**CLASS 345, COMPUTER GRAPHICS PROCESS-
ING AND SELECTIVE VISUAL DISPLAY
SYSTEMS**

SECTION I - CLASS DEFINITION

This class provides for processes and apparatus for selective electrical control of two or more light-generating or light-controlling display elements* in accordance with a received or stored image data signal. The image data includes character, graphical information or display attribute data. The image data may include, for example, information data from a peripheral input device, from the reception of a television signal, from the recognition of image data, or from the generation or creation of image data by a computer.

This class also provides for digital data processing systems or methods for data processing for visual presentation, wherein the processing of data includes the creation or manipulation of graphic objects (e.g., artificial images), or text.

SCOPE OF THE CLASS

(1)   Note. This class includes a display controller* for accessing image data. The display control includes, for example, control between a display memory and the display elements*. The display control may be performed by a processor, wherein enhancements for a previously created and stored image are provided. Examples of such display control include display memory addressing, display screen energizing, and received image data control in response to input signals applied to the display control to provide an enhanced image for display. A specific display system* in combination with a data processor or computer is classified herein.

(2)   Note. The display elements* of this class include, for example, (1) a CRT display wherein visual elements* of the image or message originate at the light-emitting screen of a cathode-ray tube, (2) a flat panel display (non-CRT display system*) wherein visual elements* of image or message are the result of light producers or light controllers arranged in a tangible mechanical grouping or array, (3) any matrix arrangement of light-generating or light-controlling display elements* with

selective electrical display control, or (4) any plural arrangement of segmented light-generating or light-controlling display elements* with selective electrical display control.

(3)   Note. Claimed subject matter directed to a display function (waveform) generator combined with a display is classified herein unless there is claimed structure relating to the manner in which the waveform is detected or measured.

(4)   Note. Generally, significantly claimed structure external to this class, claimed in combination with subject matter under the class definition above, which displays or produces an image or message related to such external structure or its function, is classified in the class appropriate to the external structure; however, a significantly claimed operator interface claimed in combination with computer graphics processing such as attribute processing or graphic manipulation, which displays or produces an image or message related to such operator interface is classified herein. Further, nominally claimed structure external to this class, claimed in combination with subject matter under this class definition, is classified in this class unless provided for in the appropriate external class.

(5)   Note. This class provides for peripheral input devices which include a manually actuatable selective means (e.g., keyboards, light pens, joysticks, mice, and touch tablets etc.) to selectively input the information data to the selective display control which translates the selective input into a message symbol or image, (e.g., a character or graphic object) on the display to an observer.

(6)   Note. This class also provides for display storage devices such as display memory with more than nominal recitation of their organization and structure claimed for storing the previously created or generated data to be displayed on the display.

(7)   Note. Graphic objects of this class are defined by their coordinates, shape, size, and attributes. Such graphic objects define

a portion of a displayed image and may be a combination of computer generated objects and real life images.

(8) Note. Information processing for creating a visual image which includes more than a nominal recitation of information processing is classified herein.

(9) Note. The use of a memory system for processing in conjunction with a data presentation/computer graphics system (e.g., for manipulating the addressing or contents of image or text data stored in a memory) is classified herein.

(10) Note. Font generation for display and font processing to form the character patterns is classified herein.

(11) Note. Color information processing wherein the color in the image is calculated, is classified herein (e.g., shading, interpolating color values in a polygon).

(12) Note. Generation or manipulation of three dimensional or perspective display information or objects, generation or control of a mapping pattern, or animation are classified in this class.

(13) Note. Systems which display a change of appearance, where the change is computer generated (e.g., creation or modification of hairstyles or clothing to be overlaid with a video image or a model), are classified in this class.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

40, Card, Picture, or Sign Exhibiting, particularly subclass 406 for display device with gas or liquid movement.

74, Machine Element or Mechanism, particularly subclass 471 for control elements which move in two planes.

116, Signals and Indicators, particularly subclasses 200 through 337 for various indicators.

178, Telegraphy, particularly subclasses 18.01 through 20.04 for digitizing writing tablets, stylus, and circuits.

200, Electricity: Circuit Makers and Breakers, particularly subclass 5 for multiple switch control.

235, Registers, particularly subclasses 375 through 386 for systems controlled by data bearing records which may include selective display; various subclasses for basic machines and associated indicating mechanisms for ascertaining the number of movements of various devices and machines, plus machines made from these basic machines alone (e.g., cash registers, voting machines), and in combination with various perfecting features, such as printers and recording means.

250, Radiant Energy, subclasses 200 through 239 for light detection using photocell circuitry and subclass 553 for light source array or matrix.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for single, plural, and integrated element solid-state light source.

273, Amusement Devices: Games, appropriate subclasses for TV games using display device.

313, Electric Lamp and Discharge Devices, appropriate subclasses for some light sources, per se, particularly subclasses 484 through 493 for gaseous discharge display panel and subclasses 498-512 for solid-state type device.

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for structure of cathode-ray tube energizing circuits and subclass 169.1 – 169.4 for structure of panel display devices (e.g., electroluminescent and gas display).

324, Electricity: Measuring and Testing, subclass 121 for measuring and testing electricity using a CRT.

326, Electronic Digital Logic Circuitry, appropriate subclasses for electronic digital logic circuits; and appropriate subclasses for generic digital logic devices, circuitry, and subcombinations thereof, wherein nonarithmetical operations are performed upon discrete electrical signals representing a value normally described by numerical digits.

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 108 through 112 for miscellaneous current driving circuits.

340, Communications: Electrical, subclasses 1.1 through 16.1 for controlling one or more devices to obtain a plurality of results by transmission of a designated one of plural distinctive control signals over a smaller number of communication lines or channels, particularly

          subclasses 2.1-2.8 for path selection, subclass 2.81 for tree or cascade selective communication, subclasses 3.1-3.9 for communication systems where status of a controlled device is communicated, subclasses 4.2 and 4.21 for synchronizing selective communication systems, subclasses 9.1-9.17 for addressing, and subclasses 12.1-12.55 for pulse responsive actuation.

341,   Coded Data Generation or Conversion, subclasses 22 through 34 for bodily actuated code generation relating to a keyboard; and various subclasses for electrical pulse and digit code converters (e.g., systems for originating or emitting a coded set of discrete signals or translating one code into another code wherein the meaning of the data remains the same but the formats may differ).

342,   Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 142 for radar display systems using a CRT display.

348,   Television, appropriate subclasses for systems and subsystems for display of television (real time scanned produced) signals.

349,   Liquid Crystal Cells, Elements and Systems, appropriate subclasses for the details of a liquid crystal cell structure.

352,   Optics: Motion Pictures, subclass 87 where motion picture animation will be found.

353,   Optics: Image Projectors, appropriate subclasses for specifics of optics involved with an image projector.

358,   Facsimile and Static Presentation Processing, subclasses 1.1 through 1.18 for static presentation processing.

359,   Optical: Systems and Elements, subclasses 237 through 324 for structure relating to an optical modulator and subclasses 443-461 for projection screens.

360,   Dynamic Magnetic Information Storage or Retrieval, (which is an integral part of Class 369 following subclass 18), appropriate subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer, for example, magnetic disk drive devices and control thereof, per se.

362,   Illumination, appropriate subclasses for a specific illumination device and particularly subclasses 227 through 252 for plural light sources for general lighting uses.

365,   Static Information Storage and Retrieval, subclasses 106 through 119 and 120-128 for storage systems using visible light for the retrieval of stored information instead of for the display of a selected image (message or data); and various subclasses for addressable static singular storage elements or plural singular storage elements of the same type (i.e., the internal elements of memory, per se).

368,   Horology: Time Measuring Systems or Devices, subclasses 223 through 242 for displays of time (i.e., watches).

369,   Dynamic Information Storage or Retrieval, particularly subclasses 99 through 175 for information handling in conjunction with a dynamic store; and various subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer.

377,   Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 112 through 113 for display control with registers; and various subclasses for generic circuits for pulse counting.

379,   Telephonic Communications, subclass 96 for displaying digital information on a terminal.

380,   Cryptography, appropriate subclasses for cryptographic electric signal modification in general.

382,   Image Analysis, appropriate subclasses, for previously scanned image data and for image recognition, processing and nominal display relating to such recognition; and various subclasses for operations performed on image data with the aim of measuring a characteristic of an image, detecting variations, detecting structures, or transforming the image data, and for procedures for analyzing and categorizing patterns present in image data.

400,   Typewriting Machines, particularly subclasses 83 through 85 for typewriting machines including a display.

434,   Education and Demonstration, subclasses 1 through 10 for system performing distant object energy sensing wherein said systems include a display, subclasses 307 and 323 for educational system including a CRT.

463,   Amusement Devices: Games, subclasses 1 through 47 , where there is recited a method or apparatus for moving or processing information specified as game or contest information (e.g., a video game, etc.), especially subclasses 31-34 for specifics of processing visual infor-

mation data in a game or contest appropriate for Class 463.

705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for user interface specific to business practice.

707, Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 634 and 805 for database specific user interface.

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 270 through 277 for mathematical function generation and subclass 849 for specialized analog function generation including a CRT display.

713, Electrical Computers and Digital Processing Systems: Support, subclass 187 and 188 for software program protection or computer virus detection in combination with data encryption.

714, Error Detection/Correction and Fault Detection/Recovery, appropriate subclasses for generic electrical pulse or pulse coded data error detection and correction.

715, Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, appropriate subclasses for document processing specific user interface, for an operator interface generally, or for screen saver display processing.

SECTION III - GLOSSARY

The following terms have been defined for purposes of classification in this class. In the class and subclass definition of this class, terms used in a sense defined below are indicated by an asterisk (*). When these terms are not indicated by an asterisk(*) in the definitions, the meaning is not restricted to the glossary definitions below.

ADDRESS DATA

Data that represent or identify a source or destination. (also see: Data)

ALPHANUMERIC

Any symbol found in the ASCII character set.

BUS

A conductor used for transferring data, signals, or power.

COMPUTER

A machine that inputs data, processes data, stores data, and outputs data.

DATA

Representation of information in a coded manner suitable for communication, interpretation, or processing. Also see: Address Data; Instruction Data; Status Data; User Data.

DATA PROCESSING

See PROCESSING, below.

DISPLAY CONTROLLER

An electrical circuit which actuates a display device* in accordance with received image data*.

DIGITAL DATA PROCESSING SYSTEM

An arrangement of processor(s) in combination with either memory or peripherals, or both, performing data processing.

DISPLAY DEVICE

A communication device which converts image data* into a visual image*.

DISPLAY ELEMENT

Means for producing a visual effect in a display device* comprised of a plurality (e.g., matrix) of such means.

DISPLAY SYSTEM

A system which comprises one or more display terminals* or one or more display devices*.

DISPLAY TERMINAL

A unit which comprises at least one display device* and user interface control means (e.g., mouse).

IMAGE DATA

The information provided to form the visual image*.

INFORMATION

Meaning that a human being assigns to data by means of the conventions applied to that data.

INSTRUCTION DATA

Data that represent an operation and identify its operands, if any. (also see: Data)

MEMORY

A functional unit to which data can be stored and from which data can be retrieved.

PERIPHERAL

A functional unit that transmits data to or receives data from a computer to which it is coupled.

PROCESSING

Methods or apparatus performing systematic operations upon data or information exemplified by functions such as data or information transferring, merging, sorting, and computing (i.e., arithmetic operations or logical operations).

> (1)   Note. In this class, the glossary term data is used to modify processing in the term data processing; whereas the term digital data processing system refers to a machine performing data processing.

> (2)   Note. In an effort to avoid redundant constructions, in this class, where appropriate, the term address data processing is used in place of address data data processing.

PROCESSOR

A functional unit that interprets and executes instruction data.

STATUS DATA

Data that represent conditions of data, digital data processing systems, computers, peripherals, memory, etc. (also see: Data)

USER DATA

Data other than address data, instruction data, or status data. (also see: Data)

VISUAL ELEMENT

The smallest constituent part of a composite visual image*. A visual element* may be the visual effect produced by a display element*.

VISUAL IMAGE

The resultant image shown by the display device*.

SUBCLASSES

1.1   **PLURAL DISPLAY SYSTEMS:**
This subclass is indented under the class definition. Subject matter including more than one visual display system.

> (1)   Note. The use of adjacent Arts to display a large image is typical of this type of plural display system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
4,   for a single display system having plural display devices.

SEE OR SEARCH CLASS:
709,   Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, appropriate subclasses for transmission of information among multiple computer systems.
710,   Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 1 through 74 for input/output data processing, and subclasses 100-132 for intrasystem connection in a digital data processing system.

1.2   **Data transmitted or received at surface of display:**
This subclass is indented under subclass 1.1. Subject matter wherein the more than one visual display system includes plural display terminals in which a user uses an electronic device to transmit and or receive data at the display surface by electromagnetic means.

1.3   **Tiling or modular adjacent displays:**
This subclass is indented under subclass 1.1. Subject matter wherein the more than one visual display system includes plural displays adjacent to be viewed by the same user.

2.1 Remotely located:

This subclass is indented under subclass 1.1. Subject matter wherein the more than one visual display system includes plural display terminals that are positioned at separate locations where they cannot be viewed simultaneously.

(1) Note. Display terminals in different offices of a work environment are typical of this type of plural display system.

2.2 Presentation of similar images:

This subclass is indented under subclass 2.1. Subject matter wherein the plural display terminals positioned at separate locations have similar images that are controlled by the users at the separate locations.

(1) Note. These systems are used to jointly edit a common image or text that is simultaneously displayed.

2.3 Wireless connection:

This subclass is indented under subclass 2.1. Subject matter wherein the plural display terminals positioned at separate locations receive data for display by wireless means and require further processing before driving a computer display.

3.1 Diverse systems (e.g., CRT or LCD interface):

This subclass is indented under subclass 1.1. Subject matter wherein the plural display systems are different types.

(1) Note. Different types of display systems include Arts, Led, Lacs, plasma, etc.

3.2 Frame, field, or scan rate conversion:

This subclass is indented under subclass 3.1. Subject matter wherein the different display types require a conversion of the frame, field, or scan rate before driving each display type.

3.3 Number of pixels per row or column conversion (i.e., resolution conversion):

This subclass is indented under subclass 3.1. Subject matter wherein the different display types require a conversion of the number of pixel per row and/or column before driving each display type.

3.4 Controller automatically senses monitor resolution:

This subclass is indented under subclass 3.3. Subject matter wherein the selective electrical control determines, without human intervention, the maximum number of pixels that can be displayed on a display.

4 SINGLE DISPLAY SYSTEM HAVING STACKED SUPERIMPOSED DISPLAY DEVICES (E.G., TANDEM):

This subclass is indented under the class definition. Subject matter in which one transparent display device* is positioned above another display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
629 through 641, for a single display device having a superimposed overlay.

5 Diverse display devices:

This subclass is indented under subclass 4. Subject matter wherein the stacked display devices* are different types of display devices* (e.g., EL and LCD).

SEE OR SEARCH THIS CLASS, SUBCLASS:
3.1, for diverse plural display systems.

6 Three-dimensional arrays:

This subclass is indented under subclass 4. Subject matter wherein the images from the stacked superimposed display devices* together provide a resultant display with perspective.

SEE OR SEARCH THIS CLASS, SUBCLASS:
419, for three-dimensional presentation processing.

7 IMAGE SUPERPOSITION BY OPTICAL MEANS (E.G., HEADS-UP DISPLAY):

This subclass is indented under the class definition. Subject matter wherein a single visual image* from a display device* is superimposed with an external world scene by some light-affecting means.

SEE OR SEARCH CLASS:
340,   Communication: Electrical, subclasses 901+ for external condition vehicle-mounted indicators.
359,   Optical: Systems and Elements, subclasses 630+ for specific optical components of heads-up arrangement.

8   **Operator body-mounted heads-up display (e.g., helmet mounted display):**
This subclass is indented under subclass 7. Subject matter wherein the display device* for providing the single visual image* is assembled on a helmet worn on the operator's head or is carried on the operator's body.

9   **Plural image superposition:**
This subclass is indented under subclass 7. Subject matter wherein at least two visual images* from at least two display devices*, respectively, are superimposed by some light-affecting means.

(1)   Note. Examples of light-affecting means include lenses, mirrors, reflectors, etc.

10   **DATA RESPONSIVE CRT DISPLAY CONTROL:**
This subclass is indented under the class definition. Subject matter including means for controlling a cathode-ray tube to display visual image data*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
180,   for light pen for CRT display.
418+,   for significant structure of a data processor or computer architecture wherein elements of computation or data processing techniques are used in connection with a CRT creation or manipulation of s:graphic objects or text performed by a computer or processor in connection with a CRT.

SEE OR SEARCH CLASS:
313,   Electric Lamp and Discharge Devices, subclasses 364+ for structure of the cathode-ray tube.
315,   Electric Lamp and Discharge Devices: Systems, subclasses 8.51+ and 169.1+ for a CRT system and a CRT signal control means with no

selective data control of display elements.
348,   Television, appropriate subclasses for a display of television or of video, with receiver related electronic generation and control of an image of the channel to which the receiver is tuned.

11   **CRT provides display control:**
This subclass is indented under subclass 10. Subject matter wherein the control means includes a CRT for driving a second CRT, the second CRT providing the visual image data* to be displayed.

(1)   Note. Display systems which include a first CRT, used as part of a driving circuit and not providing the resultant display, for driving a second CRTproviding the resultant display is found herein.

12   **Data responsive deflection and intensity control:**
This subclass is indented under subclass 10. Subject matter wherein the control means controls both the electron beam's deflection and its intensity.

SEE OR SEARCH THIS CLASS, SUBCLASS:
13+,   for data responsive deflection control for a CRT.
20+,   for data responsive intensity control for a CRT.
589   through 605, for intensity control for a generic display device.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclasses 364+ and 383+ for CRT deflection circuits and intensity control wherein no selective data control of display elements is provided.

13   **Data responsive deflection control:**
This subclass is indented under subclass 10. Subject matter in which the control means is responsive to input data or an input message and affects the images by controlling electron beam's deflection in the CRT.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclasses 364+ for CRTdeflection circuits.

14   X and Y axis deflection control:
This subclass is indented under subclass 13. Subject matter wherein the electron beam's deflection is controlled in both horizontal and vertical directions in the CRT.

15   Curvilinear deflection control (e.g., lissajous):
This subclass is indented under subclass 13. Subject matter in which the control means generates a complex waveform which includes some frequency and its harmonics with varying phases whereby the image may be built up by a circular or curvilinear deflection.

16   Stroke or vector:
This subclass is indented under subclass 13. Subject matter wherein the image includes a straight line produced from an input data which may represent terminal points or a point with magnitude and direction.

17   Strokes for forming characters:
This subclass is indented under subclass 16. Subject matter wherein the strokes formed on the CRT result in the generation of alphanumeric* data.

SEE OR SEARCH THIS CLASS, SUBCLASS:
26,   for a character generator used with a CRT.
194,   for a character generator used with a generic display device.
467   through 472.3, for a character display on a generic display device.

18   Up/down counter:
This subclass is indented under subclass 16. Subject matter including a means for determining the points of the stroke or vector in incremental steps.

SEE OR SEARCH CLASS:
377,   Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, appropriate subclasses for counters in general.

19   Impedance array:
This subclass is indented under subclass 13. Subject matter in which the control means includes an arrangement of impedances for controlling the electron beam's deflection.

20   Data responsive intensity control:
This subclass is indented under subclass 10. Subject matter in which the control means is responsive to input data or an input message and controls the brilliance of an image on the CRT.

SEE OR SEARCH THIS CLASS, SUBCLASS:
63,   for fluid light-emitter matrix-type display device with intensity control.
77,   for electroluminescent matrix-type display device with intensity control.
589   through 605, for intensity control for a generic display device.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclasses 383+ for CRT intensity control wherein no selective data control of display elements is provided.

21   Magnetic element array:
This subclass is indented under subclass 20. Subject matter including a plurality of magnetic element means providing the brilliance information to the CRT.

22   Color display:
This subclass is indented under subclass 10. Subject matter wherein the visual image* contains more than two colors to be displayed on the CRT.

SEE OR SEARCH THIS CLASS, SUBCLASS:
72,   for fluid light-emitter matrix color display.
83,   for solid body light-emitter color display.
88,   for liquid crystal color display.
589   through 605, for selectable color attributes or for color surface detail/ characteristics relating to a visual image to be displayed by a generic display device.

23   **Graphic and alphanumeric display:**
This subclass is indented under subclass 10. Subject matter wherein the control means selectably provides an image representative of an object (e.g., a plane, boat, etc.) and of a font of alphanumeric* characters on the CRT.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
24,   for a graphic CRT display.
25,   for an alphanumeric CRT display.
440   through 472.3, for a character and graphical display on a generic display device.

24   **Graphic display:**
This subclass is indented under subclass 10. Subject matter wherein the control means selectably provides an image representative of an object (e.g., a plane, boat, etc.) on the CRT.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
440   through 472.3, for a graphical display on a generic display device.
660   through 671, for graphical image size control.

25   **Alphanumeric display:**
This subclass is indented under subclass 10. Subject matter wherein the control means selectably provides an image of a font of alphanumeric* characters on the CRT.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
467   through 472, for a character display on a generic display device.
660   through 671, for alphanumeric image size controlling.
672   through 688, for alphanumeric image scrolling.

SEE OR SEARCH CLASS:
340,   Communications: Electrical, subclasses 815.53+ for lighted alphanumeric visual indicator.

26   **Character generator:**
This subclass is indented under subclass 25. Subject matter wherein the control means includes a storage means used as a source of the alphanumeric* characters.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
194,   for a character generator used with a generic display device.
467   through 472, for a character display on a generic display device.

27   **Combined with storage means:**
This subclass is indented under subclass 10. Subject matter wherein the control means includes a means to retain or to store data elements being applied to the CRT.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
507+,   for a memory system in connection with computer display processing hardware.

SEE OR SEARCH CLASS:
365,   Static Information Storage and Retrieval, appropriate subclasses for static storage systems using visible light for the retrieval of stored information instead of for the display of a selected image.
369,   Dynamic Information Storage or Retrieval, appropriate subclasses for dynamic storage systems using visible light for the retrieval of stored information instead of for the display of a selected image.
711,   Electrical Computers and Digital Processing Systems: Memory, appropriate subclasses for memory addressing, accessing and controlling.

28   **Addressing:**
This subclass is indented under subclass 27. Subject matter including a means for assigning storage locations to the data elements.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
81,   for optical addressing of an electroluminescent display.
188,   for addressing with priority a multiplane color memory which stores image data for a computer s:graphics processing system.
193,   for addressing a character memory which stores image data for a computer graphics processing system.

515,   for addressing a bit map or graphic memory which stores image data for a computer graphics processing system.

516,   for addressing circuitry in combination with a display store to be used in conjunction with a computer s:graphics processing system.

29   Delay line:

This subclass is indented under subclass 10. Subject matter wherein the control means has a delay means for synchronizing operations of circuits in the control means.

(1)   Note. The delay line may have selective parallel inputs and a serial output.

30   PLURAL PHYSICAL DISPLAY ELEMENT CONTROL SYSTEM (E.G., NON-CRT):

This subclass is indented under the class definition. Subject matter wherein the light-generating or light-controlling display elements* are provided as an arrangement of plural segmented and matrix display elements* or as a flat panel array with selective electrical control.

SEE OR SEARCH CLASS:

40,   Card, Picture, or Sign Exhibiting, appropriate subclasses for mechanical indicia carrying changeable displays.

116,   Signals and Indicators, appropriate subclasses for mechanical indicators.

313,   Electric Lamp and Discharge Devices, subclasses 484+ for gaseous discharge mediums with no selective electrical driving control circuitry, subclasses 498+ for solid-state type discharge mediums with no selective electrical driving control circuitry.

315,   Electric Lamp and Discharge Devices: Systems, appropriate subclasses for gaseous and solid-state type discharge mediums having circuits without selective electrical control as to which of the display elements are to be energized.

340,   Communication: Electrical, subclasses 815.4+ for visual indicators of some condition or state with nonselective electrical display control; subclasses 901+ for external condition vehicle-mounted indicators; subclasses 907+ for traffic control indicators; subclasses 945+ for aircraft and watercraft indicating systems; subclasses 988+ for indicators relating to vehicle position; subclasses 425.5+ for land vehicle indicators; subclasses 500+ for condition responsive indicating systems.

349,   Liquid Crystal Cells, Elements And Systems, appropriate subclasses for liquid crystal cell structure in general.

359,   Optical: Systems and Elements, subclass 237 for optical modulators with no selective electrical control circuitry.

362,   Illumination, appropriate subclasses for subject matter directed to illumination systems which render objects to be visible.

31   Physically movable array:

This subclass is indented under subclass 30. Subject matter in which an image is formed by moving the array of display elements* or a subset of the array of display elements* on a display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6,   for three-dimensional arrays formed from stacked display devices.

32   Optical means interposed in viewing path (e.g., filters, lens, etc.):

This subclass is indented under subclass 30. Subject matter having an optical means interposed in the viewing path of the display element* array.

SEE OR SEARCH CLASS:

340,   Communications: Electrical, subclasses 815.73+ for visual alphanumeric indicator having optical means.

353,   Optics: Image Projectors, appropriate subclasses for all projected pluralities of images, superimposed or in a mosaic.

359,   Optical: Systems and Elements, appropriate subclasses for designated optical means.

33   **Segmented display elements:**
This subclass is indented under subclass 30. Subject matter in which the light-generating or light-controlling display elements* are provided as an arrangement of segmented display elements* with selective electrical control.

34   **Seven segment display:**
This subclass is indented under subclass 33. Subject matter wherein the arrangement of segmented display consists of seven bars so that each digit from 0 to 9 can be displayed.

SEE OR SEARCH CLASS:
340,   Communications: Electrical, subclass 815.44 for visual indicator having seven segments.

35   **Bar graph:**
This subclass is indented under subclass 33. Subject matter wherein the light-generating or light-controlling display elements* are aligned in a variable length line arrangement to show the condition of a given parameter.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
440.2,   for bar graph shown on a generic display device.

36   **Electroluminescent display elements:**
This subclass is indented under subclass 35. Subject matter wherein the bar graph includes electroluminescent display elements* or segmented display elements* having a luminescent phosphor which emits light with the application of the selective electrical control.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
76+,   for matrix electroluminescent display.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.3 for electroluminescent devices and circuitry without selective electrical control as to which of the display elements are to be energized.
340,   Communications: Electrical, foreign art collections FOR 281-282 for a selective electroluminescent element matrix.

37   **Gas discharge display segments (e.g., plasma):**
This subclass is indented under subclass 35. Subject matter wherein the bar graph includes segmented display elements* which generate light due to the presence of a gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
60+,   for matrix fluid light-emitting display.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.4 for energizing or bias supplies for a gas panel display device.

38   **Liquid crystal display segments:**
This subclass is indented under subclass 35. Subject matter wherein the bar graph includes liquid crystal display elements* or a liquid with crystalline properties.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
87+,   for matrix liquid crystal display devices.

SEE OR SEARCH CLASS:
349,   Liquid Crystal Cells, Elements And Systems, subclass 142 for segmented or fixed pattern liquid crystal cell structure.

39   **Light-emitting diode segments (LEDs):**
This subclass is indented under subclass 35. Subject matter wherein the bar graph includes light-emitting diodes or diodes that emit light when biased in a forward direction.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
82+,   for matrix light-emitting diode display.

SEE OR SEARCH CLASS:
257,   Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for LED structure.
340,   Communications: Electrical, subclass 815.45 for visual indicator using light-emitting diodes (LEDs) and for-

eign art collection FOR 282 for a selective LED matrix.

40 **Plural (e.g., stacked, adjacent):**
This subclass is indented under subclass 35. Subject matter wherein a plurality of the variable length line arrangements are provided to show the conditions of a plurality of parameters.

41 **Fluid light-emitting display elements (e.g., gas, plasma):**
This subclass is indented under subclass 33. Subject matter in which the segmented display elements* generate light due to a fluid medium in the display elements*.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
60+,   for matrix fluid light-emitting display.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.4 for energizing or bias supplies for a gas panel display device.

42 **Controlling circuitry:**
This subclass is indented under subclass 41. Subject matter wherein the segmented display elements* are selectively controlled by a specified electrical control device (e.g., counters, logic circuits, shift registers, etc.).

43 **Mask or electrode shape:**
This subclass is indented under subclass 33. Subject matter in which the segmented electrode display elements* have a significant contour or in which an opaque material with a significantly shaped opening is provided with the segmented display elements*.

44 **Solid light-emitting display elements:**
This subclass is indented under subclass 33. Subject matter in which the segmented display elements* are composed of solid light-generating material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
82+,   for matrix solid body light-emitting display.

SEE OR SEARCH CLASS:
250,   Radiant Energy, subclass 552 for solid-state light source systems.

45 **Electroluminescent:**
This subclass is indented under subclass 44. Subject matter in which the segmented display elements* include EL display elements* or wherein the segmented display elements* include a luminescent phosphor which emits light with the application of the selective electrical control.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
76+,   for matrix electroluminescent display.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.3 for electroluminescent devices and circuitry without selective electrical control as to which of the display elements are to be energized.
340,   Communications: Electrical, foreign art collections FOR 281-282 for a selective electroluminescent element matrix.

46 **Light-emitting diodes:**
This subclass is indented under subclass 44. Subject matter in which the segmented display elements* include light-emitting diodes or diodes that emit light when biased in a forward direction.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
82+,   for matrix light-emitting diode display.

SEE OR SEARCH CLASS:
257,   Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for LED structure.
340,   Communications: Electrical, subclass 815.45 for visual indictor using light-emitting diodes (LEDs) and foreign art collection FOR 282 for a selective LED matrix.

47   **Fluorescent elements:**
This subclass is indented under subclass 33. Subject matter wherein the segmented display elements* include fluorescent light-emitting elements or cathodoluminescent display elements* wherein electrons strike a phosphor material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
75,   for vacuum fluorescent matrix displays.

48   **Light-controlling display elements:**
This subclass is indented under subclass 33. Subject matter comprising means to control the amount or distribution of light which is reflected from or transmitted to the segmented display elements*.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
84,   for light-controlling display elements formed in a matrix.

49   **Electrochromic elements:**
This subclass is indented under subclass 48. Subject matter in which the segmented display elements* include electrochromic display elements*, or elements made from a material with light absorption properties such that the material takes on a color upon the application of an electric field.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
105,   for matrix electrochromic displays.

SEE OR SEARCH CLASS:
359,   Optical: Systems and Elements, subclass 265 for electrochromic light valve arrays without selective electrical control.

50   **Liquid crystal elements:**
This subclass is indented under subclass 48. Subject matter in which the segmented display elements* include liquid crystal display elements* or liquid with crystalline properties.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
87+,   for matrix liquid crystal display devices.

SEE OR SEARCH CLASS:
349,   Liquid Crystal Cells, Elements and Systems, subclass 142 for segmented or fixed pattern liquid crystal cell structure.

51   **Display element selection circuitry:**
This subclass is indented under subclass 50. Subject matter in which the selective electrical control includes details of circuitry for selecting the segmented display elements* to be displayed.

52   **Power supply generating circuitry:**
This subclass is indented under subclass 50. Subject matter in which the selective electrical control includes means for selectively supplying drive voltages to the display elements.

SEE OR SEARCH CLASS:
323,   Electricity: Power Supply or Regulation Systems, appropriate subclasses for specifics of a power supply.

53   **Specific waveform (e.g., square waveforms, sinusoidal):**
This subclass is indented under subclass 50. Subject matter in which the selective electrical control includes means for selectively supplying particular waveforms to the display elements*.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
94+,   for waveform generation for a matrix liquid crystal display.
208+,   for a waveform generator coupled to a generic display device.

54   **Field period polarity reversal:**
This subclass is indented under subclass 53. Subject matter in which the waveforms applied to the display elements* are alternatively supplied in a positive and negative manner.

55 Display elements arranged in matrix (e.g., rows and columns):
This subclass is indented under subclass 30. Subject matter wherein the light-generating or light-controlling display elements* are provided as a matrix arrangement of display elements* with selective electrical control.

56 Image shifting means (i.e., traveling message):
This subclass is indented under subclass 55. Subject matter wherein the selective electrical control includes means for moving image or a message on the display matrix.

SEE OR SEARCH THIS CLASS, SUBCLASS:
61, for fluid light-emitter with shifting means.

57 Having endless belt or tape reader:
This subclass is indented under subclass 56. Subject matter wherein the image is formed on a moving belt (i.e., image bearing web) or the movement of the image on the display matrix is in response to reading of binary code data on a tape.

58 Crosstalk elimination:
This subclass is indented under subclass 55. Subject matter wherein the selective electrical control includes means for removal of spurious (i.e., undesirable noise) signals from the matrix.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and systems, subclasses 551+ for unwanted signal suppression in general.

59 Matrix for conveying alphanumeric data:
This subclass is indented under subclass 55. Subject matter wherein the matrix arrangement of display elements* displays character information.

SEE OR SEARCH THIS CLASS, SUBCLASS:
25, for alphanumeric CRT display.
467 through 472, for a character display on a generic display device.

60 Fluid light emitter (e.g., gas, liquid, or plasma):
This subclass is indented under subclass 55. Subject matter wherein the display element* includes a light-generating fluid medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:
37, and 41+, for segmented fluid light-emitting display devices.

SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclass 169.4 for energizing or bias supplies for a gas panel display device.

61 Shifting means:
This subclass is indented under subclass 60. Subject matter wherein the fluid is moved to adjacent display elements* in order to increase the brightness of the display.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56, for image shifting means for a matrix display device.

62 Specified plasma coupling path:
This subclass is indented under subclass 61. Subject matter in which the shifting means constitutes a connecting path arrangement for a plasma discharge.

63 Intensity control:
This subclass is indented under subclass 60. Subject matter in which the selective electrical control includes means for controlling the brightness characteristics of the fluid light emitter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
589 through 605, for intensity changes in graphical image processing.

64 Liquid light emitter:
This subclass is indented under subclass 60. Subject matter in which the display element* includes a light-generating liquid medium.

65   Phosphor excited by fluid response:
This subclass is indented under subclass 60. Subject matter wherein the display elements* include a phosphor compound within the fluid medium for emission of light.

SEE OR SEARCH CLASS:
250,   Radiant Energy, subclasses 458.1+ and 483.1+ for luminescent devices utilizing phosphor.
313,   Electric Lamp and Discharge Devices, subclasses 103+ for channel electron multiplier devices.

66   Particular discharge path:
This subclass is indented under subclass 60. Subject matter in which the display elements* include a gas, plasma, or liquid medium having a specific shape or contour for the generation of the light.

67   More than two electrodes per element:
This subclass is indented under subclass 60. Subject matter in which a display element* of the fluid medium has three or more electrodes.

68   Means for combining selective and sustain signals:
This subclass is indented under subclass 60. Subject matter in which the selective electrical control includes circuit means for applying a select signal and a sustain signal in concert to appropriate selected electrodes of the matrix for energization of the fluid medium.

69   Resistor-diode arrangement:
This subclass is indented under subclass 68. Subject matter in which the circuit combining means includes an arrangement of resistors and diodes for applying the selective and sustain signals to the electrodes of the matrix.

70   Including transformer:
This subclass is indented under subclass 69. Subject matter in which the resistor-diode arrangement utilizes a transformer for providing the necessary voltage to the electrodes of the matrix.

SEE OR SEARCH CLASS:
336,   Inductor Devices, appropriate subclasses for transformers, per se.

71   Electrode insulated from fluid medium:
This subclass is indented under subclass 60. Subject matter in which the display elements* of the matrix have at least one electrode with an insulating or dielectric layer between the electrode and the fluid medium of the matrix.

72   Color:
This subclass is indented under subclass 60. Subject matter in which the display elements* emit a specific color light due to the fluid material itself or due to a colored phosphor layer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
589   through 605, for selectable color attributes relating to a visual image to be displayed by a generic display device.

73   Incandescent:
This subclass is indented under subclass 55. Subject matter wherein the display elements* generate light due to electron flow through a filament of resistive material, wherein the filament is heated to a level for providing the emission of light.

(1)   Note. An array of incandescent light bulbs are found herein.

SEE OR SEARCH CLASS:
362,   Illumination, appropriate subclasses for incandescent illumination in general.

74.1   Cathodoluminescent type:
This subclass is indented under subclass 55. Subject matter wherein the display elements generate light due to the application of electrical control through an anode or cathode to emit an electron beam at each display element to strike a phosphor layer.

SEE OR SEARCH CLASS:
313,   Electric Lamp and Discharge Devices, subclasses 483+ for an electric lamp and discharge device with luminescent solid or liquid material.

75.1   Vacuum fluorescent:
This subclass is indented under subclass 74.1. Subject matter wherein the cathodoluminiescent display elements include a vacuum for electrons to travel through so as to excite a phosphor material to emit light.

SEE OR SEARCH THIS CLASS, SUBCLASS:
47,   for segmented fluorescent element display.

75.2   Field emissive (e.g., FED, Spindt, or microtip, etc.):
This subclass is indented under subclass 74.1. Subject matter wherein the display elements generate light due to the application of electrical control through a field emissive electrode to emit an electron beam at each display element to strike a phosphor layer (e.g., FED, Spindt, or microtip, etc.).

SEE OR SEARCH CLASS:
313,   Electric Lamp and Discharge Devices, subclasses 495 through 497 and other appropriate subclasses for structural details of the FED panel.
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.1 and 169.3 and other appropriate subclasses for driving techniques not limited to display systems.

76   Electroluminescent:
This subclass is indented under subclass 55. Subject matter in which the light-generating display elements* emit light when an electric current is passed through dielectric and phosphor materials.

SEE OR SEARCH THIS CLASS, SUBCLASS:
36,   and 45, for segmented electroluminescent element displays.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclass 169.3 for electroluminescent devices and circuitry without selective electrical control as to which of the display elements are to be energized.

340,   Communications: Electrical, foreign art collections FOR 281-282 for a selective matrix having electromluminescent elements.

77   Brightness or intensity control:
This subclass is indented under subclass 76. Subject matter in which the selective electrical control includes means for generating selected light output levels for each display element*.

(1)   Note. Intensity control for color output is included herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
20,   for data responsive CRT intensity control.
63,   for matrix fluid light-emitting display intensity control.
589   through 605, for intensity control for a generic display device.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclasses 383+ for CRT intensity control wherein no selective data control of display elements is provided.
340,   Communications: Electrical, subclasses 815.4+ for intensity control with a visual indicator.

78   Having compensating pulse:
This subclass is indented under subclass 76. Subject matter in which the selective electrical control includes means for generating an additional voltage pulse in conjunction with a normal drive waveform for altering the electrical characteristics at the electroluminescent display elements* (e.g., enhanced contrast, latent image, flicker, or noise elimination, etc.).

79   Field period polarity reversal:
This subclass is indented under subclass 76. Subject matter in which the selective electrical control provides waveforms to the electroluminescent display elements* in an alternating positive and negative manner.

80   **Driving means integral to substrate:**
This subclass is indented under subclass 76. Subject matter in which a selective electrical control device and the display elements* are formed as a unit.

81   **Optical addressing (e.g., photodetection):**
This subclass is indented under subclass 76. Subject matter in which the selective electrical control in response to detection of an applied external light source controls the selective energization of the electroluminescent display elements*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
28,   for addressing of CRT with storage means.

82   **Solid body light emitter (e.g., LED):**
This subclass is indented under subclass 55. Subject matter in which the light-generating display elements* are composed of solid body material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39,   and 44+, for segmented solid light-emitting display elements.

SEE OR SEARCH CLASS:
250,   Radiant Energy, subclass 552 for solid-state light source systems.
257,   Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for LED structure.
340,   Communications: Electrical, 815.45 for visual indicators with light emitting diodes (LEDs) and foreign art collection FOR 282 for a selective matrix of LEDs.

83   **Color:**
This subclass is indented under subclass 82. Subject matter in which the selective electrical control controls the color of the light generated.

SEE OR SEARCH THIS CLASS, SUBCLASS:
589   through 605, for selectable color attributes relating to a visual image to

be displayed by a generic display device.

84   **Light-controlling display elements:**
This subclass is indented under subclass 55. Subject matter in which the matrix display elements* control the amount or distribution of light which is applied to the display elements*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
48+,   for segmented light-controlling display elements.

85   **Electroscopic (e.g., movable electrodes or electrostatic elements):**
This subclass is indented under subclass 84. Subject matter in which each display element* includes a movable flap or shutter which is controlled electrostatically by the selective electrical control.

86   **Magneto-optic:**
This subclass is indented under subclass 84. Subject matter in which each display element* includes a magneto-optic chip and a polarizer for controlling the passage of light.

87   **Liquid crystal display elements (LCD):**
This subclass is indented under subclass 84. Subject matter in which the matrix light-controlled display elements* include liquid crystal display elements* or liquid with crystalline properties.

SEE OR SEARCH THIS CLASS, SUBCLASS:
38,   and 50, for segmented liquid crystal display elements.

SEE OR SEARCH CLASS:
349,   Liquid Crystal Cells, Elements and Systems, appropriate subclasses for liquid crystal cell structure.

88   **Color:**
This subclass is indented under subclass 87. Subject matter in which the display elements* control the passage of light which results in the display of one or more specific colors.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
589   through 605, for selectable color attributes relating to a visual image to be displayed by a generic display device.

89   Gray scale capability (e.g., halftone):
This subclass is indented under subclass 87. Subject matter wherein the selective electrical control provides control of the brightness or light intensity level (i.e., shades) of the image data* to be displayed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
589   through 605, for intensity control for a generic display device.

90   Control means at each display element:
This subclass is indented under subclass 87. Subject matter wherein the selective electrical control includes a switching means for controlling the state of each display element* individually.

91   Diode or varistor:
This subclass is indented under subclass 90. Subject matter wherein the switching means includes a diode or varistor connected to a display element* for controlling light passage.

SEE OR SEARCH CLASS:
257,   Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for diode structure.

92   Thin film transistor (TFT):
This subclass is indented under subclass 90. Subject matter wherein the switching means includes a transistor made by using thin film techniques for controlling each display element*.

SEE OR SEARCH CLASS:
257,   Active Solid-State Devices (e.g.,Transistors, Solid-State Diodes) appropriate subclasses for thin film transistor structure.
349,   Liquid Crystal Cells, Elements, and Systems, subclasses 42+ for use of transistors in LCD structure.

93   Redundancy (e.g., plural control elements or electrodes):
This subclass is indented under subclass 90. Subject matter wherein the switching means includes extra elements (e.g., electrodes) to reduce the chances of failure in the display.

94   Waveform generation:
This subclass is indented under subclass 87. Subject matter wherein the selective electrical control includes a source for applying specific waveforms or particular voltages to the display elements*.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
53+,   for waveform generation for a segmented liquid crystal display.
208+,   for waveform generator coupled to a generic display device.

95   Three or more voltages:
This subclass is indented under subclass 94. Subject matter in which the waveforms include pulses with at least three different values in driving the display elements*.

96   Field period polarity reversal:
This subclass is indented under subclass 94. Subject matter wherein the waveforms applied to the display elements* are alternately supplied in a positive and negative manner in a field period.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
54,   for field period polarity reversal for a segmented liquid crystal display.
209,   for field period polarity reversal for a generic display device.

97   Ferroelectric or smectic liquid crystal elements:
This subclass is indented under subclass 94. Subject matter wherein the display elements* are comprised of a ferroelectric or smectic liquid crystal material.

98   Specific display element control means (e.g., latches, memories, logic):
This subclass is indented under subclass 87. Subject matter wherein the selective electrical control provides a specific means (e.g., latches,

memories, or logic, etc.) for controlling the state of the display elements*.

99 Particular timing circuit:
This subclass is indented under subclass 98. Subject matter having specific data control means which provide specific clock or timing control signals to the display elements*.

100 Particular row or column control (e.g., shift register):
This subclass is indented under subclass 98. Subject matter having a row or column scanner for selecting a particular display element*.

(1) Note. The display element* control means may include shift registers for performing the selection of the display element*.

SEE OR SEARCH CLASS:
377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 64+ for shift registers, per se.

101 Data signal compensation in response to temperature:
This subclass is indented under subclass 87. Subject matter wherein the selective electrical control includes means for generating compensation signals for the liquid crystal display elements* in response to temperature variations.

SEE OR SEARCH CLASS:
349, Liquid Crystal Cells, Elements and Systems, subclass 72 for detection of liquid crystal temperature.

102 Backlight control:
This subclass is indented under subclass 87. Subject matter wherein a source of light is located in the back of the liquid crystal display elements* for providing light to the liquid crystal display elements*.

SEE OR SEARCH CLASS:
349, Liquid Crystal Cells, Elements and Systems, subclasses 61+ for particular illumination of liquid crystal material.

103 Grouped electrodes (e.g., matrix partitioned into sections):
This subclass is indented under subclass 87. Subject matter wherein the liquid crystal display elements* are divided into plural groups which are driven separately so as to scan the entire display matrix at a faster speed.

104 Input/output liquid crystal display panel:
This subclass is indented under subclass 87. Subject matter wherein the liquid crystal display elements* are used for both inputting and outputting display information.

SEE OR SEARCH THIS CLASS, SUBCLASS:
173, for touch panels used with a generic display device.

105 Electrochromic elements:
This subclass is indented under subclass 84. Subject matter wherein the color of the display elements* is changed by application of an externally applied electric field.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49, for segmented electrochromic display devices.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 265 for electrochromic light valve arrays without selective electrical control.

106 Thermochromic elements:
This subclass is indented under subclass 84. Subject matter wherein the color of the display elements* is changed based on temperature variation of the display elements*.

107 Particle suspension (e.g., electrophoretic):
This subclass is indented under subclass 84. Subject matter wherein charge pigment particles are suspended by an applied electromotive force in a fluid medium in order to change the color of the light-controlling display elements*.

SEE OR SEARCH CLASS:
359,   Optical: Systems and Elements, subclasses 296+ for changing the position or orientation of suspended particles in an optical modulator.

108   Plural mechanically movable display elements:
This subclass is indented under subclass 55. Subject matter in which the display elements* are flags, flaps, or other singular devices which may be moved or rotated selectively so as to be viewed or not viewed thereby altering the visual elements*.

SEE OR SEARCH CLASS:
40,   Card, Picture, or Sign Exhibiting, appropriate subclasses for mechanical indicia carrying changeable displays.
116,   Signals and Indicators, appropriate subclasses for mechanical indicators.
340,   Communications: Electrical, subclasses 815.4+ for visual indicators of some condition or state with nonselective electrical display control.

109   Having shutters:
This subclass is indented under subclass 108. Subject matter wherein the display elements* include a hinged cover or screen for selectively covering or uncovering the display elements*.

110   With motor or rotor driver means:
This subclass is indented under subclass 108. Subject matter wherein the display elements* are driven by a motor.

SEE OR SEARCH CLASS:
318,   Electricity: Motive Power Systems, appropriate subclasses for motors in general.

111   With permanent magnet placed on movable display elements:
This subclass is indented under subclass 108. Subject matter wherein the display elements* include a permanent magnet material which is influenced by application of a magnetic field so as to selectively move or rotate the display elements*.

SEE OR SEARCH CLASS:
335,   Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, appropriate subclasses for permanent magnet, per se.

156   DISPLAY PERIPHERAL INTERFACE INPUT DEVICE:
This subclass is indented under the class definition. Subject matter wherein the selective electrical control includes means which permits an operator to selectively control a display device*.

(1)   Note. The peripheral input devices are used for interfacing with a display device* for controlling the display device* in some manner, such as positioning a cursor or other indicia of the point of specific control.

SEE OR SEARCH CLASS:
710,   Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 1 through 74 for transferring data from one or more peripherals to one or more computers for the latter to process, store, or further transfer or for transferring data from the computers to the peripherals.

157   Cursor mark position control device:
This subclass is indented under subclass 156. Subject matter wherein the peripheral input device positions a marker on the screen of the display device*.

SEE OR SEARCH CLASS:
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclass 856–862 for cursor manipulation.

158   Including orientation sensor (e.g., infrared, ultrasonic, remotely controlled):
This subclass is indented under subclass 157. Subject matter wherein the peripheral input device is provided with a sensing means for determining the position of the cursor mark.

159   Having variable cursor speed:
This subclass is indented under subclass 157. Subject matter wherein the cursor mark can be moved at different rates.

160   Cursor key:
This subclass is indented under subclass 157. Subject matter wherein keys are used for controlling the position of the cursor mark.

SEE OR SEARCH CLASS:
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclass 856–862 for cursor manipulation.

161   Joystick:
This subclass is indented under subclass 157. Subject matter wherein a control handle pivoted for motion in all directions controls the position of the cursor mark.

SEE OR SEARCH CLASS:
74,   Machine Element or Mechanism, subclasses 471+ for mechanical structure directed to a joystick control not relating to a display.
200,   Electricity: Circuit Makers and Breakers, subclasses 5+ for electrical multiple switch control such as a joystick, per se.
273,   Amusement Devices: Games, subclasses 148+ for joystick control specific to a video game.

162   Positional storage means:
This subclass is indented under subclass 157. Subject matter wherein the cursor mark position control device is provided with a storage device for storing X and Y positional information.

163   Mouse:
This subclass is indented under subclass 157. Subject matter wherein the cursor mark position device is movable on a fixed surface (e.g., desk top) for controlling the position of cursor mark.

164   Rotatable ball detector:
This subclass is indented under subclass 163. Subject matter wherein the mouse includes a rotatable ball for detecting movement of the mouse.

SEE OR SEARCH THIS CLASS, SUBCLASS:
167,   for using a trackball for moving the cursor position.

165   Photosensor encoder:
This subclass is indented under subclass 164. Subject matter wherein photosensors are used for encoding the rotation of the rotatable ball.

SEE OR SEARCH CLASS:
250,   Radiant Energy, appropriate subclasses for photosensor encoder, per se.

166   Optical detector:
This subclass is indented under subclass 163. Subject matter wherein the mouse includes photosensors for detecting movement of the mouse.

167   Trackball:
This subclass is indented under subclass 157. Subject matter wherein the cursor mark position control device is a rotatable ball rotated by the operator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
164,   for a rotatable ball detector in a mouse.

168   Including keyboard:
This subclass is indented under subclass 156. Subject matter wherein the operator uses plural keys for selectively inputting information data to control the display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
160,   for cursor control by keyboard.

SEE OR SEARCH CLASS:
340,   Communications: Electrical, subclasses 407.1+ for keyboard based in tactual indicator.

341, Coded Data Generation or Conversion, subclasses 22+ for bodily actuated code generation relating to a keyboard and not a display.

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 142+ for electric digital calculating computers with specialized input including keyboard data entry.

169 Portable (i.e., handheld, calculator, remote controller):
This subclass is indented under subclass 168. Subject matter wherein the keyboard is compact and can be held within the palm of an user.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 100 through 714 for handheld calculators with keyboard.

170 Light source associated with each key:
This subclass is indented under subclass 168. Subject matter wherein each key of the keyboard is associated with a light-emitting element (e.g., LED, lamp, etc.).

SEE OR SEARCH CLASS:
341, Coded Data Generation or Conversion, subclass 31 for photoelectric actuation.

171 Having foreign language capability (e.g., Japanese, Chinese):
This subclass is indented under subclass 168. Subject matter wherein the keyboard is capable of inputting non-English alphabets.

SEE OR SEARCH CLASS:
704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/ Decompression, subclasses 1+ for foreign language processing or translation.

172 Having programmable function key:
This subclass is indented under subclass 168. Subject matter wherein the keyboard includes a specific key for performing specific functions assigned by a program.

SEE OR SEARCH CLASS:
708, Electrical Computers: Arithmetic Processing and Calculating, subclass 130 for a user definable key in a calculator.

173 Touch panel:
This subclass is indented under subclass 156. Subject matter wherein the peripheral input device includes a planar touch sensor which determines the position of a touch.

SEE OR SEARCH CLASS:
178, Telegraphy, subclasses 18.01+ for structure directed to an input digitizing writing tablet and not to a display.
200, Electricity: Circuit Makers and Breakers, subclasses 512+ for membrane-type solid contact relating to a switch of a touchpad.
340, Communications: Electrical, subclasses 407.1+ for tactual indicator.

174 Including impedance detection:
This subclass is indented under subclass 173. Subject matter wherein the touch panel includes impedance sensors (e.g., resistance, capacitance, inductance, etc.) for determining the position of the touch.

175 Including optical detection:
This subclass is indented under subclass 173. Subject matter wherein the touch panel utilizes optical sensors (e.g., photodiodes, phototransistors) for determining the position of the touch.

176 Transparent substrate having light entrapment capability (i.e., waveguide):
This subclass is indented under subclass 173. Subject matter wherein the touch panel includes a transparent material mounted on the display device* for entrapping the light within the substrate.

SEE OR SEARCH CLASS:
385, Optical Waveguides, appropriate subclasses for optical waveguides in general.

177   **Including surface acoustic detection:**
This subclass is indented under subclass 173. Subject matter wherein the touch panel includes surface acoustical transducers for determining the position of a touch.

SEE OR SEARCH CLASS:
367,   Communications, Electrical: Acoustic Wave Systems and Devices, appropriate subclasses for acoustical transducers in general.

178   **Alignment or calibration capability (i.e., parallax problem):**
This subclass is indented under subclass 173. Subject matter wherein the input device compensates for any misalignment of a touch location and its corresponding energized display element*.

179   **Stylus:**
This subclass is indented under subclass 156. Subject matter wherein the operator uses a handheld pointer to input positional information data to the display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
180,   for a light pen for a CRT.

180   **Light pen for CRT display:**
This subclass is indented under subclass 156. Subject matter wherein the operator uses a handheld light pen to input positional information data to the cathode-ray tube display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
179,   for using stylus to input to a display device.

181   **CRT having tracking capability:**
This subclass is indented under subclass 180. Subject matter wherein the electron beam of the CRT traces the movement of the light pen on a surface of the CRT.

182   **Light pen for fluid matrix display panel:**
This subclass is indented under subclass 156. Subject matter wherein the operator uses a handheld light pen to input positional information data to a fluid matrix display panel.

183   **Light pen for controlling plural light-emitting display elements (e.g., LEDs, lamps):**
This subclass is indented under subclass 156. Subject matter wherein the operator uses a handheld light pen to control the on or off state of the light-emitting display elements* (e.g., LED or lamp, etc.) on the display device*.

184   **Mechanical control (e.g., rotatable knob, slider):**
This subclass is indented under subclass 156. Subject matter wherein the operator uses a rotatable knob or interconnected mechanical arms to input data or to control the position of a cursor.

204   **DISPLAY DRIVING CONTROL CIRCUITRY:**
This subclass is indented under the class definition. Subject matter wherein the selective electrical control is provided by a collection of one or more specified electrical control devices.

205   **Physically integral with display elements:**
This subclass is indented under subclass 204. Subject matter in which the control devices and the display elements* share some structural element, (e.g., to share an electrode of a capacitor in a control device with an electrode of a display element*).

206   **Having common base or substrate:**
This subclass is indented under subclass 205. Subject matter wherein the structural element is a base or substrate for both the control devices and the display elements*.

207   **Light detection means (e.g., with photodetector):**
This subclass is indented under subclass 204. Subject matter wherein the control devices include an element which senses light for driving the display elements*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
166,   for optical detector for detecting movement of a mouse.

SEE OR SEARCH CLASS:
250,   Radiant Energy, subclasses 200+ for light detection using photocell cir-

cuitry and subclass 553 for light source array or matrix.

208 Waveform generator coupled to display elements:
This subclass is indented under subclass 204. Subject matter in which the control devices include a source or generator of specific waveforms which is responsive to input data to selectively apply the waveforms to the display elements*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
53,   for waveform generation for a segmented liquid crystal display.
94+,   for waveform generation for a matrix liquid crystal display.

209 Field period polarity reversal:
This subclass is indented under subclass 208. Subject matter in which the waveforms applied to the display elements* are alternatively supplied in a positive and negative manner.

210 Having three or more voltage levels:
This subclass is indented under subclass 208. Subject matter in which the waveform includes pulses with at least three different voltage values in driving the display elements*.

211 Display power source:
This subclass is indented under subclass 204. Subject matter wherein the display elements* have a specified electrical power source and the power source includes means for controlling power supplied relative to a display element* characteristic; e.g., varied current for varied size of element.

SEE OR SEARCH CLASS:
315,   Electric Lamp and Discharge Devices: Systems, subclasses 169.1+ for combination of display and an energizing source not limited to selective electrical control of the resultant image.
323,   Electricity: Power Supply or Regulation Systems, appropriate subclasses for specifics of a power supply.
349,   Liquid Crystal Cells, Elements and Systems, subclasses 19+ for a particular energizing source for a liquid crystal cell structure.

359,   Optical: Systems and Elements, subclasses 245+ for electro-optic displays and an energizing source not limited to selective electrical control of the resultant image; subclasses 265+ for electrochromic displays and an energizing source not limited to selective electrical control of the resultant image.

212 Regulating means:
This subclass is indented under subclass 211. Subject matter wherein the controlling means limits the power supplied to the display elements* in some manner (e.g., establishing a maximum voltage to be applied to the display elements* or establishing a certain time period for the driving voltage to be applied).

213 Synchronizing means:
This subclass is indented under subclass 211. Subject matter wherein the power source includes a clock means for providing timing signals to the display elements* to display the image data* at a certain time.

214 Controlling the condition of display elements:
This subclass is indented under subclass 204. Subject matter includes means to maintain the operational properties of the display elements*(e.g., to maintain the display elements* within a certain operational range).

215 Including priming means:
This subclass is indented under subclass 214. Subject matter including means for controlling the readiness of the display elements* to be activated (e.g., by initially charging the display elements*).

418 COMPUTER GRAPHICS PROCESSING:
This subclass is indented under the class definition. Subject matter wherein data is displayed to a user for visual viewing (e.g., control of the form of the data on a CRT, monitor, screen, display device, or any generic visual output device).

(1)   Note. Subject matter of this subclass may include means or steps for interaction between a user and the display.

(2)   Note. Processing of interactive data for presentation with at most a nominal recitation of the input device (i.e., where the user's input is used to control the presentation of display data) is classified herein.

(3)   Note. Means or steps for creating or manipulating s:graphics objects or text is classified herein or a further subclass thereof.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
1.1   through 111, for details of specific display systems. See note (3) above.
581   through 618, for display attribute con. See note (3) above.
156   through 184, for user input interface with a specific display system (e.g., mouse, light pen, touch tablet). See note (2) above.

SEE OR SEARCH CLASS:
358,   Facsimile and Static Presentation Processing, subclasses 1.1 through 1.18 for static presentation processing.
463,   Amusement Devices: Games, subclasses 1+, where there is recited a method or apparatus for moving or processing information specified as game or contest information (e.g., a video game, etc.), especially subclasses 31+ for specifics of processing visual information data in a game or contest appropriate for Class 463.

419   **Three-dimension:**
This subclass is indented under subclass 418. Subject matter wherein objects are pictured to show them as they appear to the eye with reference to relative distance or depth from an imaginary viewpoint.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
653,   for rotation of a graphical object in three dimensions.
664,   for manipulating the size of a graphical object in three dimensions.
679,   for translation of a graphical object in three dimensions.

420   **Solid modelling:**
This subclass is indented under subclass 419. Subject matter wherein complex objects are represented as a combination of simpler shapes or primitives and the relationships between them.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
423,   for the process of dividing a surface or 3D graphic object into smaller surfaces.

421   **Hidden line/surface determining:**
This subclass is indented under subclass 419. Subject matter wherein it is determined whether a portion of an object is hidden or covered by another object and, if so, not displaying (removing) that portion of the object which is hidden.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
629   through 641, for merging or overlapping graphic objects.

422   **Z buffer (depth buffer):**
This subclass is indented under subclass 421. Subject matter wherein a memory having locations corresponding to display locations stores distance information* which is used to determine which objects or portions of objects are hidden.

423   **Tessellation:**
This subclass is indented under subclass 419. Subject matter which includes the process of dividing a surface or 3D graphic object into smaller surfaces or 3D graphic objects.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
420,   for solid modeling of complex objects.

424   **Voxel:**
This subclass is indented under subclass 419. Subject matter wherein a volume element represents a value at a point in three-dimensional space (similar to a pixel in two-dimensional space).

426 **Lighting/shading:**
This subclass is indented under subclass 419. Subject matter which determines intensity or color on a surface of the object taking into consideration light sources, surface characteristics and object orientation.

427 **Space transformation:**
This subclass is indented under subclass 419. Subject matter wherein a 3D coordinate data set representing a 3D model is manipulated to create a 2D coordinate data set representing a proper perspective view of an object from an imaginary viewpoint.

428 **Adjusting level of detail:**
This subclass is indented under subclass 418. Subject matter wherein a change is made in the resolution of a graphic object.

(1) Note. In three-dimensional systems resolution is used to account for distance or atmospheric conditions.

SEE OR SEARCH THIS CLASS, SUBCLASS:
698, and 699, for systems that convert the resolution of a display screen from one stan to another (e.g., VGA, EGA, etc.).

440 **Graph generating:**
This subclass is indented under subclass 418. Subject matter wherein a set of display points define a graph showing a relationship between two or more variables.

440.1 **Real-time waveform display:**
This subclass is indented under subclass 440. Subject matter wherein the graph represents a real time waveform.

440.2 **Bar graph:**
This subclass is indented under subclass 440. Subject matter wherein the graph is a variable length line.

441 **Shape generating:**
This subclass is indented under subclass 418. Subject matter wherein a set of display points define a two-dimensional representation of a s:graphic object.

442 **Curve:**
This subclass is indented under subclass 441. Subject matter wherein the graphic object defined is a curved line, e.g., arc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
443, for defining the graphical object as a straight line.

443 **Straight line:**
This subclass is indented under subclass 441. Subject matter wherein the graphic object defined is a straight line, e.g., using Bresenham's algorithm.

SEE OR SEARCH THIS CLASS, SUBCLASS:
442, for defining the graphical object as a curve line.

467 **Character generating:**
This subclass is indented under subclass 418. Subject matter wherein a character data element is generated.

SEE OR SEARCH THIS CLASS, SUBCLASS:
25, through 26, for data responsive CRT display control for alphanumeric display.
192, through 195, for character memory display storage device.
467 through 472, for display attribute controllers for character display.

468 **Character geometry processing:**
This subclass is indented under subclass 467. Subject matter wherein the character data element is generated based on a geometric attribute.

469 **Character generation using control points or hints:**
This subclass is indented under subclass 468. Subject matter wherein the character data element is generated based on intersecting and nonintersecting control points or additional processing instructions that are coded to the font contours.

469.1   **Character border:**
This subclass is indented under subclass 467. Subject matter wherein the character data element is generated based on an outline or an edge of a character to be displayed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
470,   for generating character fill data from outline data involving significant data processing.

470   **Generating character fill data from outline data:**
This subclass is indented under subclass 467. Subject matter wherein formation of display data within the confines of outer and inner perimeters of textual characters is performed.

471   **Alteration of stored font:**
This subclass is indented under subclass 467. Subject matter wherein the existing font parameter is modified to create a different appearance.

472   **Scaling:**
This subclass is indented under subclass 471. Subject matter wherein a size of displayed font is modified.

SEE OR SEARCH THIS CLASS, SUBCLASS:
660,   for changing the size of a graphical object.

472.1   **Reduction only:**
This subclass is indented under subclass 472. Subject matter where a size of displayed font is compressed only.

472.2   **Enlargement only:**
This subclass is indented under subclass 472. Subject matter where a size of displayed font is expanded only.

472.3   **Calligraphic:**
This subclass is indented under subclass 467. Subject matter where the character data element generated is for a certain language including pictograms (e.g., Katakana, Chinese, Korean, hieroglyphics, etc.).

473   **Animation:**
This subclass is indented under subclass 418. Subject matter wherein a sequence of individual display images are generated for presentation as a sequence to simulate motion (e.g., cartoons).

474   **Motion planning or control:**
This subclass is indented under subclass 473. Subject matter wherein locations traversed by animation are planned or controlled, particularly where a path is to be maintained or objects on a path are to be avoided.

475   **Temporal interpolation or processing:**
This subclass is indented under subclass 473. Subject matter wherein movement using a series of computed intermediate positioned displays is displayed.

501   **COMPUTER GRAPHIC PROCESSING SYSTEM:**
This subclass is indented under the class definition. Subject matter comprising apparatus or method for processing or manipulating data for presentation by a computer prior to use with or in a specific display system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
27,   through 28 and 507+, for subject matter including display memory organization and structure for storing an image and manipulating image data between the display memory and the display system.

SEE OR SEARCH CLASS:
348,   Television, appropriate subclasses for TV video signal processing.
382,   Image Analysis, appropriate subclasses for image data analysis systems.
711,   Electrical Computers And Digital Processing Systems: Memory, appropriate subclasses for memory addressing, accessing, and controlling.

502   **Plural graphics processors:**
This subclass is indented under subclass 501. Subject matter wherein more than one graphics processor is used.

SEE OR SEARCH CLASS:
712,   Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 1 through 43 for arrangements of processors for performing data processing in general.

503   Coprocessor (e.g., graphic accelerator):
This subclass is indented under subclass 502. Subject matter wherein two or more graphics processors operate concurrently with the different processors performing different types of operations to increase the system performance.

504   Master-slave processors:
This subclass is indented under subclass 502. Subject matter wherein one graphics processor (master) supervises or controls the operations of one or more other s:graphics processors (slaves).

505   Parallel processors (e.g., identical processors):
This subclass is indented under subclass 502. Subject matter wherein the plurality of processors operate simultaneously.

506   Pipeline processors:
This subclass is indented under subclass 502. Subject matter wherein the plural processors are operated sequentially.

519   Integrated circuit (e.g., single chip semiconductor device):
This subclass is indented under subclass 501. Subject matter wherein one or more of the components of a graphic processing systems are composed on an single semiconductor chip.

SEE OR SEARCH CLASS:
365,   Static Information Storage and Retrieval, appropriate subclasses, in particular subclass 189.011 and 230.01+ for read/write and addressing circuitry for a semiconductor structure device.
712,   Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 1 through 43 for microprocessor architecture formed on one chip.

520   Interface (e.g., controller):
This subclass is indented under subclass 501. Subject matter including a means for communicating or controlling between one of graphic processing component and another graphic processing component.

522   Graphic command processing:
This subclass is indented under subclass 501. Subject matter wherein a CPU or a host computer issues a command to a graphic processing system to perform an operation.

(1)   Note. Claims which recite processing commands specifically for a graphics system are classified herein.

SEE OR SEARCH CLASS:
712,   Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 200 through 203 for general instruction processing, such as, instruction prefetching, fetching, execution, etc.

530   Computer Graphics Display Memory System:
This subclass is indented under the class definition. Subject matter wherein a storage system or display memory organization and structure is used for storing image data which is being created and processed for presentation.

(1)   Note. The use of a memory system for processing in conjunction with a data presentation/computer graphics system (e.g., for manipulating the addressing or contents of image data stored in a memory) is classified herein.

(2)   Note. Classification herein requires more than nominal recitation of memory accessing or controlling in combination with graphics processing systems. A nominal combination refers to a combination wherein one or more of the means or steps thereof are recited so broadly, and without details, as to constitute a

mere identification rather than a description of each means or step.

(3)   Note. Memory devices, per se, are classified in their respective device classes. See the SEARCH CLASS notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

27   through 28, for visual display systems with selective electrical control.

418   through 475, for 3D graphics processing subclasses.

SEE OR SEARCH CLASS:

348,   Television, particularly subclasses 714 through 718 for details of static storage device for storing video data.

358,   Facsimile And Static Presentation Processing, particularly subclass 444 for memory interface and subclasses 1.16-1.17 memory for processing data for static presentation (i.e., for viewing on a fixed medium such as paper).

360,   Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses for magnetic disks, tapes, drums, etc.

365,   Static Information Storage and Retrieval, various subclasses for static memory devices including internal elements of the memory, particularly subclasses 189.011 through 189.19 for read/write circuits and subclasses 230.01-230.09 for addressing of addressable, static single storage elements or plural elements; subclass 189.05 for buffering or latching data being read from or written to memory; subclass 189.08 for logic devices in combination with memory systems; subclasses 200 and 201 for testing of memory systems; and subclass 230.08 for buffering and latching address data being employed to access memory.

382,   Image Analysis, particularly subclass 305, image storage and retrieval.

463,   Amusement Devices: Games, particularly subclass 43 for data storage or retrieval.

707,   Data Processing: Database, Data Mining, and File Management or Data Structures, subclasses 609 through 686 and 705 through 789 for data retrieval and file or database management; and subclasses 790 through 812 for database design and data structures per se; and subclasses 821 through 831 for file management.

709,   Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring, appropriate subclasses for transferring data between memories of different computers directly (i.e., with minimum or no intervention from graphics processors of the computers).

710,   Electrical Computers and Digital Data Processing Systems: Input/Output, particularly subclass 22 for direct memory access (DMA) (i.e., the transferring of data between peripherals and memories of a computer or digital data processing system with minimal or no intervention from the main processor of the computer or digital data processing system).

711,   Electrical Computers and Digital Processing Systems: Memory, appropriate subclasses for the storage device and storage accessing and control where there is no recitation of image or graphics information in the claims.

714,   Error Detection/Correction a Fault Detection/Recovery, particularly subclass 718 for memory testing.

531   **Graphics display memory controller:**
This subclass is indented under subclass 530. Subject matter including means for controlling the read/write operations of the graphics display memory.

SEE OR SEARCH CLASS:

711,   Electrical Computers and Digital Processing Systems: Memory, subclasses 100, 154-166 for generic or main memory access and control.

365,   Static Information Storage and Retrieval, subclasses 189.01 through 189.19 for read/write circuit.

532   **Plural memory controllers:**
This subclass is indented under subclass 531. Subject matter wherein two or more memory controllers are used for controlling the read/write operations of the graphics display memory.

533   **Using different access modes:**
This subclass is indented under subclass 531. Subject matter wherein different access modes are used for controlling the read/write operations of the graphics display memory (e.g., raster scan mode, block mode, burst mode, accessing each memory devise sequentially and in parallel etc.).

534   **Memory access timing signals:**
This subclass is indented under subclass 531. Subject matter wherein the means for accessing the graphics display memory is based on the read/write timing control signals.

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclasses 167 through 169 for generic or main memory access timing.

535   **Memory arbitration:**
This subclass is indented under subclass 531. Subject matter including means for granting one of the plurality of requesters access to the graphics display memory based on the requester priority information.

SEE OR SEARCH CLASS:
711,   Electrical Computer and Digital Processing System: Memory, subclasses 151 and 158 for accessing memory not related to a computer graphics display memory, such as, main or system memory.

536   **Plural storage devices:**
This subclass is indented under subclass 530. Subject matter wherein the graphic system includes more than one storage device.

(1)   Note. Included are memory devices or storage having a special or unique function or characteristic.

SEE OR SEARCH THIS CLASS, SUBCLASS:
1.1   through 3.4, for plural display systems.

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclass 5 for multiple memory modules.

537   **Data transfer between memories:**
This subclass is indented under subclass 536. Subject matter wherein image data is transferred from one graphics display memory device to another graphics display memory device.

(1)   Note. Bit block transfers are transfers within the same memory and are not classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
562,   for bit block transfers.

538   **Data transfer between system memory and graphics display memory:**
This subclass is indented under subclass 537. Subject matter wherein image data is transferred between the system or main memory and the graphics display memory.

SEE OR SEARCH THIS CLASS, SUBCLASS:
552,   for transfer of texture data between system memory and texture memory.

539   **Double buffered:**
This subclass is indented under subclass 536. Subject matter wherein image data is written to one frame buffer and concurrently read out to the display from the other buffer and the function of the two buffers are switched during the next access cycle.

540   **Interleaved:**
This subclass is indented under subclass 536. Subject matter wherein adjacent data within an image/frame are stored or located in different rows or banks of memory.

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclass 127, cache memory interleaved; and subclass 157, interleaving.

541   **Shared memory:**
This subclass is indented under subclass 530. Subject matter wherein the memory is shared between plural graphics processors or between a host processor and graphics processors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
546,   for multi-format frame buffer for storing both graphics data and video data

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclasses 147 through 153, shared memory area.

542   **Unified memory architecture (e.g., UMA):**
This subclass is indented under subclass 541. Subject matter wherein a portion or part of the main or system memory is used as graphics display memory.

543   **Memory allocation:**
This subclass is indented under subclass 530. Subject matter wherein the memory locations are reserved or assigned for use by different processors or data.

(1)   Note. The memory locations can also be reassigned.

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclass 153, shared memory partitioning and subclasses 170-173, memory configuring.

544   **Memory partitioning:**
This subclass is indented under subclass 530. Subject matter wherein the memory is divided into individual sections.

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Processing Systems: Memory, subclass 153, shared memory partitioning and subclass 173, memory partitioning.

545   **Frame buffer:**
This subclass is indented under subclass 530. Subject matter wherein the graphics display memory stores the contents of a screen of display image.

(1)   Note. Frame buffer is also known as refresh buffer, bitmap memory, graphics memory, etc.

546   **Multi-format frame buffer:**
This subclass is indented under subclass 545. Subject matter wherein the frame buffer memory stores both video and graphics data, such as, YUV for video and RGB for graphics.

(1)   Note. The above data refer YUV for video and RGB for graphics.

SEE OR SEARCH THIS CLASS, SUBCLASS:
541,   for shared memory.

547   **Memory for storing video data:**
This subclass is indented under subclass 545. Subject matter wherein the graphics display memory stores motion video pictures data which is processed by the graphics system for displaying on the computer display device.

(1)   Note. The memory used for processing, storing, and displaying on the computer graphics display is classified herein.

SEE OR SEARCH CLASS:
348,   Television, subclasses 714 through 718, memory for processing, storing, and displaying still or motion video data in the TV environment.

548   **Off-screen memory:**
This subclass is indented under subclass 545. Subject matter wherein the portion of the frame buffer stores information not currently being displayed.

549   Color memory:
This subclass is indented under subclass 545. Subject matter wherein the graphics display memory stores color image information.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
22,   for color display.
589   through 605, for color processing or modification.

550   Multiple planes:
This subclass is indented under subclass 549. Subject matter wherein the graphics display memory includes plurality of color planes for storing color image information which may be accessed independently.

551   Character memory:
This subclass is indented under subclass 545. Subject matter wherein the graphics display memory retains codes which represent an alphanumeric symbol.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
23,   141, and 467-472, for generating, processing or displaying character.

SEE OR SEARCH CLASS:
358,   Facsimile and Static Presentation Processing, particularly subclass 1.11, for character or font.

552   Texture memory:
This subclass is indented under subclass 530. Subject matter wherein the graphics display memory is used for storing shading and other attribute information where the information is added to the 'surface' of a graphical image or object to mimic the surface detail of real objects.

(1)   Note. Texture cache memory is also classified herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
538,   for texture data transfer between the system memory and the graphics display memory.
582   through 588, for texture mapping.

553   Display list memory:
This subclass is indented under subclass 530. Subject matter wherein the graphics display memory is used for storing the pixel parameters information of the primitives to be rendered by the graphics processor where the parameters also 'instruct' the graphics processor to draw polygons, lines, vectors, points, and other graphics primitives.

554   Multi-port memory:
This subclass is indented under subclass 530. Subject matter wherein the graphics display memory is configured such that there is more than one access port to and from the graphics display memory.

SEE OR SEARCH CLASS:
365,   Static Information Storage and Retrieval, appropriate subclasses for a generic memory device; particularly subclasses 230.01 through 230.09 for addressing memory.
711,   Electrical Computers and Digital Processing Systems: Memory, subclass 149 for a network memory.

555   For storing compressed data:
This subclass is indented under subclass 530. Subject matter wherein the quantity of the image information is reduced prior to storage in the graphics display memory.

SEE OR SEARCH CLASS:
382,   Image Analysis, subclasses 232 through 253 for image data compression.

556   For storing condition code, flag or status:
This subclass is indented under subclass 530. Subject matter wherein the graphics display memory is used for storing codes which represent the current state or condition of the graphics processor or image information.

557   Cache:
This subclass is indented under subclass 530. Subject matter wherein a high speed storage device stores frequently used graphics information to provide faster accesses.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
552,   for texture cache memory.

SEE OR SEARCH CLASS:
711,   Electrical Computer and Digital Pro-
        cessing Systems: Memory, sub-
        classes 118 through 146   for cache
        memory not related to a computer
        graphics display memory.

558   **First in first out (i.e., FIFO)**
This subclass is indented under subclass 530.
Subject matter wherein a memory is used in
which data are removed in the same order that
they were stored, i.e., first in is first out.

559   **Register:**
This subclass is indented under subclass 530.
Subject matter wherein a high speed memory is
used as a temporary storage to hold data for a
particular purpose in the graphic processing
system.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:
100,   for particular row or column control
        shift registers.

560   **Row buffer (e.g., line memory):**
This subclass is indented under subclass 530.
Subject matter wherein the graphics display
memory includes registers for retaining a line
of image information.

561   **Logical operations:**
This subclass is indented under subclass 530.
Subject matter wherein logical expressions,
such as, AND, OR, NOR, XOR, adder, and
multiplier operations are used by the graphics
processor to manipulate the image information.

562   **Bit block transfer:**
This subclass is indented under subclass 561.
Subject matter wherein a rectangular group of
pixels (blocks of bits describing the pixels) are
moved from one location (source) of the graph-
ics display memory to another location (desti-
nation) of the graphics display memory.

563   **Mask data operation:**
This subclass is indented under subclass 561.
Subject matter wherein the graphics display
memory stores information which selectively
allows or blocks access to previously stored
information.

564   **Addressing:**
This subclass is indented under subclass 530.
Subject matter wherein indices to the locations
of stored data elements is processed.

565   **Using memory for storing address informa-
tion:**
This subclass is indented under subclass 564.
Subject matter wherein the indices to the loca-
tions of stored data elements is stored in a reg-
ister, table, or other memory.

566   **Address manipulation:**
This subclass is indented under subclass 564.
Subject matter wherein indices to the locations
of stored data elements are modified before
being used to access the graphics display mem-
ory.

567   **Using decoding:**
This subclass is indented under subclass 566.
Subject matter wherein a decoding circuit or
device is used for deriving or selecting the indi-
ces to the locations of stored data elements.

568   **Address translation (e.g., between virtual
and physical addresses):**
This subclass is indented under subclass 566.
Subject matter including means for converting
the indices (address) from a first form (e.g.,
virtual or logical) to a second form (physical
or real).

SEE OR SEARCH CLASS:
711,   Electrical Computers and Digital Pro-
        cessing Systems: Memory, sub-
        classes 202 through 209 for mapping
        memory addresses not related to a
        computer graphics display memory,
        such as, main or system memory.

569 **For 2D coordinate to linear address conversion:**
This subclass is indented under subclass 564. Subject matter including means for converting X, Y coordinate addresses into linear or sequential addresses.

570 **Page mode:**
This subclass is indented under subclass 564. Subject matter including accessing sequential memory locations in the graphics display memory with reduced cycle time.

571 **Memory addresses arranged in a matrix (e.g., row and column addresses):**
This subclass is indented under subclass 564. Subject matter wherein storage locations are arranged to form rows and columns accessible by a single row and column address.

572 **Address generator:**
This subclass is indented under subclass 564. Subject matter including means for generating indices to the locations of stored data elements.

SEE OR SEARCH CLASS:
711, Electrical Computers and Digital Processing Systems: Memory, subclasses 1 through 6 for generating memory addresses not related to a computer graphics display memory, such as, main or system memory.

573 **Plural address generators:**
This subclass is indented under subclass 572. Subject matter wherein more than one address generating means is used for generating indices to the locations of stored data elements.

574 **Read/Write address generator:**
This subclass is indented under subclass 572. Subject matter including particular recitation of read and/or write address generator. Enter Project number (excluding first four digits).

581 **Attributes (surface detail or characteristic, display attributes):**
This subclass is indented under subclass 418. Subject matter wherein the information is processed that relates to the characteristics of an object or portion of an image.

(1) Note. Examples of the classifiable subject matter included herein are (1) causing certain image data to be displayed in a specified manner; (2) providing brightness control and/or selectable colors for the image data to be displayed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
10 through 29, for display control relating specifically to a CRT.
30 through 111, for display control relating to a specific display device, such as a gas discharge display panel, an electroluminescent display panel, a light-emitting diode display array or a liquid crystal panel.

SEE OR SEARCH CLASS:
348, Television, appropriate subclasses for systems and subsystems for display of television (real time scanned produced) signals.
358, Facsimile and Static Presentation Processing, subclasses 1.9 through 3.32 for static presentation attribute processing.
382, Image Analysis, appropriate subclasses for previously scanned image data and for image recognition, processing, and nominal display relating to such recognition.
463, Amusement Devices: Games, subclasses 1 through 47, where there is recited a method or apparatus for moving or processing information specified as game or contest information (e.g., a video game, etc.), especially subclasses 31-34 for specifics of processing visual information data in a game or contest appropriate for Class 463.

582 **Texture:**
This subclass is indented under subclass 581. Subject matter wherein the attributes include distribution of color, intensity, translucency, or the like on a surface to give an appearance of texture, such as smooth, rough, shiny, or dull.

583   **Solid texture:**
This subclass is indented under subclass 582. Subject matter where the image is transformed to appear on a surface that includes distribution of color and intensity on said surface so as to give it the appearance of a solid having a texture, such as smooth, rough, shiny, or dull.

584   **Bump map:**
This subclass is indented under subclass 582. Subject matter where the appearance of texture or relief on a surface (a variation to the normal vector or depth dimension of the surface) is created without modification the underlying geometry of the 3D object.

585   **Non-planar surface:**
This subclass is indented under subclass 582. Subject matter where the surface is other than a single, flat surface, e.g., curved or multifaceted surface, etc.

586   **Mathematically defined:**
This subclass is indented under subclass 582. Subject matter where the texture is defined by a mathematical formula.

587   **MIP map:**
This subclass is indented under subclass 582. Subject matter where there is a set of textures consisting of an original texture map and a number of smaller versions of this original texture map, each one half the size of the previous one, and where each texture map is filtered to be smoother than the previous version, so that as the view point gets further away from the texture mapped object; the smaller the version of said MIP map is used to represent the texture.

588   **Repeating pattern:**
This subclass is indented under subclass 582. Subject matter where there is a relatively small pattern that is repeated any number of times to cover the surface to be textured.

589   **Color or intensity:**
This subclass is indented under subclass 581. Subject matter wherein the attribute includes color, brightness, or gray scale.

590   **Gamut clipping or adjustment:**
This subclass is indented under subclass 589. Subject matter where the available range of colors or intensities is either adjusted or a part of said range is made unavailable.

591   **Color processing in perceptual color space:**
This subclass is indented under subclass 589. Subject matter wherein the color values are converted into a perceptual color space.

592   **Transparency (mixing color values):**
This subclass is indented under subclass 589. Subject matter wherein color values from two or more graphic objects or images are blended based upon the transparency or opacity assigned to each graphic object or image.

593   **Color selection:**
This subclass is indented under subclass 589. Subject matter where colors are selected either automatically or manually.

594   **Using GUI:**
This subclass is indented under subclass 593. Subject matter where a graphical user interface is used to select the colors.

SEE OR SEARCH CLASS:
715,   Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing, subclasses 700 through 867 for a graphical user interface, per se.

595   **Expert system or AI:**
This subclass is indented under subclass 593. Subject matter where colors are selected by use of artificial intelligence or an expert system.

SEE OR SEARCH CLASS:
706,   Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence or an expert system.

596   **Dither or halftone:**
This subclass is indented under subclass 589. Subject matter where a color (which may be a shade of gray) of an image, which would otherwise not be displayable, is reproduced by using pixels of varying size, density, placement, or

color to give the impression of areas of gray or to approximate an undisplayable color.

SEE OR SEARCH CLASS:
358,   Facsimile and Static Presentation Processing, subclasses 3.06 through 3.2 for static presentation halftone processing.

597   Color:
This subclass is indented under subclass 596. Subject matter where a color other than gray is approximated.

598   Spatial:
This subclass is indented under subclass 597. Subject matter where a color other than gray is approximated by placement of pixels.

599   Spatial:
This subclass is indented under subclass 596. Subject matter where a shade of gray is approximated by placement of pixels.

600   Color bit data modification or conversion:
This subclass is indented under subclass 589. Subject matter where the number of bits used to represent each pixel is modified or where the system of encoding the bits to represent a given color is altered.

601   Using look up table:
This subclass is indented under subclass 600. Subject matter wherein the bits representing an image s pixel are transformed or modified by using a color look up table.

602   Plural look up tables:
This subclass is indented under subclass 601. Subject matter where there are plural color look up tables that are usually selectable to select a desired transformation or modification.

603   Format change (e.g., NTSC to RGB, RGB to composite, or XYZ to RGB):
This subclass is indented under subclass 600. Subject matter where the organization, arrangement, or final form of the encoding of the color bits is altered in order to change the format of the image from one format to a different format.

604   Color space transformation (e.g., RGB to YUV):
This subclass is indented under subclass 600. Subject matter where one system of representing the color spectrum is changed to another system in accordance with a mathematical rule.

605   Change in number of bits for a designated color (e.g., 4 bits to 8 bits, 8 bits to 4 bits):
This subclass is indented under subclass 600. Subject matter wherein the transformation of the color information includes a conversion in the quantity of bits used to describe a certain color.

606   Interpolation of attribute values across object surface:
This subclass is indented under subclass 581. Subject matter wherein a value of an attribute is determined that lies between two known values.

607   In perspective:
This subclass is indented under subclass 606. Subject matter wherein the interpolation modifies the image data to produce either a perspective or a shadow effect (e.g., providing a 3D effect on a two-dimensional display, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
419,   for three-dimensional presentation involving significant data processing.

608   Tri-linear:
This subclass is indented under subclass 606. Subject matter wherein the interpolation is performed as a series of three or more linear interpolations in three-dimensional space.

609   Bi-linear:
This subclass is indented under subclass 606. Subject matter wherein the interpolation is performed as a series of linear interpolations on a plane or two-dimensional space.

610   Linear:
This subclass is indented under subclass 606. Subject matter wherein the interpolation is performed between two values.

611   **Anti-aliasing or image smoothing:**
This subclass is indented under subclass 581. Subject matter wherein stair-step effects or jagged edges are removed from the graphical display.

SEE OR SEARCH CLASS:
382,   Image Analysis, subclass 269 for image enhancement with nominal display control.

612   **Save attributes for each object affecting a given pixel:**
This subclass is indented under subclass 611. Subject matter wherein each pixel stores information defining the attributes of each object affecting the pixel.

(1)   Note. Attributes can include color, intensity, transparency, opacity, depth, normal vector, or reflection coefficients.

613   **Subpixel processing:**
This subclass is indented under subclass 611. Subject matter wherein each pixel is treated as a collection of smaller regions and the resulting displayed pixel value is the average of the value from each region.

614   **Pixel fragment:**
This subclass is indented under subclass 611. Subject matter wherein information defining the percentage or portion of a pixel covered by an object is saved or used to determine the pixel s final attribute.

615   **Convolving technique:**
This subclass is indented under subclass 611. Subject matter wherein a displayed output value is derived by obtaining an average from a number of input values, or wherein a displayed output value is based on convolving a corresponding input value and neighboring input values, so that the output values provide a display wherein stair-step effects or jagged edges are removed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
673,   for similar averaging technique.

SEE OR SEARCH CLASS:
708,   Electrical Computer: Arithmetic Processing and Calculating, subclasses 315,420, and 445, for the use of similar convolution techniques for calculation in digital or analog computers.

616   **Error diffusion:**
This subclass is indented under subclass 611. Subject matter where error obtained while calculating a pixel value is carried over to calculations used to determine the next pixel value.

617   **Contrast:**
This subclass is indented under subclass 581. Subject matter where difference in the light and dark areas of an image is controlled.

618   **Image with abnormal condition:**
This subclass is indented under subclass 581. Subject matter wherein the attribute is a characteristic of a portion of an image that is abnormal.

619   **Graphic manipulation (object processing or display attributes):**
This subclass is indented under subclass 418. Subject matter wherein data representing either a graphic object or a display attribute is manipulated.

(1)   Note. This subclass provides for generating and processing data representing a graphic object.

(2)   Note. Examples of the classifiable subject matter included herein are: (1) causing certain image data to be displayed in a specified manner, (2) providing rotation of an image or object, (3) providing movement of an image or object, and (4) providing magnification (i.e., size change) of an image or object.

SEE OR SEARCH THIS CLASS, SUBCLASS:
441,   for generating a graphic shape without manipulation.

620   **Clipping:**
This subclass is indented under subclass 619. Subject matter wherein a graphic object is restricted to a particular region in the presenta-

tion space, with those portions not in said space being removed.

621 Based on model of objects:
This subclass is indented under subclass 620. Subject matter where the clipping is based on a computer emulation of the graphical object being clipped.

622 Testing or using bounding shape (e.g., bounding box or sphere):
This subclass is indented under subclass 621. Subject matter where clipping operation is generated by comparing a shape against the graphical object to be clipped.

623 Object clipped to view volume:
This subclass is indented under subclass 621. Subject matter where the particular region is a volume that is to be projected onto a view plane.

624 Object clipped to another object:
This subclass is indented under subclass 621. Subject matter where another graphical object is used to generate a clipping operation.

625 Based on image data:
This subclass is indented under subclass 620. Subject matter where the clipping operation is based on data relating to a previously generated image.

626 Masking:
This subclass is indented under subclass 625. Subject matter where there is a filter that selectively includes or excludes the object being clipped.

627 Non-rectangular array:
This subclass is indented under subclass 625. Subject matter where the particular region has a shape other than a rectangle.

628 Rectangular region:
This subclass is indented under subclass 625. Subject matter where the particular region has a rectangular shape.

629 Merge or overlay:
This subclass is indented under subclass 619. Subject matter wherein data of a first image and data of a second image are manipulated to generate a composite image.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
421, for determining whether a portion of an object is hidden or covered by another object.

630 Combining model representations:
This subclass is indented under subclass 629. Subject matter where one object model is formed from a combination of two or more object models.

631 Reducing redundancy:
This subclass is indented under subclass 629. Subject matter where redundant portions of the combined model are removed.

632 Placing generated data in real scene:
This subclass is indented under subclass 629. Subject matter where a graphic object is placed within an image of a real scene.

633 Augmented reality (real-time):
This subclass is indented under subclass 632. Subject matter where the graphic objects are related to objects in the real scene and are presented in real-time.

634 Image based:
This subclass is indented under subclass 629. Subject matter where a first image is conveyed in front of a second image usually using bit map graphic techniques.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
4 through 6, for stacked superimposed display devices.

635 Non-overlapping:
This subclass is indented under subclass 634. Subject matter wherein no part of the first image lies on top of any part of the second image.

636 Character and graphics:
This subclass is indented under subclass 634. Subject matter wherein a graphical object is merged or overlaid on a textual character or vice versa.

637　Priority based:
This subclass is indented under subclass 634. Subject matter wherein objects are selected for merge or overlay is prioritized.

638　Insertion of bitmapped moving picture:
This subclass is indented under subclass 634. Subject matter wherein a motion picture is merged or overlaid onto a still image.

639　Weighted:
This subclass is indented under subclass 634. Subject matter where the first image is conveyed upon the second image based upon a weighting value.

640　Weights vary across image (e.g., transition from foreground to background):
This subclass is indented under subclass 639. Subject matter where the first image is conveyed upon the second image based upon a weighting value that varies across the image.

641　Fixed overlay pattern:
This subclass is indented under subclass 634. Subject matter where one of the images is a fixed pattern.

642　Picking:
This subclass is indented under subclass 619. Subject matter where an object or group of objects closest to a given location or region are identified for further processing.

643　Arithmetic processing of image data:
This subclass is indented under subclass 619. Subject matter wherein graphical data is operated on according to algorithms involving particular functions wherein details of such particular functions are disclosed.

644　Matrix calculations:
This subclass is indented under subclass 643. Subject matter wherein principle operations are performed on data arranged in rows and columns, including transforming functions arranged in rows and columns.

645　Hierarchy of transformations (e.g., hierarchy of global and local coordinate):
This subclass is indented under subclass 643. Subject matter where in one mathematical operation is fully dependent on the results of a previous operation, which serves as its reference.

646　Morphing:
This subclass is indented under subclass 619. Subject matter where one image is warped so as to becomes another image.

647　Distortion:
This subclass is indented under subclass 619. Subject matter where objects in an image are changed from their usual, original, natural, or intended shape.

648　Affine:
This subclass is indented under subclass 619. Subject matter wherein the graphic object or image is manipulated by an arbitrary sequence of least two of rotation, translation, and scaling or manipulated by shearing.

(1)　Note. The manipulation of the graphic object or image by only one of rotation, translation, and scaling is classified below in the rotation, scaling, or translation subclasses.

649　Rotation:
This subclass is indented under subclass 619. Subject matter wherein the image movement is an angular displacement of the image data.

SEE OR SEARCH CLASS:
340,　Communications: Electrical, subclasses 815.86 through 815.88　for rotary visual indicator.
382,　Image Analysis, subclasses 296 through 297　for image rotation undertaken to correct geometric distortion or misregistration.

650　Graphical user interface tools:
This subclass is indented under subclass 649. Subject matter where the rotation is specified interactively by a user.

651　Alignment functions (e.g., snapping, gravity):
This subclass is indented under subclass 650. Subject matter where the system aids the user in rotating the object.

652   Constrained manipulations (e.g., movement in less than all dimensions):
This subclass is indented under subclass 650. Subject matter where the system aids the user by limiting the manipulation to a selected subset of available axis.

653   3D manipulations:
This subclass is indented under subclass 650. Subject matter wherein the object may be rotated on any axis in three-dimensional space.

654   2D manipulations:
This subclass is indented under subclass 650. Subject matter where the object may be rotated on any axis within a two-dimensional space or plane.

655   Object based:
This subclass is indented under subclass 649. Subject matter where the rotation is based upon some characteristic of a graphical object that is rotated.

656   Image based (addressing):
This subclass is indented under subclass 649. Subject matter where the system performs rotation of the image by using bit map graphics.

657   By arbitrary ratio:
This subclass is indented under subclass 656. Subject matter where the image is rotatable by any angle.

658   By 90 degrees:
This subclass is indented under subclass 656. Subject matter where the image is rotated in 90-degree increments.

659   Image rotates in response to display device orientation:
This subclass is indented under subclass 656. Subject matter where the image is rotated based upon the orientation of the display device.

660   Scaling:
This subclass is indented under subclass 619. Subject matter wherein the size of the image or graphic object is changed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
472,   for scaling the size of a stored font.

SEE OR SEARCH CLASS:
382,   Image Analysis, subclasses 298 through 300 for similar processes for changing the size of an image.

661   Graphical User Interface tools:
This subclass is indented under subclass 660. Subject matter wherein the size of the image or graphic object is specified interactively by a user.

662   Alignment functions (e.g. snapping, gravity):
This subclass is indented under subclass 661. Subject matter wherein the system aids the user in scaling the object.

663   Constrained manipulations (i.e., movement in less than all dimensions):
This subclass is indented under subclass 661. Subject matter wherein where the system aids the user by limiting the manipulation to a selected subset of available sizes.

664   3D manipulations:
This subclass is indented under subclass 661. Subject matter wherein the object may be scaled in three dimensions.

665   2D manipulations:
This subclass is indented under subclass 661. Subject matter wherein the object may be scaled in two dimensions.

666   Object based:
This subclass is indented under subclass 660. Subject matter wherein the scaling is based upon a characteristic of a graphical object.

667   Image based (addressing):
This subclass is indented under subclass 660. Subject matter wherein the system performs scaling by using bit map graphics.

668   By arbitrary ratio:
This subclass is indented under subclass 667. Subject matter wherein the image is scaleable to any size.

669   By integer multiples:
This subclass is indented under subclass 667. Subject matter wherein the image is scaled in increments.

670   Reduction only:
This subclass is indented under subclass 667. Subject matter wherein the size of the image is reduced.

671   Enlargement only:
This subclass is indented under subclass 667. Subject matter wherein the size of the image is enlarged.

672   Translation:
This subclass is indented under subclass 619. Subject matter wherein the graphic object is moved to another position.

SEE OR SEARCH CLASS:
382,   Image Analysis, subclass 295 for similar processes for positioning or translating an image undertaken to correct geometric distortions or misregistration between the image and, for example, an image sensor.

673   Averaging technique:
This subclass is indented under subclass 672. Subject matter where an arithmetic mean of pixel values is used.

SEE OR SEARCH CLASS:
708,   Electrical Computer: Arithmetic Processing and Calculating, subclass 202 and 445 for generic digital averaging calculating.

674   Copying data to create additional rows or columns:
This subclass is indented under subclass 672. Subject matter where the movement of the graphical object is used to copy data to create additional rows or columns in table formatted data.

676   Graphical user interface tools:
This subclass is indented under subclass 672. Subject matter wherein the movement of the image or graphic object is specified interactively by a user.

677   Alignment functions (e.g. snapping, gravity):
This subclass is indented under subclass 676. Subject matter wherein the system aids the user in moving the object.

678   Constrained manipulations (i.e., movement in less than all dimensions):
This subclass is indented under subclass 676. Subject matter wherein the system aids the user by limiting the manipulation to a selected subset of available axis.

679   3D manipulations:
This subclass is indented under subclass 676. Subject matter wherein the object may be moved in three dimensions.

680   2D manipulations:
This subclass is indented under subclass 676. Subject matter wherein the object may be moved in two dimensions.

681   Object based:
This subclass is indented under subclass 672. Subject matter wherein the translation is based upon some characteristic of graphical object being translated.

682   Image based (addressing):
This subclass is indented under subclass 672. Subject matter wherein the system performs translation of the image by using bit map graphics.

683   Sprite:
This subclass is indented under subclass 682. Subject matter wherein a small portion of the image (sprite) is moved relative to the background.

684   Scrolling:
This subclass is indented under subclass 682. Subject matter wherein the desired image movement includes linear incremental movement.

SEE OR SEARCH CLASS:
715,   Data Processing: Presentation Processing of Document, Operator Inter-

face Processing, and Screen Saver Display Processing, subclasses 786 through 789 , for a scrolling operation performed in a graphical user interface window environment.

685   Alphanumeric:
This subclass is indented under subclass 684. Subject matter wherein the incremental movement includes displacement of a text message.

686   Memory addressing:
This subclass is indented under subclass 684. Subject matter wherein the image is scrolled by altering the addresses applied to the memory storing the image.

687   Smooth or continuous:
This subclass is indented under subclass 686. Subject matter wherein the incremental movement is smooth or continuous.

688   Attribute changes during scrolling:
This subclass is indented under subclass 684. Subject matter wherein the attributes of the image is altered when the image is scrolled.

689   Textual entry or display of manipulation information (e.g., enter or display degree of rotation):
This subclass is indented under subclass 619. Subject matter wherein the system aids the user by allowing alphanumeric entry of position or orientation or displays the current position or orientation.

690   Intensity or color driving control (e.g., gray scale):
This subclass is indented under subclass 204. Subject matter wherein the selective electrical control provides control of the brightness or light intensity or color level of the image data to be displayed.

(1)   Note. Patents classifiable here do not selectively control or create the attributes of an image or object.

(2)   Note. Attribute selection or creation is classified elsewhere in this class. See the SEE OR SEARCH THIS CLASS, SUB-CLASS notes below.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
12,   and 20, for CRT data responsive intensity control.
63,   for matrix fluid light-emitter intensity control.
77,   for matrix electroluminescent display with intensity control.
89,   for matrix liquid crystal display with gray scale capability.
581   through 618, for attribute selection or creation.

SEE OR SEARCH CLASS:
340,   Communications: Electrical, subclass 815.55 for intensity control for a visual indicator.
358,   Facsimile and Static Presentation Processing, subclasses 1.9 through 3.32 for static presentation attribute processing.

691   Temporal processing (e.g., pulse width variation over time):
This subclass is indented under subclass 690. Subject matter wherein the brightness, light intensity, or color level is controlled by using different time periods in conveying the image data.

692   Binary weighted:
This subclass is indented under subclass 691. Subject matter wherein the temporal processing is binary weighted such that subsequent subfields or pulses increase by a power of 2.

693   Non-binary weighted:
This subclass is indented under subclass 691. Subject matter wherein the temporal processing is non-binary weighted such that subsequent subfields or pulses increase by any number.

(1)   Note. If the increase is only by power of 2 then the patent is classified elsewhere in this class. See the SEE OR SEARCH THIS CLASS, SUBCLASS notes below.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
692,   for temporal processing that is binary.

694   **Spatial processing (e.g., patterns or subpixel configuration):**
This subclass is indented under subclass 690. Subject matter wherein the brightness level, light intensity level, or color level are controlled by using different areas in conveying the image data.

SEE OR SEARCH CLASS:
358,   Facsimile and Static Presentation Processing, subclasses 3.13 through 3.2 for static presentation halftone dithering.

695   **Subpixels have different shapes:**
This subclass is indented under subclass 694. Subject matter wherein subpixels have different areas or outlines or both.

696   **Changing of subpixel location over time:**
This subclass is indented under subclass 694. Subject matter wherein the arrangement of subpixels that are shown changes over time while maintaining the same brightness level, light intensity level, or color level.

697   **Including optical means:**
This subclass is indented under subclass 690. Subject matter wherein color or intensity is visualized by means of an external optical element (e.g., polarizers or lens, etc.) although produced by selective operation of the display, per se.

698   **Adjusting display pixel size or pixels per given area (i.e., resolution):**
This subclass is indented under subclass 204. Subject matter wherein the area of a display covered by a single pixel or the number of pixels per unit of area is varied.

SEE OR SEARCH CLASS:
358,   Facsimile and Static Presentation Processing, subclass 3.1 for variation of the density of a print element and subclass 3.12 for variation of the size of a print element.

699   **Controller automatically senses monitor resolution:**
This subclass is indented under subclass 698. Subject matter wherein the selective electrical control determines, without human intervention, the maximum number of pixels that can be displayed on a display.

CROSS-REFERENCE ART COLLECTIONS

901   **ELECTRONIC BOOK WITH DISPLAY:**
This subclass is indented under the class definition. Collection of art wherein the display elements* only convey information from a publication.

(1)   Note. Typically the image data* is stored by some form of removable memory, and often the display device* is portable.

902   **MENU DISPLAY:**
This subclass is indented under the class definition. Collection of art wherein the image data* includes a listing of items wherein an item may be selected as part of the selective electrical control.

SEE OR SEARCH THIS CLASS, SUBCLASS:
810   through 845, for menu data processing.

903   **MODULAR DISPLAY:**
This subclass is indented under the class definition. Collection of art wherein the display elements* are easily combinable to form a larger display device*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
1.1,   for plural display systems.

904   **DISPLAY WITH FAIL/SAFE TESTING FEATURE:**
This subclass is indented under the class definition. Collection of art wherein the selective electrical control provides for checking the accuracy of the display device*.

905   **DISPLAY DEVICE WITH HOUSING STRUCTURE:**
This subclass is indented under the class definition. Collection of art wherein the periphery of the display elements* includes a significant casing.

947   FONT CHARACTER EDGE PROCESSING:
This subclass is indented under the class definition. Collection of art for generation of character data elements wherein the perimeters of textual characters are formed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
468+,   for character font data processing.

948   ALTERATION OF STORED FONTS TO MAINTAIN FEATURE CONSISTENCY THROUGHOUT SCALED FONT:
This subclass is indented under the class definition. Collection of art for modification of existing font parameters to create a different appearance wherein specific visual or measurable attributes are retained while modifying the font data.

949   ANIMATION PROCESSING METHOD:
This subclass is indented under the class definition. Collection of art wherein a sequence of individual display images are generated for presentation as a sequence to simulate motion with special processing steps that are not provided for elsewhere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
473,   for animation data processing in general.

950   Sprite processing:
This subclass is indented under subclass 949. Collection of art wherein discrete geometric s:graphic elements are manipulated.

(1)   Note. The processing of s:graphic elements prior to frame buffer is classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
672   through 688, for image movement and position control.

951   Key frame processing:
This subclass is indented under subclass 950. Collection of art wherein key frames portraying extreme or standard positions from which intermediate positions may be inferred are pre-sented in animated sequence with appropriate interpolation.

952   Simulation:
This subclass is indented under subclass 949. Collection of art wherein animated display is created in response to a process modelling another process.

953   Geometric processing:
This subclass is indented under subclass 949. Collection of art wherein animated display is created by iterative displays of mathematically derived images.

954   Quaternions:
This subclass is indented under subclass 953. Collection of art wherein animated display is created using a set of all possible rotations.

955   Morphing:
This subclass is indented under subclass 949. Collection of art wherein animated display modifies an image into a different image by a succession of interpolated transformations blended to appear as a continuous metamorphosis.

956   Language driven animation:
This subclass is indented under subclass 949. Collection of art wherein animated display is created in response to a set of commands provided by an operator.

957   Actor:
This subclass is indented under subclass 956. Collection of art wherein animated display is created in response to a defined motion process explicitly placed in the motion sequence.

958   Collision avoidance:
This subclass is indented under subclass 949. Collection of art wherein animated display recognize and reacts to a foreseeable intersection of motion paths among multiple images.

959   Object path adherence:
This subclass is indented under subclass 949. Collection of art wherein animated display controls movement to constrain path traversal within predefined criteria.

960   Iterative display of preconfigured images:
This subclass is indented under subclass 949. Collection of art wherein animation is created by simulating movement by interactive display of a succesion of images each presenting and advance in movement from the prior image.

(1)   Note. The creation of images for subsequent iterative display is classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
473,   for paging schemes of iterative display of images.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this Class for specific correspondences. [Note: the titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100   Cathodoluminescent type:
Foreign art collection wherein the display elements generate light due to the application of electrical control through an anode or cathode to emit an electron beam at each display element to strike a phosphor layer.

FOR 101   Vacuum fluorescent:
Foreign art collection wherein the cathodoluminescent display elements include a vacuum for elec to travel through so as to excite a phos material to emit light.

FOR 102   Memory: (345/521)
Subject matter wherein the interfacing means is between a graphics processor and a storage device.

FOR 103   Data manipulation (e.g., masking, interpola): (345/523)
Subject matter wherein a graphics processor defines operations for processing and manipu the data.

FOR 104   Logical operation: (345/524)
Subject matter wherein logical expression is used by the arithmetic and logic unit (ALU) to manipulate the data.

FOR 105   Bit block transfer: (345/525)
Subject matter wherein a rectangular group of pixels (blocks of bits describing the pixels) move from one location (source) to another location (destination).

FOR 106   Data transfer between graphic system components: (345/526)
Subject matter wherein data is transferred between graphic system components (e.g., a graphic processor and a memory).

FOR 107   DISPLAY STORAGE DEVICE: (345/507)
Subject matter wherein the computer graphics processing system includes a store means manipulating the memory addressing or contents of the memory.

FOR 108   Color memory: (345/186)
Subject matter wherein the store means stores color image data*.

FOR 109   Multiple planes: (345/510)
Subject matter wherein the store means include a plurality of bit maps for storing color image data*.

FOR 110   Addressing with priority: (345/188)
Subject matter including means for assigning storage locations to the multiple planes based on priority access.

FOR 111   Bit map or graphic memory: (345/509)
Subject matter wherein the store means retains on or off (0 or 1) bits to represent one-to-one correspondence between the stored image data and the pixel data of a displayed image data.

FOR 112   Addressing: (345/515)
Subject matter including means for assigning storage locations to the picture data.

FOR 113   Mask data operation: (345/191)
Subject matter wherein the store means stores information which covers previously stored information.

FOR 114   Character memory: (345/192)
Subject matter wherein the store means retains codes which represent an alphanumeric* sym.

FOR 115   Addressing: (345/193)
Subject matter includes means for assigning storage location to the codes.

FOR 116   Character generator: (345/194)
Subject matter wherein the character memory includes a store for retaining a character pat.

FOR 117   Multiple fonts:(345/195)
Subject matter wherein the character memory includes a plurality of the character generators or provides for a plurality of character pattern styles.

FOR 118   Row buffer (e.g., line memory): (345/196)
Subject matter wherein the store means includes a register for retaining a line of the image data*.

FOR 119   Register: (345/513)
Subject matter wherein the graphic process system includes a temporary storage device, and the contents of the register are data elements or memory location addresses.

FOR 120   Shift register: (345/197)
Subject matter in which the store means retains a number of bits in a sequential manner.

FOR 121   With routing logic: (345/198)
Subject matter including a logic means cooper with the shift register for establishing read or write operation.

FOR 122   Color look-up-table (e.g., palette): (345/199)
Subject matter wherein the store means includes a palette for retaining color data.

FOR 123   Addressing circuitry: (345/516)
Subject matter wherein the computer graphics processing system includes means for assigning storage locations to the store means.

FOR 124   Memory addresses arranged in matrix (e.g., row and column addresses): (345/517)
Subject matter wherein storage locations are arranged to form rows and columns of data accessible by a single row or column address.

FOR 125   Plural storage devices: (345/508)
Subject matter wherein the store means includes a number of distinct memories.

FOR 126   Data transfer between memories: (345/511)
Subject matter wherein data is transferred from one location to another location in the same memory or between memories.

FOR 127   Shared memory: (345/512)
Subject matter wherein the memory is shared by more than one graphics processor.

FOR 128   Condition code, flag, or status: (345/514)
Subject matter wherein the contents of the stor device are codes which represent the cur state or condition of the graphics processor.

FOR 129   Multiple port access: (345/518)
Subject matter wherein the memory is config such that there is more than one access port to and from memory, also including read/ write operations.

FOR 130   Data compression or compaction: (345/202)
Subject matter wherein the quantity of the image data* is reduced prior to storage in the store means.

FOR 131   Significant data assignment in storage device: (345/203)
Subject matter wherein the image data* is stored in the store means in accordance with a certain arrangement and format.

FOR 132   PLURAL DISPLAY SYSTEMS:
Foreign art collections including more than one visual display system*.

(1)   Note. The use of adjacent CRTs to display a large image is typical of this type of plural display system.

FOR 133   Remotely located:
Foreign art collections including subject matter wherein the more than one visual display system* includes plural display terminals* which are positioned at separate

locations where they cannot be viewed simulta.

(1)   Note.   Display terminals in different offices of a work environment are typical of this type of plural display system.

FOR 134   Diverse systems (e.g., CRT/LCD interface):
Foreign art collections including subject matter wherein the plural display sys are different types.

(1)   Note. Different types of display systems include CRTs, LEDs, LCDs, plasma, etc.

FOR 135   DISPLAY   ATTRIBUTE   CONTROLLER:
Foreign art collections including subject matter wherein a desired display effect is achieved by a display controller*.

(1)   Note. Examples of the classifiable sub matter included herein are: (1) caus certain image data* to be displayed in a specified manner, (2) providing rotation of a previously generated image, (3) providing scrolling of received image data, (4) providing magnification (i.e., size change) of a previously generated image, (5) displaying the image data* at a specified resolution, and (6) providing brightness control and/or selectable col for the image data* to be displayed.

FOR 136   Particular overlay (e.g., superimposing feature):
Foreign art collections including subject matter wherein the selective electrical control includes a display in which first image data* is conveyed in front of second image data*.

FOR 137   Foreground and background:
Foreign art collections including subject matter wherein the first image data* is foreground information and the second image data* is background information.

FOR 138   Simultaneous diverse images:
Foreign art collections including subject matter wherein a plurality of distinct image data* are displayed at the same time on a display device*.

(1)   Note. Displays with distinct and pre display regions are included here.

FOR 139   Character and graphical display:
Foreign art collections including subject matter wherein the plurality of distinct image data* includes alphanumeric* and non-alphanumeric* data to be displayed.

FOR 140   Specified image of abnormal condition:
Foreign art collections including subject matter wherein the display elements* convey image data* which indicate an unusual status (e.g., an alarm indication via an icon or a change in color based on an unusual condition, etc.).

FOR 141   Having image confined to designated region (e.g., image clipping):
Foreign art collections including subject matter wherein the image data* is con within a designated area.

FOR 142   Image movement or position control (e.g., panning):
Foreign art collections including subject matter wherein the selective electrical control makes the displayed image move.

FOR 143   Scrolling:
Foreign art collections including subject matter wherein the desired image movement includes linear incremental move.

FOR 144   Alphanumeric:
Foreign art collections including subject matter wherein the incremental move includes displacement of a text message to be displayed.

FOR 145   Graphical:
Foreign art collections including subject matter wherein the incremental move includes displacement of a graphical object to be displayed.

FOR 146   Rotation:
Foreign art collections including subject matter wherein the image movement is an angular displacement of the image data*.

FOR 147   Image size control:

Foreign art collections including subject matter wherein the selective electrical control varies the size of the displayed image.

FOR 148   Alphanumeric:
Foreign art collections including subject matter wherein the display elements* convey a character message of different size.

FOR 149   Reduction:
Foreign art collections including subject matter that includes means for compressing the size of the displayed character message.

FOR 150   Enlargement:
Foreign art collections including subject matter that includes means for expanding the size of the displayed character message.

FOR 151   Graphical:
Foreign art collections including subject matter wherein the display elements* convey graphical entities of different size.

FOR 152   Defined resolution (e.g., EGA, VGA):
Foreign art collections including subject matter wherein the selective electrical control provides the image data* for a desig number of display elements*.

FOR 153   Graphic display:
Foreign art collections including subject matter wherein the display elements* convey graphical entities (e.g., geometric shapes, drawings, graphs of analog curves, bar graphs, or histograms).

FOR 154   Waveform display (e.g., oscilloscope type):
Foreign art collections including subject matter wherein the display elements* convey waveforms or graphs of analog curves.

FOR 155   Vector display:
Foreign art collections including subject matter wherein the display elements* convey a straight line from an input data which may represent terminal points or a point with magnitude and direction.

FOR 156   With image smoothing control (e.g., anti-aliasing):
Foreign art collections including subject matter wherein the selective electrical con-

trol removes stair-step effects or jagged edges from the displayed graphical entities.

FOR 157   Convolving technique:
Foreign art collections including subject matter wherein a displayed output value is derived by obtaining an average from a number of input values, or wherein a displayed output value is based on convolving a corresponding input value and neighboring input values, so that the output values provide a display wherein stair-step effects or jagged edges are removed.

FOR 158   Averaging technique:
Foreign art collections including subject matter wherein a displayed output value is derived by obtaining an average from a number of input values, or wherein a displayed output value is based on a corresponding input value and neighboring input values.

FOR 159   Perspective:
Foreign art collections including subject matter wherein the selective electrical control modifies the image data* to produce either a perspective or a shadow effect (e.g., providing a 3D effect on a two-dimensional display).

FOR 160   Bar graph:
Foreign art collections including subject matter wherein the display elements* convey a variable length-line arrangement to show the condition of a given parameter.

FOR 161   Character display:
Foreign art collections including subject matter wherein the display elements* convey numeric symbols or symbols of a certain language.

FOR 162   Calligraphic:
Foreign art collections including subject matter wherein the symbols of a certain language include pictograms; e.g., Katakana, Chinese, Korean, hieroglyphics.

FOR 163   Character border:
Foreign art collections including subject matter wherein the character data element is generated based on an outline or an edge of a character to be displayed.

FOR 164　CURSOR MANIPULATION:
Foreign art collections including subject matter wherein the selective electrical control provides a control of a movable operator-controlled display entity or cursor.

FOR 165　Menu selection:
Foreign art collections including subject matter wherein the cursor is used to select from a number of displayed items.

FOR 166　Intensity control (e.g., gray scale):
Foreign art collections including subject matter wherein the selective electrical control provides control of the brightness or light intensity level of the image data* to be displayed.

FOR 167　Temporal processing (e.g., pulse width vari over time):
Foreign art collections including subject matter wherein the brightness or light intensity level is controlled by using different time periods in conveying the image data*.

FOR 168　Spatial processing (e.g., patterns or subpixel configurations):
Foreign art collections including subject matter wherein the brightness or light intensity level is controlled by using different areas in conveying the image data*.

FOR 169　Selectable color attributes:
Foreign art collections including subject matter wherein the display elements* are capable of conveying two or more colors or wherein the image data* includes information pertaining to two or more colors to be dis.

FOR 170　Including optical means:
Foreign art collections including subject matter wherein color is visualized by means of an external optical element (e.g., polarizers or lens) although produced by selective operation of the display, per se.

FOR 171　Designated subpixel arrangement:
Foreign art collections including subject matter wherein the colors associated with the display elements* are arranged in a designated manner.

FOR 172　Color bit data modification or conversion:
Foreign art collections including subject matter wherein the selective electrical control transforms or modifies the image data* including color information to be displayed.

FOR 173　Format change (e.g., NTSC to RGB, RGB to composite, or XYZ to RGB):
Foreign art collections including subject matter wherein the transformation of the color information includes a conversion from one form to another in order to provide a desired output signal.

FOR 174　Change in number of bits for a designated color (e.g., 4 bits to 8 bits, 8 bits to 4 bits):
Foreign art collections including subject matter wherein the transformation of the color information includes a conversion in the quantity of bits in describing a certain color.

FOR 175　Synchronization of diverse media:
Foreign art collections including subject matter wherein a presentation includes elements having more than one data type where the elements are presented in a predetermined order and timing relationship.

(1)　Note. Authoring, playing, or recording a presentation which includes synchroni of different media is classified herein.

FOR 209　Mapping image onto surface of 3D object:
Foreign art collections including subject matter wherein a 2D image is trans to appear as if on a surface of a 3D object.

FOR 210　Surface detail/characteristic:
Foreign art collections including subject matter wherein the information is pro which relates to the attributes of an object or portion of an image.

FOR 211　Texture:
Foreign art collections including subject matter wherein the attributes include distribution of color and intensity on a surface to give an appearance of texture, such as smooth, rough, shiny, dull.

FOR 212　Color:

Foreign art collections including subject matter wherein the attribute includes color.

FOR 213   Intensity:
Foreign art collections including subject matter wherein the attribute is bright.

FOR 214   Object processing:
Foreign art collections including subject matter wherein the data representing a graphic object is manipulated.

(1)   Note. This subclass provides for gener and processing data representing a graphic object.

FOR 215   Clipping:
Foreign art collections including subject matter wherein the graphic object is restricted to a particular region in the presentation space, with those portions not in the space being removed.

FOR 216   Merge/overlay:
Foreign art collections including subject matter including two or more overlap graphic objects.

FOR 217   Affine:
Foreign art collections including subject matter wherein the graphic object is at least rotated (pivoted about its center point) and translated, rotated and scaled, or translated and scaled.

(1)   Note. The graphic object can also be rotated, scaled, and translated.

FOR 218   Rotation:
Foreign art collections including subject matter wherein the graphic object is pivoted about its center point.

FOR 219   Translation:
Foreign art collections including subject matter wherein the graphic object is moved to another position.

FOR 220   Scaling:
Foreign art collections including subject matter wherein the size of the graphic object is changed.

END