418 **COMPUTER GRAPHICS PROCESSING**
419 .Three-dimension
420 ..Solid modelling
421 ..Hidden line/surface determining
422 ...Z buffer (depth buffer)
423 ..Tessellation
424 ..Voxel
426 ..Lighting/shading
427 ..Space transformation
428 .Adjusting level of detail
581 .Attributes (surface detail or characteristic, display attributes)
582 ..Texture
583 ...Solid Texture
584 ...Bump map
585 ...Non-planar surface
586 ...Mathematically defined
587 ...MIP map
588 ...Repeating pattern
589 ..Color or intensity
590 ...Gamut clipping or adjustment
591 ...Color processing in perceptual color space
592 ...Transparency (mixing color values)
593 ...Color selection
594 ....Using GUI
595 ....Expert system or AI
596 ...Dither or halftone
597 ....Color
598 .....Spatial
599 ....Spatial
600 ...Color bit data modification or conversion
601 ....Using look up table
602 .....Plural look up tables
603 ....Format change (e.g., NTSC to RGB, RGB to composite, XYZ to RGB)
604 ....Color space transformation (e.g., RGB to YUV)
605 ....Change in number of bits for a designated color (e.g., 4 bits to 8 bits, 8 bits to 4 bits)
606 ..Interpolation of attribute values across object surface
607 ...In perspective
608 ...Tri-linear
609 ...Bi-linear
610 ...Linear
611 ..Anti-aliasing or image smoothing
612 ...Save attributes for each object affecting a given pixel
613 ...Subpixel processing
614 ...Pixel fragment
615 ...Convolving technique
616 ...Error diffusion
617 ..Contrast
618 ..Image with abnormal condition
619 .Graphic manipulation (object processing or display attributes)
620 ..Clipping
621 ...Based on model of objects
622 ....Testing or using bounding shape (e.g., bounding box sphere)
623 ....Object clipped to view volume
624 ....Object clipped to another object
625 ...Based on image data
626 ....Masking
627 ....Non-rectangular array
628 ....Rectangular region
629 ..Merge or overlay
630 ...Combining model representations
631 ...Reducing redundancy
632 ...Placing generated data in real scene
633 ....Augmented reality (real-time)
634 ...Image based
635 ....Non-overlapping
636 ....Character and graphics
637 ....Priority based
638 ....Insertion of bitmapped moving picture
639 ....Weighted
640 .....Weights vary across image (e.g., transition from foreground to background)
641 ....Fixed overlay pattern
642 ..Picking
643 ..Arithmetic processing of image data
644 ...Matrix calculations
645 ...Hierarchy of transformations (e.g., hierarchy of global and local coordinate)
646 ..Morphing
647 ..Distortion
648 ..Affine

649 ..Rotation
650 ...Graphical user interface tools
651 ....Alignment functions (e.g., snapping, gravity)
652 ....Constrained manipulations (e.g., movement in less than all dimensions)
653 ....3D manipulations
654 ....2D manipulations
655 ...Object based
656 ...Image based (addressing)
657 ....By arbitrary angle
658 ....By 90 degrees increment
659 ....Image rotates in response to display device orientation
660 ..Scaling
661 ...Graphical user interface tools
662 ....Alignment functions (e.g., snapping, gravity)
663 ....Constrained manipulations (i.e., movement in less than all dimensions)
664 ....3D manipulations
665 ....2D manipulations
666 ...Object based
667 ...Image based (addressing)
668 ....By arbitrary ratio
669 ....By integer multiples
670 ....Reduction only
671 ....Enlargement only
672 ..Translation
673 ...Averaging technique
674 ...Copying data to create additional rows or columns
676 ...Graphical user interface tools
677 ....Alignment functions (e.g., snapping, gravity)
678 ....Constrained manipulations (i.e., movement in less than all dimensions)
679 ....3D manipulations
680 ....2D manipulations
681 ...Object based
682 ...Image based (addressing)
683 ....Sprite
684 ....Scrolling
685 .....Alphanumeric
686 .....Memory addressing
687 ......Smooth or continuous
688 .....Attribute changes during scrolling
689 ..Textual entry or display of manipulation information (e.g., enter or display degree of rotation)
440 .Graph generating
440.1 ..Real-time waveform display
440.2 ..Bar graph
441 .Shape generating
442 ..Curve
443 ..Straight line
467 .Character generating
468 ..Character geometry processing
469 ...Character generation using control points or hints
469.1 ..Character border
470 ..Generating character fill data from outline data
471 ..Alteration of stored font
472 ...Scaling
472.1 ....Reduction only
472.2 ....Enlargement only
472.3 ..Calligraphic
473 .Animation
474 ..Motion planning or control
475 ..Temporal interpolation or processing

156 **DISPLAY PERIPHERAL INTERFACE INPUT DEVICE**

157 .Cursor mark position control device
158 ..Including orientation sensors (e.g., infrared, ultrasonic, remotely controlled)
159 ..Having variable cursor speed
160 ..Cursor key
161 ..Joystick
162 ..Positional storage means
163 ..Mouse
164 ...Rotatable ball detector
165 ....Photosensor encoder
166 ...Optical detector
167 ..Trackball
168 .Including keyboard
169 ..Portable (i.e., handheld, calculator, remote controller)
170 ..Light source associated with each key
171 ..Having foreign language capability (e.g., Japanese, Chinese)
172 ..Having programmable function key
173 .Touch panel

174 ..Including impedance detection
175 ..Including optical detection
176 ..Transparent substrate having light entrapment capability (i.e., waveguides)
177 ..Including surface acoustic detection
178 ..With alignment or calibration capability (i.e., parallax problem)
179 .Stylus
180 .Light pen for CRT display
181 ..CRT having tracking capability
182 .Light pen for fluid matrix display panel
183 .Light pen for controlling plural light-emitting display elements (e.g., LED, lamps)
184 .Mechanical control (e.g., rotatable knob, slider)
501 **COMPUTER GRAPHIC PROCESSING SYSTEM**
502 .Plural graphics processors
503 ..Coprocessor (e.g., graphic accelerator)
504 ..Master-slave processors
505 ..Parallel processors (e.g., identical processors)
506 ..Pipeline processors
519 .Integrated circuit (e.g., single chip semiconductor device)
520 .Interface (e.g., controller)
522 .Graphic command processing
530 **COMPUTER GRAPHICS DISPLAY MEMORY SYSTEM**
531 .Graphic display memory controller
532 ..Plural memory controllers
533 ..Using different access modes
534 ..Memory access timing signals
535 ..Memory arbitration
536 .Plural storage devices
537 ..Data transfer between memories
538 ...Data transfer between system memory display memory
539 ..Double buffered
540 ..Interleaved
541 .Shared memory
542 ..Unified memory architecture (e.g., UMA)
543 .Memory allocation
544 .Memory partitioning
545 .Frame buffer
546 ..Multi-format frame buffer
547 ..Memory for storing video data
548 ..Off-screen memory
549 ..Color memory
550 ...Multiple planes
551 ..Character memory
552 .Texture memory
553 .Display list memory
554 .Multi-port memory
555 .For storing compressed data
556 .For storing condition code, flag or status
557 .Cache
558 .First in first out (i.e., FIFO)
559 .Register
560 .Row buffer (e.g., line memory)
561 .Logical operations
562 ..Bit block transfer
563 ..Mask data operation
564 .Addressing
565 ..Using memory for storing address information
566 ..Address manipulation
567 ...Using decoding
568 ...Address translation (e.g., between virtual and physical addresses)
569 ..For 2D coordinate to linear address conversion
570 ..Page mode
571 ..Memory addresses arranged in matrix row and column addresses)
572 ..Address generator
573 ...Plural address generators
574 ...Read/Write address generator
204 **DISPLAY DRIVING CONTROL CIRCUITRY**
205 .Physically integral with display elements
206 ..Having common base or substrate
207 .Light detection means (e.g., with photodetector)
690 .Intensity or color driving control (e.g., gray scale)
691 ..Temporal processing (e.g., pulse width variation over time
692 ...Binary weighted
693 ...Non-binary weighted
694 ..Spatial processing (e.g., patterns or subpixel configuration)
695 ...Subpixels have different shapes
696 ...Changing of subpixel location over time
697 ..Including optical means

55 .Display elements arranged in matrix (e.g., rows and columns)
56 ..Image shifting means (i.e., traveling message)
57 ...Having endless belt or tape reader
58 ..Crosstalk elimination
59 ..Matrix for conveying alphanumeric data
60 ..Fluid light emitter (e.g., gas, liquid, or plasma)
61 ...Shifting means
62 ....Specified plasma coupling path
63 ...Intensity control
64 ...Liquid light emitter
65 ...Phosphor excited by fluid response
66 ...Particular discharge path
67 ...More than two electrodes per element
68 ...Means for combining selective and sustain signals
69 ....Resistor-diode arrangement
70 .....Including transformer
71 ...Electrode insulated from fluid medium
72 ...Color
73 ..Incandescent
74.1 ..Cathodolulminescent type
75.1 ...Vacuum fluorescent
75.2 ...Field emissive (e.g., FED, Spindt, microtip, etc.)
76 ..Electroluminescent
77 ...Brightness or intensity control
78 ...Having compensating pulse
79 ...Field period polarity reversal
80 ...Driving means integral to substrate
81 ...Optical addressing (e.g., photodetection)
82 ..Solid body light emitter (e.g., LED)
83 ...Color
84 ..Light-controlling display elements
85 ...Electroscopic (e.g., movable electrodes or electrostatic elements)
86 ...Magneto-optic
87 ...Liquid crystal display elements (LCD)
88 ....Color
89 ....Gray scale capability (e.g., halftone)
90 ....Control means at each display element
91 .....Diode or varistor
92 .....Thin film tansistor (TFT)
93 .....Redundancy (e.g., plural control elements or electrodes)
94 ....Waveform generation
95 .....Three or more voltages
96 .....Field period polarity reversal
97 .....Ferroelectric liquid crystal elements
98 ....Specific display element control means (e.g., latches, memories, logic)
99 .....Particular timing circuit
100 .....Particular row or column control (e.g., shift register)
101 ....Data signal compensation in response to temperature
102 ....Backlight control
103 ....Grouped electrodes (e.g., matrix partitioned into sections)
104 ....Input/output liquid crystal display panel
105 ...Electrochromic elements
106 ...Thermochromic elements
107 ...Particle suspensions (e.g., electrophoretic)
108 ..Plural mechanically movable display elements
109 ...Having shutters
110 ...With motor or rotor driver means
111 ...With a permanent magnet placed on movable display elements

CROSS-REFERENCE ART COLLECTIONS

901 **ELECTRONIC BOOK WITH DISPLAY**
902 **MENU DISPLAY**
903 **MODULAR DISPLAY**
904 **DISPLAY WITH FAIL/SAFE TESTING FEATURE**
905 **DISPLAY DEVICE WITH HOUSING STRUCTURE**
947 **FONT CHARACTER EDGE PROCESSING**

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