto, bus, or train):

This subclass is indented under subclass 100. Subject matter wherein a conveyance that is, or can be, manned is located, identified, or controlled by image analyzing techniques.

(1) Note. Included are: reading of tire pattern*s and codes; control of the vehicle by movements of the operator being detected by the imaging system*; and identification or recognition of the vehicle by an imaging system*. The types of vehicles include automobiles, buses, and trains or rail cars.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 907+ and 933+ for specific vehicle detection and traffic control.

348, Television, subclass 113 for navigation control of conveyance using a television camera, where a television system is an integral part of the system.

105 License plate:

This subclass is indented under subclass 104. Subject matter including image sensing for specifically finding and reading a series of alphanumerics from a plate on, or affixed to, a conveyance such as an automobile.

106 Range or distance measuring:

This subclass is indented under subclass 100. Subject matter wherein the length or magnitude of a path from a sensor or imaging system* to an object is determined.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclasses 3+ for optical measuring of distances and ranges.

107 Motion or velocity measuring:

This subclass is indented under subclass 100. Subject matter wherein the amount of change in position or movement of an imaged object is determined.

(1) Note. Included is determination of the speed or acceleration, or change in speed or acceleration, or change of the position of the imaged object.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 488+ for mechanically determining speed and acceleration.

348, Television, subclasses 154 and 155 for motion detection using a television camera, where a television system is an integral part of the system.

356, Optics: Measuring and Testing, subclasses 27+ for optically determining velocity.

108 Surface texture or roughness measuring:

This subclass is indented under subclass 100. Subject matter wherein the examined characteristics of an imaged object include distribution of color and intensity on a surface to give an appearance of texture, such as smooth, rough, shiny, or dull.

(1) Note. Included is determining a representation of the physical structure of the surface.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 582 through 588 for determining and using texture in computer graphics and display.

109 Seismic or geological sample measuring:

This subclass is indented under subclass 100. Subject matter wherein the analyzed image is a sample of earth or rock.

(1) Note. Included in this subclass are core samples and samples from boreholes, as well as other geological samples. Features extracted from the sample include those that define the form, structure, color, and mineralogical composition of the sample.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 152.01+ for boreholes, and subclass 784 for measuring earth stresses.

348, Television, subclass 85 for use of television systems in borehole inspection.

356, Optics: Measuring and Testing, subclasses 241.1+ for borescopes and bore inspection.

367, Communications, Electrical: Acoustic Wave Systems and Devices, appropriate subclasses for extraction and processing of seismic samples and borehole samples.

110 Animal, plant, or food inspection:

This subclass is indented under subclass 100. Subject matter wherein the examined or analyzed image is an animal, plant, or foodstuff.

(1) Note. Included in this subclass are livestock, birds, fish, grain, fruit, nuts, plants, roots, and vegetables.

111 Textiles or clothing:

This subclass is indented under subclass 100. Subject matter wherein the image analysis* is designed for, or used in, the inspection or production of textiles or apparel.

(1) Note. Included in this subclass is the inspection or examination of leather, fabric, yarn, and various other types of cloth. Included also is analysis of pattern*s for cutting the textile material.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclasses 238.1+ and 429+ for optical inspection of cloth and similar material.

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 130 through 144 for computer-controlled manufacturing of textiles.

112 Document or print quality inspection (e.g., newspaper, photographs, etc.):

This subclass is indented under subclass 100. Subject matter wherein the accuracy or correctness of printed pattern*s on an object under inspection is determined or the inspection of the accuracy of reproduced pattern*s is determined.

(1) Note. Included herein are imaging system*s that inspect webs, such as newspaper, etc., for proper registration of the print thereon. Also included herein is inspection of the condition of a document for soiling, staining, and similar damage to the document.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 559+ and 571+ for optical inspection of webs.

113 Reading maps, graphs, drawings or schematics:

This subclass is indented under subclass 100. Subject matter wherein the imaging system* is specifically designed for reading or processing documents having s:graphical notations or illustrations.

(1) Note. Included herein are systems that extract data from these documents and identify features therein. Also included herein are systems that read the chemical notations that represent chemical structures.

(2) Note. Excluded from this subclass are systems that read only texts.

114 Reading aids for the visually impaired:

This subclass is indented under subclass 100. Subject matter wherein a particular representation of an image is generated that can be interpreted by a sense other than sight.

(1) Note. Included herein are systems that recognize letters, words, or documents and provide an output that does not rely primarily on sight for sensing, including audio or tactile reproduction.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 4.1 through 4.14 for communication or control for the handicapped.

348, Television, subclasses 62+ for use of a television camera in systems for aids for the visually impaired, where a television system is an integral part of the system.

434, Education and Demonstration, subclasses 112+ for reading aids for the handicapped.

115 Personnel identification (e.g., biometrics):
This subclass is indented under subclass 100. Subject matter wherein an image or an image pattern* is analyzed for the purpose of recognizing an individual or verifying a person's identity.

(1) Note. Included herein are measurements of a finger, hand, or foot, as well as keystroke dynamics and ID cards.

(2) Note. It is not necessary that the pattern* selected for analysis be a physical characteristic of the person to be identified. Any pattern*, such that its connection to a given individual permits confident identification of the individual, is sufficient.

(3) Note. Included are both identification of a person (i.e., comparing the input feature to a plurality of stored features to identify the person) and verification of the identity of a person (i.e., comparing the input feature to a specific feature, such as an ID card, to verify the person's identity).

SEE OR SEARCH CLASS:
235, Registers, subclasses 380+ for an identification card system wherein a code rather than a pattern* is identified; see also Class 382, II B (2) Note.
340, Communications: Electrical, subclasses 5.1 through 5.92 for intelligence comparison for controlling in a selective communication system, particularly subclasses 5.52-5.53 for varying authorization by comparison using user s body characteristic, subclasses 5.8-5.86 for authentication, and subclasses 5.82-5.84 for authentication by biometrics.
704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/ Decompression, subclasses 246+ for voice recognition and subclass 273 for security systems including speech signal processing.
902, Electronic Funds Transfer, subclass 3 for biometrics, and subclasses 4+ and 25+ for use of bank cards and similar devices to identify individuals in an electronics funds transfer system.

116 Using a combination of features (e.g., signature and fingerprint):
This subclass is indented under subclass 115. Subject matter wherein more than one type of distinct identification process is used to recognize or verify a person's identity.

(1) Note. Included are any combination of identification or recognition processes or systems specified elsewhere in this class, or specifically classified elsewhere, where the emphasis is on the use of a plurality of different recognition processes and not to the particulars of any individual process in the identification of a person.

117 Using a characteristic of the eye:
This subclass is indented under subclass 115. Subject matter wherein a person is identified by analyzing the person's eye or characteristics of the eye, including retinal pattern*s and iris pattern*s.

SEE OR SEARCH CLASS:
351, Optics: Eye Examining, Vision Testing and Correcting, subclasses 200+ for optical measurements of the eye.
359, Optics: Systems (Including Communication) and Elements, appropriate subclasses for viewing the eye using optical elements.

118 Using a facial characteristic:
This subclass is indented under subclass 115. Subject matter wherein a person is identified by analyzing the person's face or characteristics thereof, including distinct features of the face like eyes, nose, mouth, etc. and spacing of the features, as well as the face as a whole, including facial curves and thermal energy pattern*s of the face.

(1) Note. The actual examination of the eye itself for personnel recognition is classified in this class, subclass 117.

SEE OR SEARCH CLASS:

351, Optics: Eye Examining, Vision Testing and Correcting, subclass 204 for optical measurements of distances between pupils.

119 Using a signature:

This subclass is indented under subclass 115. Subject matter wherein a person is identified by analyzing the pattern* of a signed name.

(1) Note. For classification in this subclass, the focal point of the analysis must be the writer rather than the written message; that is, an attempt must be made to identify the writer rather than the mere alpha content of the signature.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 865.4 for mechanical signature verification instruments.

178, Telegraphy, subclasses 18.01+ for writing instruments and sensor tablets.

348, Television, subclass 161 for the remote verification of signatures using television and having an operator making a decision as to the authenticity of the signature, where a television system is an integral part of the system.

120 Sensing pressure together with speed or acceleration:

This subclass is indented under subclass 119. Subject matter wherein the pressure characteristics of the writing sample are used in combination with either speed (velocity, that is, the first derivative of the values of the pen movement) or acceleration (change in velocity, that is, the second derivative of the values of the pen movement) characteristic to identify the person doing the writing.

121 Sensing pressure only:

This subclass is indented under subclass 119. Subject matter wherein the characteristic of the writing sample used is only pressure or force exerted by the writer with a writing instrument during the writing of the sample.

122 Sensing speed or acceleration only:

This subclass is indented under subclass 119. Subject matter wherein the characteristic of the writing sample used is only speed (velocity, that is, the first derivative of the values of the pen movement) or acceleration (change in velocity, that is, the second derivative of the values of the pen movement) exerted by the writer with a writing instrument during the writing of the sample.

123 Sensing geometrical properties:

This subclass is indented under subclass 119. Subject matter wherein the characteristics of the writing sample used are static parameters of the writing.

(1) Note. The static parameters include shapes, dimensions, and key points of the sample. Also included are detecting and using selected points of the sample with respect to a reference, such as a grid on which the sample is written.

124 Using a fingerprint:

This subclass is indented under subclass 115. Subject matter wherein a person is identified by analyzing the person's fingerprint.

SEE OR SEARCH CLASS:

283, Printed Matter, subclasses 68+ for fingerprint identifying.

356, Optics: Measuring and Testing, subclass 71 for visually comparing a fingerprint on a document with a standard fingerprint.

125 Extracting minutia such as ridge endings and bifurcations:

This subclass is indented under subclass 124. Subject matter in which the finest details of a fingerprint are measured so as to identify a person.

(1) Note. These details are commonly called 'minutiae' and consist of features such as ridge endings, bifurcations, triradii, and cores.

126 With a guiding mechanism for positioning finger:

This subclass is indented under subclass 124. Subject matter wherein the system includes specific apparatus to place the finger to be inspected at a specific location with respect to an imaging system*.

127 With a prism:

This subclass is indented under subclass 124. Subject matter wherein a prism is used as part of an imaging system* so as to acquire an image of the fingerprint for identification.

(1) Note. Included are systems where the fingerprint is directly applied to the prism for pickup by the imaging system*.

128 Biomedical applications:

This subclass is indented under subclass 100. Subject matter wherein the image analyzing system is designed specifically for or utilized in the areas of radiation imaging or microscopic cell analysis for the detection or diagnosis of disease, or any other image analyzing application substantially related to medicine, health, or other life sciences not provided for elsewhere.

SEE OR SEARCH CLASS:

128, Surgery, subclass 922 for image analysis.

250, Radiant Energy, subclasses 455+ for tomography.

356, Optics: Measuring and Testing, subclasses 39+ for visible-light blood analyzing instruments.

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 10+ for blood cell counters.

129 DNA or RNA pattern* reading:

This subclass is indented under subclass 128. Subject matter wherein cells or cell objects are analyzed for specific parameters related to DNA, RNA, or chromosome pattern*s.

130 Producing difference image (e.g., angiography):

This subclass is indented under subclass 128. Subject matter wherein related images are processed (e.g., by subtraction) to produce difference images indicative of dissimilarities.

131 Tomography (e.g., CAT scanner):

This subclass is indented under subclass 128. Subject matter wherein a means or process is provided for generating or processing digitized images of one or more slices of a nominally solid object, generated by computer tomography (i.e., CT), magnetic resonance (i.e., MR) or ultrasonically.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 455+ for tomography.

132 X-ray film analysis (e.g., radiography):

This subclass is indented under subclass 128. Subject matter related to processing standard film or digitized X-ray images (e.g., bone fractures or mammography) such as for enhancement, segmentation, tone generation.

133 Cell analysis, classification, or counting:

This subclass is indented under subclass 128. Subject matter related to optically viewing or digitally storing cell images for evaluating characteristics of cell images by chromaticity of features and feature counting.

(1) Note. Included herein is counting the number of a particular type of cell.

SEE OR SEARCH CLASS:

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 10+ for blood cell counters.

134 Blood cells:

This subclass is indented under subclass 133. Subject matter wherein the cell analysis, classification, or counting is directed to red, white, or other types of blood cells.

135 Reading paper currency:

This subclass is indented under subclass 100. Subject matter including means or process that can sense images of paper money to verify

authenticity, discriminate denominations, sense condition, or count documents, based on optical or magnetic scanning.

SEE OR SEARCH CLASS:
- 194, Check-Controlled Apparatus, subclass 4 for verifying the authenticity of money.
- 209, Classifying, Separating, and Assorting Solids, subclass 534 for sorting paper money.
- 235, Registers, subclass 379 for banking systems controlled by a coded record.
- 250, Radiant Energy, subclasses 200+ for sensing using photocells.
- 356, Optics: Measuring and Testing, subclass 71 for visually comparing currency with a standard.
- 902, Electronic Funds Transfer, subclass 7 for the identification of counterfeit money in a funds transfer system.

136 Reading coins:
This subclass is indented under subclass 100. Subject matter wherein a means or process is provided for inspecting a coin so as to identify the coin or determine its numismatic condition or irregularities.

SEE OR SEARCH CLASS:
- 902, Electronic Funds Transfer, subclass 7 for identification of counterfeit money in a funds transfer system.

137 Reading bank checks (e.g., documents bearing E-13B type characters):
This subclass is indented under subclass 100. Subject matter including apparatus that can sense images of a bank check and extract measurements to verify authenticity or classify the sensed bank based on optical scanning.

(1) Note. Included herein are systems that read E-13B type characters from bank checks.

SEE OR SEARCH CLASS:
- 705, Data Processing: Financial, Business Practice, Management, or Cost/price Determination, subclass 45 for a financial transaction data processing system having paper bank check handling.

138 Reading monetary amount:
This subclass is indented under subclass 137. Subject matter wherein user-entered data corresponding to the cash value of the bank check are recognized.

139 Reading MICR data:
This subclass is indented under subclass 137. Subject matter related to reading preprinted magnetic ink character or symbol data from the bank check.

(1) Note. Included herein is reading feature information (e.g., stroke length or thickness) which is scanned to generate a data signal.

140 Including an optical imager or reader:
This subclass is indented under subclass 139. Subject matter wherein the bank check is also optically scanned for viewing or storage or for obtaining optical as well as magnetic characteristics useful in character recognition.

141 Manufacturing or product inspection:
This subclass is indented under subclass 100. Subject matter wherein the image analysis* system has been designed for use in product manufacturing (e.g., integrated circuits or metal parts), including as part of automated inspection systems for recognizing defects or irregularities or as part of the system to control the manufacturing by image analysis*.

SEE OR SEARCH CLASS:
- 348, Television, subclasses 86+ and 125+ for manufacturing and flaw detection using a television camera, where a television system is an integral part of the system.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 95 through 212 for use of computers in manufacturing.

142 Bottle inspection:
This subclass is indented under subclass 141. Subject matter wherein a rigid or semirigid container typically of glass or plastic having a comparatively narrow neck or mouth is inspected to determine the dimensions or a condition of the container.

(1) Note. This subclass also may include means or process for reading symbol data from a vessel or a label on a vessel.

(2) Note. In this subclass inspection of can goods are excluded from this subclass. Can goods are appropriately classified in this class, subclass 44.

SEE OR SEARCH CLASS:
250, Radiant Energy, subclass 223 for optical inspection of bottles using radiant energy.
348, Television, subclass 127 for bottle inspection using a television camera, where a television system is an integral part of the system.

143 Inspection of packaged consumer goods:
This subclass is indented under subclass 141. Subject matter wherein packaged products (e.g., cigarettes) or labels on the goods are inspected for irregularities in appearance or other defects.

SEE OR SEARCH CLASS:
209, Classifying, Separating, and Assorting Solids, subclasses 509+ for sorting various consumer goods like cigarettes.

144 Mask inspection (e.g., semiconductor photomask):
This subclass is indented under subclass 141. Subject matter wherein photomasks for semiconductor or printed circuit board fabrication are scanned for defects, holes, etc.

145 Inspection of semiconductor device or printed circuit board:
This subclass is indented under subclass 141. Subject matter wherein semiconductor wafers, chips, or similar materials or an insulating board on which circuit has been printed are inspected for defect detection, dimension checking, mark reading, or other conditions.

SEE OR SEARCH CLASS:
29, Metal Working, subclass 833 for assembling an electrical component to an insulating base utilizing an optical sighting means.
438, Semiconductor Device Manufacturing: Process, particularly subclass 16 for methods of treating electronically functioning semiconductor substrates including a step of measuring an optical characteristic of the process or of the electronic device.

146 Measuring external leads:
This subclass is indented under subclass 145. Subject matter wherein external leads of a component are inspected, such as for coplanarity, shape, or alignment prior to insertion into a printed circuit board or the like.

147 Inspecting printed circuit boards:
This subclass is indented under subclass 145. Subject matter wherein a printed circuit or printed wiring board is inspected to locate defects in conductors, holes, the presence or absence of components, etc.

SEE OR SEARCH CLASS:
348, Television, subclass 126 for circuit board inspection using a television camera, where a television system is an integral part of the system.

148 At plural magnifications or resolution:
This subclass is indented under subclass 145. Subject matter wherein inspection is performed at more than one image magnification or resolution.

149 Fault or defect detection:
This subclass is indented under subclass 145. Subject matter wherein a device is inspected for defects relating to dimensional tolerances, surface irregularities, etc.

150 Faulty soldering:
This subclass is indented under subclass 149. Subject matter wherein means or process is provided for inspecting printed circuit board packages containing IC or other devices to identify defective or missing soldering or bonding points.

151 Alignment, registration, or position determination:
This subclass is indented under subclass 145. Subject matter wherein semiconductor or other electrical component devices are inspected to

determine position or alignment with respect to a process mask or during installation.

152 Tool, workpiece, or mechanical component inspection:
This subclass is indented under subclass 141. Subject matter related to inspection for defects in manufactured objects including raw sheet metal, punched, stamped, or engraved machine parts or fasteners, or welding seams; also for inspection of wear of tool working surfaces (e.g., drilling or cutting tools).

SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclass 34 for a mechanical measurement system for wear or deterioration evaluation, and subclass 35 for a mechanical measurement system for flow or defect detection.

153 Robotics:
This subclass is indented under subclass 100. Subject matter related to autonomous vehicle navigation via scene analysis (i.e., object recognition and avoidance) or reference to known markings (e.g., guide lines on a warehouse floor) or to positioning articles by automated manufacturing systems using image analysis*.

SEE OR SEARCH CLASS:
348, Television, subclasses 113+ for navigation, where a television system is an integral part of the system.
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 245 through 264 for robot control.
901, Robotics, appropriate subclasses for robotics navigation or operation.

154 3-D or stereo imaging analysis:
This subclass is indented under subclass 100. Subject matter wherein a three-dimensional scene is imaged using at least two cameras or camera locations for the generation of XYZ coordinate data of any object within the scene.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 419 through 427 for three-dimensional or perspective data processing for display presentation.
356, Optics: Measuring and Testing, subclasses 12+ for stereoscopic imaging.

155 LEARNING SYSTEMS:
This subclass is indented under the class definition. Subject matter where the image analysis* system is not rigidly structured but is adaptive and capable of changing during a test or training period and/or according to experience gained.

SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 47 through 48 for trainable control systems.

156 Neural networks:
This subclass is indented under subclass 155. Subject matter in which the learning system comprises multiple layers of interconnected neurons.

SEE OR SEARCH CLASS:
128, Surgery, subclass 925 for neural network.
706, Data Processing: Intelligent Processing Systems and Methods, subclasses 15+ for intelligence applications of neural networks.

157 Network learning techniques (e.g., back propagation):
This subclass is indented under subclass 156. Subject matter which includes details of how connections to individual neurons are weighted.

(1) Note. Included herein are systems that perform back propagation, Kohonen feature maps, adaptive resonance theory, and learning vector quantization 2(LVQ2).

SEE OR SEARCH CLASS:
706, Data Processing: Intelligent Processing Systems and Methods, subclasses 15+ for neural network.

158 Network structures:
This subclass is indented under subclass 156. Subject matter which includes structural features of the network such as number of layers, number of neurons per layer, long and short term weights, and neuron construction.

SEE OR SEARCH CLASS:
706, Data Processing: Intelligent Processing Systems and Methods, subclasses 26+ for neural network structures.

159 Trainable classifiers or pattern* recognizers (e.g., adaline, perceptron):
This subclass is indented under subclass 155. Subject matter wherein the learning system compares unknown input pattern*s to reference pattern*s, the reference pattern*s being generated through a series of training steps.

SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 47 through 48 for trainable control systems.

160 Generating a standard by statistical analysis:
This subclass is indented under subclass 159. Subject matter wherein means or process is provided for creating the reference pattern*s based on probability or frequency of occurrence of data within the training pattern*s.

161 Alphanumerics:
This subclass is indented under subclass 159. Subject matter wherein the input pattern*s classified or recognized are alphanumeric symbols.

162 COLOR IMAGE PROCESSING:
This subclass is indented under the class definition. Subject matter wherein the image analysis* is specifically adapted for color images represented in various color spaces.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 589-605 for color format for dis systems.
348, Television, subclasses 453+ for chrominance processing of an image.

163 Drop-out color in image (i.e., color to be removed):
This subclass is indented under subclass 162. Subject matter wherein an object to be imaged includes colors which are either (a) detected and removed from the image of the object or (b) ignored or not detected by the imaging system*.

(1) Note. Included herein are documents with specific preprinted colors thereon.

164 Image segmentation using color:
This subclass is indented under subclass 162. Subject matter wherein regions of the image are discriminated and separated based on color features, including locating areas on an original document that are encircled by a color marker.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclass 538 for selecting image portions in color facsimile.

165 Pattern* recognition* or classification using color:
This subclass is indented under subclass 162. Subject matter which includes selecting and measuring color features to be used in recognizing a pattern*, structure, or object.

166 Compression of color images:
This subclass is indented under subclass 162. Subject matter wherein the quantity of data used to represent a color image is reduced without loss of essential information.

(1) Note. Included herein are techniques such as encoding each color plane separately or converting from one color system to another in order to facilitate compression.

167 Color correction:
This subclass is indented under subclass 162. Subject matter wherein signals representative of the colors in the image are modified to achieve improvements such as gamma correction, gradation correction, color balancing, contrast enhancement, and noise reduction.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclasses 518 through 523 for color correction in facsimile environment.

168 HISTOGRAM PROCESSING:
This subclass is indented under the class definition. Subject matter wherein a representation of the frequency of occurrence of image intensity or image features is used to derive properties of the image, to locate pattern*s within the image, or to otherwise process the image.

169 With a gray level transformation (e.g., uniform density transformation):
This subclass is indented under subclass 168. Subject matter wherein the histogram is manipulated to achieve gray level transformations including histogram equalization, histogram normalization, contrast enhancement, and tone scale transformations.

SEE OR SEARCH THIS CLASS, SUBCLASS:
167, for color correction of an image.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 596 and 690-697 for gray level transforation for a displayed image.
358, Facsimile and Static Presentation Processing, subclasses 3.01 through 3.23 for gray level processing in facsimile environment.

170 With pattern* recognition* or classification:
This subclass is indented under subclass 168. Subject matter wherein the histograms of unknown input pattern*s are compared to histograms of known pattern*s in order to determine the identity of the unknown pattern*.

171 For segmenting an image:
This subclass is indented under subclass 168. Subject matter where the histogram is processed in order to separate distinct regions in an image including distinguishing text and s:graphics areas and isolating lines and characters.

SEE OR SEARCH THIS CLASS, SUBCLASS:
164, for image segmentation based on color features.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclass 453 for image portion selection in facsimile environment.

172 For setting a threshold:
This subclass is indented under subclass 168. Subject matter where the histogram is analyzed in order to set one or multiple thresholds including methods based on locating histogram peaks and valleys.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclass 466 for variable thresholding techniques.

173 IMAGE SEGMENTATION:
This subclass is indented under the class definition. Subject matter wherein operations are carried out on an image so that certain meaningful regions of pattern*s of interest, as defined by an observer, are distinguishable from other regions or pattern*s.

(1) Note. Excluded from this subclass are segmenting operations performed on a single character for the purpose of decomposing the character into simpler features. This sort of character decomposition is classifiable herein below in the appropriate subclass indented under 'Feature Extraction' or 'Image Transformation'.

SEE OR SEARCH THIS CLASS, SUBCLASS:
164, for segmentation based on color.
171, for segmentation based on histogram.

174 Using projections (i.e., shadow or profile of characters):
This subclass is indented under subclass 173. Subject matter wherein a profile, indicating a sum or count of image elements along one dimension of the image, or a shadow, indicating the existence of an image element along one direction, is used to isolate identifiable regions.

175 Separating document regions using preprinted guides or markings:
This subclass is indented under subclass 173. Subject matter wherein machine-printed marks (such as control marks, rectangular frames, boundary lines, or identification codes) or hand-printed marks on an original document are used to identify distinguishable regions of interest.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclass 453 for image portion selection in the facsimile environment.

176 Distinguishing text from other regions:
This subclass is indented under subclass 173. Subject matter including means or process for identifying regions of text from other regions on a document.

(1) Note. Included herein are systems performing dilation/erosion or measuring gradients, variance, texture, and run-lengths.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclass 462 for text and image detection in the facsimile environment.

177 Segmenting individual characters or words:
This subclass is indented under subclass 173. Subject matter wherein individual characters and words are isolated by determining the position of the characters or words, often including determining the coordinates of a bounding box circumscribing the character or word.

178 Separating touching or overlapping characters:
This subclass is indented under subclass 177. Subject matter wherein separating characters that are run together includes processes such as dekerning, predicting separation lines, and comparing possible segmented objects to library objects.

179 Segmenting hand-printed characters:
This subclass is indented under subclass 177. Subject matter wherein the characters to be isolated are handwritten.

180 Region labelling (e.g., page description language):
This subclass is indented under subclass 173. Subject matter which includes assigning new or merging existing object labels to derive a set of connected components in the image or establishing relationships between regions on a page and storing the relationship.

181 PATTERN* RECOGNITION*:
This subclass is indented under the class definition. Subject matter wherein the image analyzing system possesses a further capability of identifying discrete pattern*s (such as alphanumeric characters) viewed within a scene or image; or of assigning pattern*s to appropriate categories as determined by resident categorization rules.

182 Limited to specially coded, human-readable characters:
This subclass is indented under subclass 181. Subject matter wherein the pattern* recognition* unit is designed specifically to read a special alphabet of highly stylized letters or numbers that have incorporated into their form a machine-readable code.

(1) Note. This subclass does not include recognition of coded pattern*s such as the Universal Product Code (UPC), which is designed to be machine-readable only and which bears no resemblance to any human-readable alphabet.

SEE OR SEARCH THIS CLASS, SUBCLASS:
137, for the E-13B font of machine- and human-readable characters.

SEE OR SEARCH CLASS:
235, Registers, subclasses 435+ for the reading of a code which is not an alphanumeric.

183 Characters formed entirely of parallel bars (e.g., CMC-7):
This subclass is indented under subclass 182. Subject matter wherein the machine-readable, human language symbols are constructed entirely of spaced-apart, substantially parallel bars, lines, or strokes.

SEE OR SEARCH CLASS:
235, Registers, subclasses 462.01+ for bar code readers which do not include reading an alphanumeric.

184 With separate timing or alignment marks:
This subclass is indented under subclass 182. Subject matter further requiring that machine-readable indicia are used for alignment or timing purposes during scanning.

185 Ideos:graphic characters (e.g., Japanese or Chinese):
This subclass is indented under subclass 181. Subject matter wherein the pattern*s to be recognized comprise ideographic or pictos:graphic symbols such as, for example, kanji (Chinese characters), kana (Japanese phonetic alphabets), or hangul (Korean characters).

186 Unconstrained handwriting (e.g., cursive):
This subclass is indented under subclass 181. Subject matter wherein the pattern*s to be recognized comprise handwritten characters which do not conform to a particular form or style, such as continuous cursive script.

187 On-line recognition of handwritten characters:
This subclass is indented under subclass 181. Subject matter further requiring that: (a) a signal be produced as a character or symbol is being formed by hand, (b) the signal be suitable for processing by a pattern* recognition* device, and (c) the pattern* recognition* device receives the signal as the character or symbol is being formed.

188 Writing on ordinary surface (i.e., electronics are in pen):
This subclass is indented under subclass 187. Subject matter wherein the recognition system utilizes a pen which includes means to output a signal indicative of the motion, direction of travel, pressure, speed, or acceleration, for example, of the pen.

189 With a display:
This subclass is indented under subclass 187. Subject matter wherein the recognition unit includes a means for displaying inputted characters, results of recognition, or information relevant to processing.

190 Feature extraction:
This subclass is indented under subclass 181. Subject matter which includes the process of selecting and measuring pieces of information, such as size, shape, texture, or position, to be used in recognizing a pattern*, structure, or object.

(1) Note. For the purpose of this subclass, 'feature' is a synonym for characteristic measurement, component, descriptor, attribute, pattern* primitive, and any other term of art referring to the information derived from a pattern* and utilized in pattern* recognition*.

(2) Note. The aim of feature extraction is to reduce the amount of raw pattern* data while finding a set of attributes for which the different classes of pattern*s separate.

191 Multispectral features (e.g., frequency, phase):
This subclass is indented under subclass 190. Subject matter wherein the frequency or phase of an electromagnetic spectrum of the pattern* is used to recognize the pattern*.

SEE OR SEARCH CLASS:
235, Registers, subclasses 454+ for optical coded card readers.

192 Feature counting:
This subclass is indented under subclass 190. Subject matter in which characteristics are extracted from a pattern* by any of the follow-

ing methods: (a) Counting lines or points of intersection between the pattern* and either a generally two-dimensional raster or any array of scanning elements to derive count values that may be used either alone or in combination with other feature data to identify the pattern*; (b) computing, from a digital image of the pattern*, the relative frequency of occurrence of specific pattern*s in the image; or (c) counting any other property of the pattern*s to be recognized in order to facilitate recognition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

168+, for determining and using a histogram to process or recognize a pattern* or image.

193 Counting intersections of scanning lines with pattern*:

This subclass is indented under subclass 192. Subject matter wherein the distinguishing features counted are the points or locations at which scanning lines intersect portions of a pattern*.

194 Counting individual pixel*s or pixel* pattern*s:

This subclass is indented under subclass 192. Subject matter wherein the distinguishing features counted are pixel*s; for example, the total number of pixel*s, the number of pixel*s in an area or window, pattern*s of pixel*, etc.

195 Local or regional features:

This subclass is indented under subclass 190. Subject matter which includes analyzing the content of partial areas and elementary regions of a pattern* to produce what are, in essence, simpler subpattern*s or component parts of the original pattern*.

196 Slice codes:

This subclass is indented under subclass 195. Subject matter wherein the pattern* to be recognized is intersected by one or more scan lines, and each scan line is individually encoded according to the particular configuration of pattern* and background elements sampled along the line.

(1) Note. The scan lines may be uniform, as in a television raster, or they may be distributed over the pattern*. The scan lines may be straight or curved.

197 Directional codes and vectors (e.g., Freeman chains, compasslike codes):

This subclass is indented under subclass 195. Subject matter wherein the outline of a pattern* is encoded as a connected sequence or chain of feature signals representing headings or points of the compass.

198 Extracted from alphanumeric characters:

This subclass is indented under subclass 197. Subject matter wherein the directional features or vectors are extracted from letters, numerals, or other human language symbols.

199 Pattern* boundary and edge measurements:

This subclass is indented under subclass 195. Subject matter wherein local features are extracted specifically in areas of transition between the pattern* and the background, thereby producing so-called transition, edge, or boundary signals.

(1) Note. To be classified herein, the measurements of boundaries and edges should be for the purpose of recognition of the pattern*.

SEE OR SEARCH THIS CLASS, SUBCLASS:

143, for data compression using boundaries and edges.

166+, for the enhancement of boundaries and edges.

200 Measurements made on alphanumeric characters:

This subclass is indented under subclass 199. Subject matter wherein the boundary or edge measurements are made on letters, numerals, or other human language symbols.

201 Point features (e.g., spatial coordinate descriptors):

This subclass is indented under subclass 195. Subject matter including any of the following: an image is sampled at only a few key locations to determine whether essential points in a pattern* are present at those locations; every measurement on the image results in a set of values representing spatial coordinates only; or

each of the features sought within a pattern* can be defined by a specific point.

(1) Note. Examples of such features are scan intercepts, line endings, and the intersection of lines.

202 Linear stroke analysis (e.g., limited to straight lines):
This subclass is indented under subclass 195. Subject matter wherein the only local features ever measured for recognition purposes are the straight-line strokes in a pattern*.

(1) Note. Horizontal, vertical, and oblique lines are some examples of straight-line strokes used in forming certain alphanumeric characters.

203 Shape and form analysis:
This subclass is indented under subclass 195. Subject matter wherein the local features extracted for recognition processing include empirically derived character components (i.e., curves, bays, loops, convex arcs, etc.), geometrical configurations (i.e., rectangles, circles, triangles, parabolas, etc.), or fundamental space measurements (i.e., distance, area, circumference, ratio of perimeter to area, etc.).

204 Topological properties (e.g., number of holes in a pattern*, connectivity, etc.):
This subclass is indented under subclass 203. Subject matter in which the features do not depend on measurements of dimensions or areas but are concerned instead with numbers or relationships of the different geometrical units (vertices, edges, faces, holes) involved.

205 Local neighborhood operations (e.g., 3x3 kernel, window, or matrix operator):
This subclass is indented under subclass 195. Subject matter in which the image under analysis, together with any pattern* therein, is divided into a plurality of generally two-dimensional neighborhoods (also known as windows, sections, or regions), and a computation is executed on each neighborhood based on a local computational algorithm or on a set of mapping operators which transform various qualitative geometric properties of the image into quantitative values.

(1) Note. To be classified herein, the neighborhood operation is for use in the recognition of a pattern*. If a neighborhood operation is used for the transformation of an image or to perform a morphological operation, proper classification is in this class, subclass 209.

206 Global features (e.g., measurements on image as a whole, such as area, projections, etc.):
This subclass is indented under subclass 190. Subject matter wherein the features extracted for recognition purposes are not the component parts of what is essentially a more complex pattern*, but rather are measurements characterizing the entire pattern* as a single entity.

207 Waveform analysis:
This subclass is indented under subclass 190. Subject matter wherein the pattern* to be recognized is first converted into an equivalent electrical analog signal, and this signal is then analyzed according to waveform analysis techniques in order to obtain useful measurements for recognition processing.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclass 441 for display of waveform images.

208 With a tapped delay line:
This subclass is indented under subclass 207. Subject matter wherein the waveform analyzing system utilizes a delay line with tapped outputs for detecting the value of a waveform at various points along the waveform, thereby allowing sampling of the waveform at time-spaced intervals.

209 Template matching (e.g., specific devices that determine the best match):
This subclass is indented under subclass 181. Subject matter wherein a pattern* is detected directly by looking for a match between the input image and a representation of the pattern*, traditionally a two-dimensional template or mask.

210 Spatial filtering (e.g., holography):
This subclass is indented under subclass 209. Subject matter in which an optical image of each pattern* to be recognized is transformed into a light amplitude distribution that is proportional to the two-dimensional Fourier transform of the pattern* image, and a spatial filter located in the transform plane modifies selected Fourier components of the resulting Fourier spectrum.

SEE OR SEARCH THIS CLASS, SUBCLASS:
280, for nonholographic Fourier transformations.

SEE OR SEARCH CLASS:
235, Registers, subclass 457 for holographic encoded records.
250, Radiant Energy, subclass 550 for interference pattern* analysis limited to prephotocell systems.

211 With electrically controlled light modulator or filter:
This subclass is indented under subclass 210. Subject matter wherein the spatial filtering unit comprises an electrically, or electronically controllable light modulator to impart an amplitude or phase modulation onto light passing through or reflected by the modulator.

SEE OR SEARCH CLASS:
359, Optics: Systems (Including Communication) and Elements, subclasses 237+ for optical modulators.

212 Nonholographic optical mask or transparency:
This subclass is indented under subclass 209. Subject matter wherein the optically formed image of each pattern* to be identified is compared to a set of optically stored prototypes, holograms not included.

213 Using both positive and negative masks or transparencies:
This subclass is indented under subclass 212. Subject matter wherein pattern* matching is performed using optically stored prototypes which represent both positive and negative versions of the pattern*s to be recognized.

214 With a display:
This subclass is indented under subclass 212. Subject matter wherein the recognition system includes means for displaying inputted pattern*s or for displaying the results of the matching.

215 Using dynamic programming or elastic templates (e.g., warping):
This subclass is indented under subclass 209. Subject matter wherein an image signal is deformed to optimally match another image signal for comparison in time or space, such as a template being geometrically distorted to achieve geometric conformity with another template.

216 At multiple image orientations or positions:
This subclass is indented under subclass 209. Subject matter wherein the matching of pattern*s is performed as the pattern*s are translated or rotated with respect to each other.

(1) Note. Also included herein is a plurality of stored templates which are positioned or oriented with respect to one another and compared to the input to determine the correct match.

217 Electronic template:
This subclass is indented under subclass 209. Subject matter wherein the recognition system, having converted an input pattern* into corresponding electrical signals, looks for a match between those signals and any one of a set of pattern* standards that are implemented electronically.

218 Comparator:
This subclass is indented under subclass 217. Subject matter wherein standards, held in a storage unit of the pattern* recognition* system and representing known pattern*s, are compared to an as-yet-unrecognized input pattern* in a manner such that a signal is developed reflecting the similarity between the standards as stored and the input pattern*.

(1) Note. Details of a specific comparison device must be claimed for original classification herein.

219 Determining both similarities and differences:
This subclass is indented under subclass 218. Subject matter wherein both the matched and mismatched portions of pattern*s during a comparison, are utilized for recognition.

220 Calculating weighted similarity or difference (e.g., don't-care areas):
This subclass is indented under subclass 218. Subject matter wherein certain areas or features that are more important than others are assigned a greater weight or value so that their correspondence with an input pattern* yields a larger output match value; this subclass l so includes using reference pattern*s that have areas that can be of any value and still produce a match, such as don't-care areas.

221 Counting difference pixel*s:
This subclass is indented under subclass 218. Subject matter wherein pixel*s of a pattern* which do not match another pattern* are used to determine the degree of correspondence between the pattern*s.

222 Using an Exclusive-OR gate:
This subclass is indented under subclass 221. Subject matter wherein means are included for performing an Exclusive OR function, to indicate similarities or differences between pattern*s.

223 Resistor matrix:
This subclass is indented under subclass 217. Subject matter wherein various configurations of resistors form electronic masks representing pattern* standards or criteria, and the resistors combine elements or groups of elements of the pattern* to be identified and develop a match voltage or current signal.

224 Classification:
This subclass is indented under subclass 181. Subject matter including a specific mechanism for assigning the pattern* to one of several possible pattern* classes (categories) based on measurements of intraclass similarity or interclass differences.

SEE OR SEARCH CLASS:
707, Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 722 through 735 for post processing of search results including ranking search results; and, subclasses 736 through 757 for preparing data for information retrieval including clustering, generating an index, ranking, scoring and weighting records.

225 Cluster analysis:
This subclass is indented under subclass 224. Subject matter wherein pattern*s are classified according to clusters or groups of points or vectors indicative of features in a multidimensional feature space.

(1) Note. While 'feature extraction' is a process of mapping image points into vectors in a multidimensional feature space, the process of detecting clusters of vectors in that space and separating the clusters is a task of 'classification'.

226 Sequential decision process (e.g., decision tree structure):
This subclass is indented under subclass 224. Subject matter wherein the classification of a pattern* proceeds sequentially through logical stages, each successive stage reducing typically the number of likely choices of pattern* classes, culminating finally in either a definite class assignment for the pattern* or a reject signal.

227 With a multilevel classifier:
This subclass is indented under subclass 226. Subject matter wherein a different classification principle is utilized at each stage or level.

(1) Note. For example, given a two-level classifier, the first level might employ a dictionary look-up method, and if no decision is reached at the first level (i.e., no match), the second level is then activated employing a nearest neighborhood method.

228 Statistical decision process:
This subclass is indented under subclass 224. Subject matter in which statistics or the laws of probability play a significant role in determining the proper classification of a pattern*.

229 Context analysis or word recognition (e.g., character string):
This subclass is indented under subclass 181. Subject matter wherein the recognition system examines the environment of a pattern* for clues as to the pattern*'s identity.

(1) Note. For example, when the pattern* is an alphanumeric character, advantage is taken of the fact that a character is normally embedded in a word, and the word in a message.

SEE OR SEARCH CLASS:
715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, appropriate subclasses for text searching.

230 Trigrams or digrams:
This subclass is indented under subclass 229. Subject matter wherein the recognition system utilizes the characteristics of strings of two or three characters.

231 Checking spelling for recognition:
This subclass is indented under subclass 229. Subject matter wherein recognition is verified based on whether a recognized character string is a valid character combination (i.e., it is a known or acceptable word).

SEE OR SEARCH CLASS:
715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclass 257 for checking the spelling of a text.

232 IMAGE COMPRESSION OR CODING:
This subclass is indented under the class definition. Subject matter in which the quantity of data used to represent an image is reduced to minimize storage or transmission requirements.

(1) Note. In subclasses 133 through 154, the employed systems conventionally include both compression and decompression means or processes.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclass 555 for image data compression in display device.
348, Television, subclasses 384.1 through 440.1 for bandwidth compression systems for analog television, where the television is an integral part of the system.
358, Facsimile and Static Presentation Processing, subclasses 426.01 through 426.16 for time or band width compression in facsimile.
375, Pulse or Digital Communications, subclass 122 for bandwidth reduction or expansion in communications systems, particularly subclasses 240.01-240.29 for digital television.
708, Electrical Computers: Arithmetic Processing and Calculating, subclass 203 for compression/decompression in digital computers.

233 Including details of decompression:
This subclass is indented under subclass 232. Subject matter which further includes apparatus, elements or operations for decompressing or decoding the compressed coded image data so as to restore the original image.

(1) Note. The restored image may include minor differences or noise due to compression losses, but should be substantially similar to the original image prior to compression.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclass 203 for decompression in digital computers.

234 Parallel coding architecture:
This subclass is indented under subclass 232. Subject matter which includes two or more processing paths in parallel so as to compress

or code a plurality of pixel*s or pixel* groups at substantially the same time.

235 Substantial processing of image in compressed form:

This subclass is indented under subclass 232. Subject matter in which compressed image data is operated upon or manipulated without being expanded or decompressed.

(1) Note. Processing can include modifications to the appearance of the image in decompressed form or the determination of decompressed image characteristics, without actually decompressing the image.

236 Interframe coding (e.g., difference or motion detection):

This subclass is indented under subclass 232. Subject matter including means or processes for encoding a plurality of image frames based on at least one relationship between the data of two or more of the image frames.

(1) Note. Excluded from this subclass are sequences of images in which each frame is coded separately, which are classified according to the type of coding performed.

SEE OR SEARCH CLASS:

348, Television, subclasses 400 through 421 for interframe coding of television signals, where the television is an integral part of the system.

237 Gray level to binary coding:

This subclass is indented under subclass 232. Subject matter in which multi-bit pixel* values representing a plurality of image intensity values are compressed or coded into single bit pixel* values representing one of two image intensities.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclass 56 for multilevel to binary coding in digital converters.

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 596 and 690-697 for generation of grey scale of an image.

358, Facsimile and Static Presentation Processing, subclasses 3.06 through 3.2 for gray level to binary coding in facsimile .

238 Predictive coding:

This subclass is indented under subclass 232. Subject matter wherein the value or characteristic of at least one future pixel* is predicted based upon the value or characteristic of at least one earlier or neighboring pixel* and the image data is coded using or based upon the prediction.

SEE OR SEARCH CLASS:

348, Television, subclasses 394 and 409 through 419 for predictive encoding of television signals, where the television is an integral part of the system.

358, Facsimile and Static Presentation Processing, subclasses 426.02 through 426.11 for predictive coding in facsimile.

239 Adaptive coding (i.e., changes based upon history, activity, busyness, etc.):

This subclass is indented under subclass 232. Subject matter including a means or process for selecting one of a plurality of coding routines, or modifying a single coding routine based upon the characteristics of either the original image or a coded image.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclass 51 for adaptive coding in digital converters.

348, Television, subclasses 404 through 407 and 419 for adaptive coding in television, where the television is an integral part of the system.

358, Facsimile and Static Presentation Processing, subclasses 426.02 through 426.11 for adaptive coding in facsimile.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, And Audio Compression/ Decompression, subclass 270.1 for speech assisted network.

240 Pyramid, hierarchy or tree structure:
This subclass is indented under subclass 232. Subject matter wherein the compression of the image data proceeds sequentially through logical stages, each successive stage reducing the amount of data required to represent the image.

SEE OR SEARCH THIS CLASS, SUBCLASS:
226, for sequential decision process in a tree structure.

SEE OR SEARCH CLASS:
341, Coded Data Generation or Conversion, subclass 79 for tree structures in digital converters.

241 Polygonal approximation:
This subclass is indented under subclass 232. Subject matter in which objects in an image are coded by approximating the shape of each object using polygons.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, appropriate subclasses for anti-aliasing and particularly subclasses 136 and 137 for anti-aliasing techniques in graphic display sys.

242 Contour or chain coding (e.g., Bezier):
This subclass is indented under subclass 232. Subject matter in which lines or edges in an image are approximated using curves, line segments or using mathematical approximations.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 17, 23 through 26, 441, and 467+ for computer generation or presentation of shapes or character fonts for display using similar approximations.

243 Shape, icon or feature-based compression:
This subclass is indented under subclass 232. Subject matter including means or processes for assigning codes to shapes, symbols and other features detected in the image.

244 Lossless compression:
This subclass is indented under subclass 232. Subject matter in which no image data is lost during compression and decompression.

(1) Note. The decompressed image is identical to the original image prior to compression.

245 Run length coding:
This subclass is indented under subclass 244. Subject matter in which the length of each run in the image (i.e., the number of adjacent pixel*s in a row having the same value) is used to encode the image.

SEE OR SEARCH CLASS:
341, Coded Data Generation or Conversion, subclass 59 for run length coding in digital converters.
358, Facsimile and Static Presentation Processing, subclass 426.13 for run length coding in facsimile.

246 Huffman or variable length coding:
This subclass is indented under subclass 244. Subject matter in which image data are encoded using a variable length code, such that the most common image data have the shortest codes.

(1) Note. This coding requires a statistical analysis of the frequency of occurrence for different image data. This analysis can be part of the compression routine, or can be predetermined based upon the type of data likely to be compressed.

SEE OR SEARCH CLASS:
341, Coded Data Generation or Conversion, subclasses 65 and 67 for Huffman coding and variable length coding, respectively, in digital converters.
358, Facsimile and Static Presentation Processing, subclasses 426.01 through 426.16 for Huffman coding in facsimile.

247 Arithmetic coding:
This subclass is indented under subclass 244. Subject matter in which the image data, consisting of a sequence of source symbols, is assigned a single arithmetic code word that

defines an interval of real numbers between 0 and 1.

248 Transform coding:
This subclass is indented under subclass 232. Subject matter in which the image data undergoes a mathematical transformation such as a Fourier or Laplace transform, and the transform coefficients are used to encode the image.

SEE OR SEARCH CLASS:
348, Television, subclasses 395 and 403 through 408 for transform coding of television signals, where the television is an integral part of the system.

249 Fractal:
This subclass is indented under subclass 248. Subject matter in which the transform coding of an image is achieved by translating the image into fractal equations, a fractal being a complex pattern* that recurs at various sizes in the image.

(1) Note. For example, the image may be decomposed into overlapping blocks and, by use of a fractal formula, the shape, size and color of each block is transformed until it matches another block. The compressed image file will then contain just the numbers needed to specify the mathematical relations between the blocks.

250 Discrete cosine or sine transform:
This subclass is indented under subclass 248. Subject matter in which image data is partitioned into blocks and transformed using the discrete cosine or the discrete sine transform.

SEE OR SEARCH CLASS:
348, Television, subclasses 395 and 403 through 408 for transform coding of television signals, where the television is an integral part of the system.
358, Facsimile and Static Presentation Processing, subclasses 426.01 through 426.16 for discrete cosine transform of images in a facsimile environment.

251 Quantization:
This subclass is indented under subclass 232. Subject matter in which a broad range of input image values are mapped to a limited number of output image values.

(1) Note. The quantization of an image possesses two components: space and amplitude. Spatial quantization, or sampling, divides the original image into grid cells (pels or pixel*s). Amplitude or gray-level quantization then assigns to each grid cell an integer value corresponding to the brightness level within the cell.

(2) Note. This subclass does not include amplitude or gray-level quantization in which a variable threshold, gain or slice level allows the quantization to adapt to varying input image values.

SEE OR SEARCH THIS CLASS, SUBCLASS:
270, through 273, for adaptive quantization based on a variable threshold, gain or slice level.

SEE OR SEARCH CLASS:
348, Television, subclass 405 for adaptive quantization of television signals, where the television is an integral part of the system.

252 Error diffusion or dispersion:
This subclass is indented under subclass 251. Subject matter in which any error in a given output image value that results from quantization is distributed among surrounding values so as to reduce the losses that accumulated errors would have on the output image as a whole.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclasses 465 and 466 for error diffusion in facsimile.

253 Vector quantization:
This subclass is indented under subclass 251. Subject matter in which a limited number of image values are stored in a codebook or dictionary and only those image values are outputted that are closest to the input image values.

SEE OR SEARCH CLASS:

348, Television, subclasses 414, 417, 418, and 422 for vector quantization as applied to television signals.

254 IMAGE ENHANCEMENT OR RESTORATION:

This subclass is indented under the class definition. Subject matter directed to the improvement of pictorial or image information so that the result is more suitable than the original information for human or machine interpretation.

SEE OR SEARCH CLASS:

348, Television, subclasses 606 through 624 for the reduction of noise or undesired signals in television.

358, Facsimile and Static Presentation Processing, subclasses 1.9 through 3.31 , 447, 461, and 463 for various signal enhancing and noise reduction techniques used in facsimile systems.

255 Focus measuring or adjustment (e.g., deblurring):

This subclass is indented under subclass 254. Subject matter wherein the focal length between an image sensor and an object being sensed is either measured or adjusted in order to correct distortions such as blurring.

(1) Note. The measurement or adjustment may be done physically through the optical system or it may be done electronically through a series of image processing operations performed on the signals from the image sensor.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 201.2 through 201.8 for automatic focus control of photocell circuits and apparatus.

348, Television, subclasses 345 through 357 for focus control in television.

355, Photocopying, subclasses 55 through 63 for focus control in photocopiers.

396, Photography, subclasses 89+ for automatic camera focusing in photography.

256 Object boundary expansion or contraction:

This subclass is indented under subclass 254. Subject matter in which pixel*s are added or deleted from the boundaries of objects in an image.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 469.1 and 470 for generation of an outline or an edge of a character for display presentation.

257 Dilation or erosion (e.g., opening or closing):

This subclass is indented under subclass 256. Subject matter in which pixel*s are added or deleted by a specific morphological operation that passes a structuring element over the entire image.

(1) Note. The structuring element may be implemented by a simple logic circuit such as an AND gate for erosion, which contracts the objects in an image, and an OR gate for dilation, which expands the objects. The morphological operation known as 'opening', which consists simply of an erosion followed by a dilation, generally smooths the contours of the objects, breaks narrow isthmuses, and eliminates thin protrusions. The morphological operation known as 'closing', which consists of a dilation followed by an erosion, tends to smooth sections of contours but, as opposed to opening, it generally fuses narrow breaks and long thin gulfs, eliminates small holes, and fills gaps in the contours.

258 Line thinning or thickening:

This subclass is indented under subclass 256. Subject matter in which the thickness of any object in the image is either reduced or broadened to some uniform standard.

(1) Note. Thinning algorithms that iteratively delete edge points of a region are generally subject to the constraints that deletion of these points (a) does not remove end points, (b) does not break connectedness, and (c) does not cause excessive erosion of the region.

259 Skeletonizing:
This subclass is indented under subclass 258. Subject matter wherein the objects which, for example, may be the strokes or lines forming an alpha-numeric character, are reduced to a one pixel* width while their connectedness is maintained.

260 Image filter:
This subclass is indented under subclass 254. Subject matter directed to any electrical apparatus or image processing operations that enhance images by suppressing or minimizing certain spatial frequencies.

(1) Note. Optical filters are not included in this subclass. For such excluded subject matter see class 359, Optics: Systems and Elements, subclasses 885 through 892.

SEE OR SEARCH THIS CLASS, SUBCLASS:
210, for holographic spatial filters.

SEE OR SEARCH CLASS:
333, Wave Transmission Lines and Networks, subclasses 165 through 212 for time or frequency domain filters.
359, Optics: Systems and Elements, subclasses 885 through 892 for optical filters. (see (1) Note, above).
455, Telecommunications, subclasses 213, 286, 307, and 339 for various electrical filters used in telecommunications.
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 300+ for digital filters.

261 Adaptive filter:
This subclass is indented under subclass 260. Subject matter wherein parameters of the filter change in accordance with the input image data.

SEE OR SEARCH CLASS:
348, Television, subclass 610 for adaptive noise filters used in television.

262 Median filter:
This subclass is indented under subclass 260. Subject matter wherein a gray level of each pixel* in an image is replaced by the median of the gray levels in a neighborhood of that pixel*.

(1) Note. The median filter is often used as an alternative to neighborhood averaging filters which tend to blur the image while smoothing it. The median filter, on the other hand, preserves edge sharpness during smoothing.

263 Highpass filter (i.e., for sharpening or enhancing details):
This subclass is indented under subclass 260. Subject matter wherein low-frequency components of the image are attenuated or eliminated.

(1) Note. Generally, highpass filtering reduces overall contrast and average intensity as it sharpens edges and other sharp details.

(2) Note. Examples of highpass filters are the Laplacian, Sobel, Roberts and Prewitt operators.

SEE OR SEARCH CLASS:
348, Television, subclass 606 and 625 through 631 for edge sharpening in television.

264 Lowpass filter (i.e., for blurring or smoothing):
This subclass is indented under subclass 260. Subject matter wherein high-frequency components of the image are attenuated or eliminated.

(1) Note. Generally, lowpass filtering blurs edges as it removes small details from the image, reduces noise and bridges small gaps in lines or curves.

(2) Note. An example of a lowpass filter is the Gaussian filter.

SEE OR SEARCH CLASS:
348, Television, subclass 597 for the generation of soft edges in television signals.

265 Recursive filter:
This subclass is indented under subclass 260. Subject matter in which the filter is repeatedly applied to the image until a specified condition is met.

266 Edge or contour enhancement:
This subclass is indented under subclass 254. Subject matter wherein processing is done to visually enhance the outlines of individual characters or objects of interest in the image by emphasizing high frequency, transitional image data while deemphasizing or removing low-frequency, homogeneous background image data.

SEE OR SEARCH THIS CLASS, SUBCLASS:
199, through 200, for edge or contour enhancement designed to facilitate the recognition of pattern*s.
263, for edge or contour enhancing filters.

267 Minimize discontinuities in dot-matrix image data (i.e., connecting or merging the dots):
This subclass is indented under subclass 266. Subject matter including specific processing to reduce gaps or breaks in the borders of image objects such as by 'filling-in' pixel*s which are closer than a predetermined distance to the edge of the object.

(1) Note. A specific application of this procedure is the merging or blending of the dots in dot-matrix lettering in order to create solid black lettering.

268 Minimize discontinuities at boundaries of image blocks (i.e., reducing blocking effects or effects of wrap-around):
This subclass is indented under subclass 266. Subject matter including means or processes to smooth undesirable transitions at the boundaries separating discrete pixel* blocks after the blocks have undergone processing such as compression or decompression, or to process pixel*s at the edges of an image when the process requires neighboring or context pixel*s.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclasses 426.01 through 426.16 for reduction of blocking effects in facsimile.

269 Minimize jaggedness in edges (e.g., anti-aliasing):
This subclass is indented under subclass 266. Subject matter which includes processing to reduce the 'stair-step' effect at curved edges of characters or other objects to accurately represent the high frequency detail of the original image.

(1) Note. Anti-aliasing at time of image generation in computer graphics system is classified elsewhere.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 611 through 616 for anti-aliasing techniques in display systems.

270 Variable threshold, gain or slice level:
This subclass is indented under subclass 254. Subject matter wherein quantization of an input analog or gray scale image to produce an output gray scale image or bit map utilizes a threshold, gain or slice level which self-adjusts according to characteristics such as the contrast or brightness of the image or portion of the image being processed.

(1) Note. For the purpose of this subclass, 'quantization' refers strictly to amplitude quantization or digitization (i.e. assigning to each pixel* an integer value corresponding to a brightness level).

SEE OR SEARCH THIS CLASS, SUBCLASS:
251, through 253, for spatial quantization or sampling.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 350+ for solid-state circuits or systems that employ variable thresholds.

358, Facsimile and Static Presentation Processing, subclass 466 for variable thresholding in facsimile systems.

271 Based on the results of a count:
This subclass is indented under subclass 270. Subject matter wherein the threshold or quantization value derived for a particular element in the image depends upon the relative frequency of occurrence of each brightness level in a region around the image element or the number of 'black' image elements at a particular location over a number of images of the same object.

SEE OR SEARCH THIS CLASS, SUBCLASS:
172, for setting a threshold using a histogram.

272 Based on a local average, mean or median:
This subclass is indented under subclass 270. Subject matter wherein the threshold or quantization value of a particular image element depends on an average, mean or median measurement of neighboring elements, with a similar average, mean or median operation being applied to each element of the whole image.

273 Based on peak levels:
This subclass is indented under subclass 270. Subject matter wherein the threshold or quantization value of a particular image element is set according to the highest and/or lowest amplitude of some measured signal, such as the grey levels of neighboring image elements or a white or black signal produced by scanning a reference plate prior to scanning the image.

274 Intensity, brightness, contrast or shading correction:
This subclass is indented under subclass 254. Subject matter which involves correcting pixel* values for variations in ambient lighting or the optimum brightness, intensity or contrast range of an image to enhance desired image features.

(1) Note. Systems which use feedback from image processing in order to control the intensity of an illumination source are included herein.

(2) Note. Adjusting intensity or color according to light sources, surface characteristics and object orientation in a computer graphics/data presentation system is classified elsewhere.

SEE OR SEARCH CLASS:
250, Radiant Energy, subclass 205 for intensity control of light sources.
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 20, 63, 77, 581-618, 596-599, and 690-697, for correcting, adjusting, or controlling the intensity, brightness, or contrast for shading of an image for display presentation.
348, Television, subclasses 251 and 254 for shading and grey-level correction of television signals.
358, Facsimile and Static Presentation Processing, subclass 461 for shading correction in facsimile systems.

275 Artifact removal or suppression (e.g., distortion correction):
This subclass is indented under subclass 254. Subject matter directed to correcting undesirable image characteristics such as spatial distortion (i.e. subtracting difference data between frames to correct for blurring due to motion), sensor or optical system induced artifacts (i.e. geometric aberrations), process induced artifacts (i.e. 'worm' artifacts caused by error diffusion) or physical deterioration of a scanned object itself (i.e. dirt or dust on photos:graphic negatives).

276 IMAGE TRANSFORMATION OR PREPROCESSING:
This subclass is indented under the class definition. Subject matter directed either to transformation of a given representation of an image into another representation by some mathematically-derived transform or process; or to operations performed on an image representation, prior to any attempt at recognition, for the specific purpose of facilitating acquisition or subsequent recognition of imagery pattern*s.

(1) Note. Image sensors per se are excluded from this subclass.

277 Transforming each dimension separately:
This subclass is indented under subclass 276. Subject matter wherein a multidimensional transformation or process (such as a two-dimensional FFT) is performed using separate one-dimensional transforms or processes. In other words, the rows of an image array are transformed separately from the columns, the horizontal components are transformed separately from the vertical components, or each axis is transformed separately from the other axes.

278 Correlation:
This subclass is indented under subclass 276. Subject matter wherein a correlation operation is performed on image data.

(1) Note. For correlation specifically used for pattern* recognition*, subclasses 110+ take precedence.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 422+ for specific digital correlation hardware.

279 Convolution:
This subclass is indented under subclass 276. Subject matter wherein a convolution operation is performed on image data.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclass 615 for performing a convolution operation on an image data.
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 420+ for specific digital convolution hardware.

280 Fourier transform:
This subclass is indented under subclass 276. Subject matter wherein a Fourier transform is performed on image data.

SEE OR SEARCH THIS CLASS, SUBCLASS:
210, for systems that obtain a Fourier transform of an image optically.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 403+ for specific Fourier transform hardware.

281 Walsh, Hough or Hadamard transform:
This subclass is indented under subclass 276. Subject matter wherein a Walsh, Hough, or Hadamard transform is performed on image data.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 403+ for specific Fourier transform hardware.

282 Selecting a portion of an image:
This subclass is indented under subclass 276. Subject matter wherein transformation or preprocessing operations are performed on a limited subset of the total image data which has been designated using a scanning window or preliminary step which identifies specific regions of the image (i.e., only text portions).

SEE OR SEARCH THIS CLASS, SUBCLASS:
173+, for actually segmenting the image into regions.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 620 through 628 for clipping an image to a designated region for display presentation.
358, Facsimile and Static Presentation Processing, subclass 453 for image portion selection in a facsimile system.

283 Using a mask:
This subclass is indented under subclass 282. Subject matter wherein input image data is compared with a standard, such as coordinate data stored in a memory, so that certain image data may be removed or masked, allowing only the data in a desired area to be extracted for further processing.

284 Combining image portions (e.g., portions of oversized documents):
This subclass is indented under subclass 276. Subject matter wherein a final image is created by selectively combining, merging, or superimposing regions from multiple images (e.g. pasting a first image portion into a base image), or regions from the same image which had to be scanned, stored or processed in pieces.

(1) Note. Systems and methods for merg/ overlapping graphic objects including systems which display a computer generated change of appearance (e.g., selection of hairstyles or clothing is overlaid with a video image or a model) are classified elsewhere.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 629 through 641 for merging or overlapping diverse images or graphic objects for display presenta.
348, Television, subclasses 584 through 601 for combining video images from plural sources.

285 Mapping 2D image onto a 3D surface:
This subclass is indented under subclass 276. Subject matter wherein a two-dimensional image is projected onto a three-dimensional surface so as to give the illusion that the image has a third dimension.

(1) Note. Systems and methods wherein images are mapped from two dimensions onto a three-dimensional surface and there is also more than nominal computer graphics processing of the trans image data, appropriate classification is elsewhere.

(2) Note. In order to be classified in this subclass the conversion of two-dimensional image to a three-dimensional surface should include substantial image analysis*.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 419 through 427 for mapping an image onto the surface of a three-dimensional object in a computer graphics environment.
348, Television, subclasses 578 and 580 for three-dimensional special effects in video images, where the television is an integral part of the system.

286 Measuring image properties (e.g., length, width, or area):
This subclass is indented under subclass 276. Subject matter encompassing the extraction of physical properties exhibited by imaged objects such as length, width, thickness, size, area, shape, and boundary points to aid in later processing.

(1) Note. For those features that are extracted from an image specifically for the purpose of recognizing pattern*s, subclasses 91+ take precedence.

SEE OR SEARCH CLASS:
356, Optics: Measuring and Testing, subclasses 600, 614, and 625 for the optical measurement of various properties of objects.
358, Facsimile and Static Presentation Processing, subclass 449 for the detection of document size in a facsimile system.
700, Data Processing: Generic Control Systems or Specific Applications, subclass 303 for a dimensional responsive control system.
702, Data Processing: Measuring, Calibrating, or Testing, subclasses 155+ for dimensional determination by data processing.

287 Detecting alignment marks:
This subclass is indented under subclass 286. Subject matter wherein the properties extracted from an image relate to reference marks, sometimes called fiducials, which are used to measure the image position or orientation and aid in image alignment.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclass 557 and 561 for the detection of the position of a coded record, web, strand, strip or sheet.

358, Facsimile and Static Presentation Processing, subclass 488 for the detection of the document position in a facsimile system.

288 Determining center of gravity or moment:

This subclass is indented under subclass 286. Subject matter wherein the properties extracted from an image relate to its center point or its various moments, such as the moment of inertia, center of gravity, center of mass, and so on.

289 Determining amount an image is rotated or skewed:

This subclass is indented under subclass 286. Subject matter wherein the properties extracted from an image relate to its inclination or skew angle measured with respect to a reference which may be, for example, a scanning direction or the physical orientation of a sensor array.

(1) Note. This subclass does not include the measurement of image orientation based on alignment marks or fiducials.

SEE OR SEARCH THIS CLASS, SUBCLASS:

287, for measurement of image orientation based on alignment marks or fiducials.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclasses 138+ for systems that measure the axial alignment or angle of various objects.

702, Data Processing: Measuring, Calibrating, or Testing, subclasses 150+ for orientation or position determination by data processing.

290 Where the image is a character, word, or text:

This subclass is indented under subclass 289. Subject matter wherein the measurement is undertaken to determine the amount of skew or angular orientation of a character, word, or text.

291 Determining the position of an object:

This subclass is indented under subclass 286. Subject matter wherein the properties extracted from an image result in a set of values representing spatial coordinates or features, such as document edges, and the position of an object relative to a reference.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclass 614 for systems that measure the displacement or position of various objects.

358, Facsimile and Static Presentation Processing, subclass 1.5 or position or velocity determined static presentation processing and subclass 488 for the detection of the document position in a facsim system.

292 Where the object is a character, word, or text:

This subclass is indented under subclass 291. Subject matter wherein the set of values relates specifically to the position of a character, word or text.

(1) Note. For example, the values may represent the left, right, upper and lower extremities of a printed character or word.

293 Changing the image coordinates:

This subclass is indented under subclass 276. Subject matter encompassing image coordinate transformations undertaken to correct geometric distortions or misregistration between the image and, for example, an image sensor.

(1) Note. Excluded from this subclass is any system which requires some special marking, grid, fiducial or coded indicia to register the image of a document or other object relative to the image sensor. For such excluded subject matter see this class, subclass 287.

SEE OR SEARCH THIS CLASS, SUBCLASS:

287, for detection of alignment marks for aligning the position or orientation of an image.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 619 through 689 for changing image coordinates of computer generated objects in a computer graphics system.

348, Television, subclass 580 for the geometric transformation of television signals.

708, Electrical Computers: Arithmetic Processing and Calculating, subclass 442 for specific coordinate conversion hardware.

294 Registering or aligning multiple images to one another:

This subclass is indented under subclass 293. Subject matter encompassing the registration or alignment between two or more images. The images, for example, may be from consecutive image frames or fields; or they may be of the same scene taken at different viewing angles or at different times; or they may consist of an original image and stored prototypes.

295 To position or translate an image:

This subclass is indented under subclass 293. Subject matter wherein a coordinate transformation is undertaken for the purpose of shifting the image (or a signal representation thereof) from one position in space to another position relative to a coordinate reference.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 648 and 672-688 for controlling image movement or translating an object for display presentation.

296 To rotate an image:

This subclass is indented under subclass 293. Subject matter wherein a coordinate transformation is undertaken for the purpose of turning the image (or a signal representation thereof) about an axis or center, or adjusting the image's orientation and skew.

(1) Note. This subclass includes transformations of a kind that rotate the sampling of an image about an axis while holding the image itself stationary. As an example, an image is sampled first along a sequence of vertical columns to obtain a two-dimensional representation of the image, and this representation is then sampled along a sequence of horizontal rows to obtain still another representation of the image.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 648 through 659 for rotation of an graphical image for display presen.

348, Television, subclass 583 for the rotation of video images in a television system.

297 Rotation of image is limited to 90, 180, or 270:

This subclass is indented under subclass 296. Subject matter wherein the coordinate transformation results in an image turned 90, 180, or 270 degrees relative to the original image.

298 To change the scale or size of an image:

This subclass is indented under subclass 293. Subject matter wherein a coordinate transformation is undertaken for the purpose of either reducing or enlarging the overall size of an image (or a signal representation thereof).

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 660 through 671 for scaling or controlling the size of an image or object for display presenta.

348, Television, subclasses 561, 581, 582 and 704 for the control of image size or magnification in a television system.

358, Facsimile and Static Presentation Processing, subclass 451 for the conversion of a document size in a facsimile system.

708, Electrical Computers: Arithmetic Processing and Calculating, subclass 208 for specific scaling hardware.

299 Raising or lowering the image resolution (e.g., sub pixel* accuracy):
This subclass is indented under subclass 298. Subject matter wherein the image scaling is achieved by altering the spatial resolution or density of dots, pixel*s or image elements used to represent the image in a quantized form. Such transformations may be utilized in a multiuse environment to achieve compatibility between input and output devices.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 698 through 699 for defining the resolution of an image to be displayed.

300 Interpolation:
This subclass is indented under subclass 299. Subject matter wherein the resolution of an image is increased by the addition of counterfeit pixel*s (or image elements) whose values are calculated (i.e., interpolated) based on real image pixel*s that are in the neighborhood of the counterfeit pixel*s to be added.

SEE OR SEARCH CLASS:
348, Television, subclasses 441+ for interpolation techniques used to convert the format of video signals.
358, Facsimile and Static Presentation Processing, subclasses 428 and 525 for interpolation in facsimile systems.
708, Electrical Computers: Arithmetic Processing and Calculating, subclass 290 for specific interpolation hardware.

301 Where the image is an alphanumeric character:
This subclass is indented under subclass 298. Subject matter wherein the image whose scale or size is changed is a letter, number or other language symbol.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 467 through 472.3 for the generation or modification of character fonts, in a data presentation or computer graphics generation system.

302 Multilayered image transformations:
This subclass is indented under subclass 276. Subject matter in which different portions of an image are transformed separately or the image as a whole is subjected to a set of image processing transformations.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 619 through 689 for transformation of an image or graphical object for generation of a computer graphic image.
700, Data Processing: Generic Control Systems or Specific Applications, subclass 2 for processing different portions of an image separately by utilizing plural processors.

303 Pipeline processing:
This subclass is indented under subclass 302. Subject matter wherein several layers of transformations are combined such that a first layer of transforms are applied to an initial representation of an image, a second layer of transforms is applied to the output of the first layer, and so on.

(1) Note. The sequence of transformations may be conducted either by a serial pipeline of image processing stages or by a single stage with feedback.

304 Parallel processing:
This subclass is indented under subclass 302. Subject matter wherein the transformations are applied simultaneously to the image.

SEE OR SEARCH CLASS:
700, Data Processing: Generic Control Systems or Specific Applications, subclasses 4 through 5 for parallel processing architecture in a generic control system.

305 Image storage or retrieval:
This subclass is indented under subclass 276. Subject matter wherein the image inputted to the image analyzing system is stored in, or

retrieved from, a large capacity storage medium such as an optical disk.

(1) Note. This subclass includes document management and image filing systems.

SEE OR SEARCH CLASS:
358, Facsimile and Static Presentation Processing, subclasses 403 and 404 for document memory management and retrieval.
707, Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 821 through 831 for file management.

306 Using identification indicia on document:
This subclass is indented under subclass 305. Subject matter wherein indicia, such as keywords, that appear on a document are used to file the document or to search the document data to be retrieved.

307 General purpose image processor:
This subclass is indented under subclass 276. Subject matter directed to an arrangement of processing elements that may be programmed or reconfigured to perform a variety of image processing operations.

308 Morphological operations (i.e., local neighborhood operations):
This subclass is indented under subclass 307. Subject matter wherein the processing is limited to local neighborhood operations performed on an image and implemented by convolving the image with an image of a structuring element, typically a 3x3 or 5x5 pixel* object, kernel or window.

309 EDITING, ERROR CHECKING OR CORRECTION (e.g., POST-RECOGNITION PROCESSING):
This subclass is indented under the class definition. Subject matter directed to any operation for testing the reliability and performance of an image analyzing system, uncovering or correcting errors, making editorial changes in images read by the system, or preparing the output of the system for further processing.

SEE OR SEARCH CLASS:
235, Registers, subclass 437 for error checking in coded record sensors.
358, Facsimile and Static Presentation Processing, subclasses 504 and 406 for measuring, testing and calibrating facsimile systems.
702, Data Processing: Measuring, Calibrating, or Testing, subclass 37 for flaw or defect detection in video imaging, and subclass 192 for noise removal or extraction in video/image signals.
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for performance monitoring and error checking in computer systems.
714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclasses for generic error checking systems.

310 Correcting alphanumeric recognition errors:
This subclass is indented under subclass 309. Subject matter directed to correcting textual data such as the letters, numbers and other characters that make up a text and that could not be recognized or that were misrecognized by a character recognition system.

311 Including operator interaction:
This subclass is indented under subclass 309. Subject matter wherein a human operator checks, corrects or edits the image data usually with the aid of a keyboard and a display.

SEE OR SEARCH CLASS:
345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 156 through 184 for the use of input devices for controlling the display of an image.
715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 700 through 866 for operator interfaces for controlling the display of an image.

312 IMAGE SENSING:
This subclass is indented under the class definition. Subject matter wherein an image sensor is specifically claimed for converting an image into signals that are readily usable in image analysis*.

(1) Note. Excluded from this subclass are image sensors disclosed or claimed specifically in environments other than image analysis*. For example, search the appropriate subclasses in Class 358 for facsimile scanners; Class 235 for coded record sensors; Class 250 for photocell sensors and sensing arrays; and Class 359 for purely optical scanning systems and elements.

313 Hand-held:

This subclass is indented under subclass 312. Subject matter wherein the sensor must be handled by a human operator to generate the necessary image signals.

SEE OR SEARCH CLASS:

178, Telegraphy, subclasses 18.01+ for telegraphy systems that sense writing.

235, Registers, subclasses 472.01+ for hand-held coded record sensors.

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 163 through 166 and 179 through 183 for hand-held input devices in display systems.

358, Facsimile and Static Presentation Processing, subclass 473 for hand-held readers in facsimile.

314 Sensing mechanism in stylus:

This subclass is indented under subclass 313. Subject matter wherein the image sensor, which may be an optical, electrical, magnetic, or piezoelectric device, is housed within a pen or stylus held by the human operator.

SEE OR SEARCH CLASS:

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 179 through 183 for the use of a pen or stylus as an input device in a display environment.

315 Sensing mechanism in platen:

This subclass is indented under subclass 313. Subject matter wherein the image sensor is mounted within, underneath or around the surface (often referred to as a platen) on which the image is formed.

SEE OR SEARCH CLASS:

178, Telegraphy, subclasses 18.01+ for the use of a digitized writing tablet.

345, Computer Graphics Processing and Selective Visual Display Systems, subclasses 173 through 178 for the use of touch panels in general.

316 Curve tracer:

This subclass is indented under subclass 312. Subject matter having means for causing the image sensor to follow the edge, contour or boundary of an image pattern* (such as an alphanumeric character) so that measurements may be made that are useful in analyzing or recognizing the pattern*.

(1) Note. No physical movement of the image sensing device itself is necessary to follow a pattern* boundary. Light projected and controlled by an image sensor may do the actual moving, as in a flying spot scanner.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclass 202 for photocells that follow the edge of pattern* image.

317 Sensor control (e.g., OCR sheet controls copier or fax):

This subclass is indented under subclass 312. Subject matter wherein the image sensor is directed and controlled by certain special markings or guides on a document or by specific internal programming so as to skip nonessential items of information, to skip lines on a document, to control timing and sampling, to regulate speed, to use the sensor output for a specific control function.

(1) Note. Included herein are programmable character recognition systems that read programming instructions from preprinted, machine-readable documents and forms. Also included are OCR forms that control the operation of photocopiers and facsimile machines.

318 Multiple scanning:

This subclass is indented under subclass 312. Subject matter wherein the same image area is scanned more than once.

319 Prescanning:
This subclass is indented under subclass 318. Subject matter in which a preliminary scan of the image area is done for the purpose of pre-recognition processing (i.e., image alignment, evaluation of print quality, etc.).

320 Magnetic:
This subclass is indented under subclass 312. Subject matter wherein magnetic properties of an image are sensed by suitable magnetic transducer(s).

SEE OR SEARCH CLASS:
235, Registers, subclasses 449 through 450 for magnetic card readers.

321 Optical (e.g., OCR):
This subclass is indented under subclass 312. Subject matter wherein the optical properties of an image are sensed by suitable optical transducer(s).

SEE OR SEARCH CLASS:
235, Registers, subclasses 454+ for optical card readers.
358, Facsimile and Static Presentation Processing, subclasses 474 through 498 for optical facsimile scanners.

322 Single spot:
This subclass is indented under subclass 321. Subject matter wherein an optical transducer (cooperating with a flying-spot scanner, for example) senses a property at a single spot in the image, and that spot is swept progressively over an image area.

323 Single line:
This subclass is indented under subclass 321. Subject matter wherein a plurality of optical transducers sufficient to form a single line of sensing elements, sense the optical properties in a corresponding line of the image, and that line is swept progressively over an image area.

324 Full retina:
This subclass is indented under subclass 321. Subject matter wherein a plurality of optical transducers sufficient to form a two-dimensional array of sensing elements, simultaneously sense the optical properties in a corresponding two-dimensional area of the image.

325 MISCELLANEOUS:
This subclass is indented under the class definition. Subject matter for analysis of image data and not elsewhere classified.

(1) Note. Included within this subclass are such items as integrated circuit layouts and devices for selecting character fonts.

(2) Note. Image analysis* properly classified above should not, as a rule, be cross-referenced here.

END