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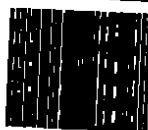
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SOLICITUD DE:



Patente de Invención.



Patente de Modelo de Utilidad.



Capítulo I.



Capítulo II.

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Anexos:



Comprobante de pago de la tasa de presentación de la solicitud por \$ 422.000.00.



Comprobante de pago por reivindicación de prioridad.



Documento que acredita la existencia y representación legal cuando el solicitante sea persona jurídica.



Poderes, si fuere el caso.



Documento de cesión del inventor al solicitante o a su causante.



Declaraciones.



Copia de la solicitud internacional. (Resumen, descripción, reivindicaciones, dibujos)



Traducción de la solicitud internacional al castellano. (Resumen, descripción, reivindicaciones, dibujos)



Copia del examen preliminar efectuado por la IPEA.



Traducción del examen preliminar efectuado por la IPEA.



De ser el caso, copia del contrato de acceso.



De ser el caso, documento que acredite la licencia o autorización de uso de conocimientos tradicionales de las comunidades indígenas.



De ser el caso, certificado de depósito del material biológico.



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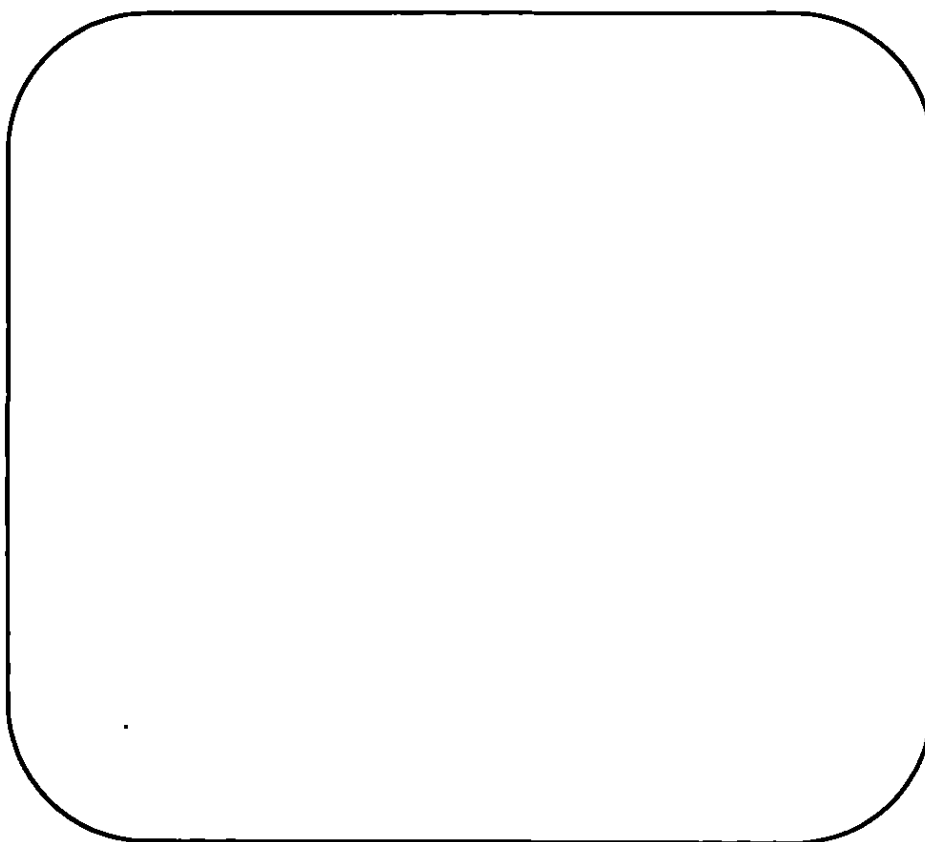
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Otros

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FIGURA CARACTERISTICA:



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Solicito la concesión de la patente,

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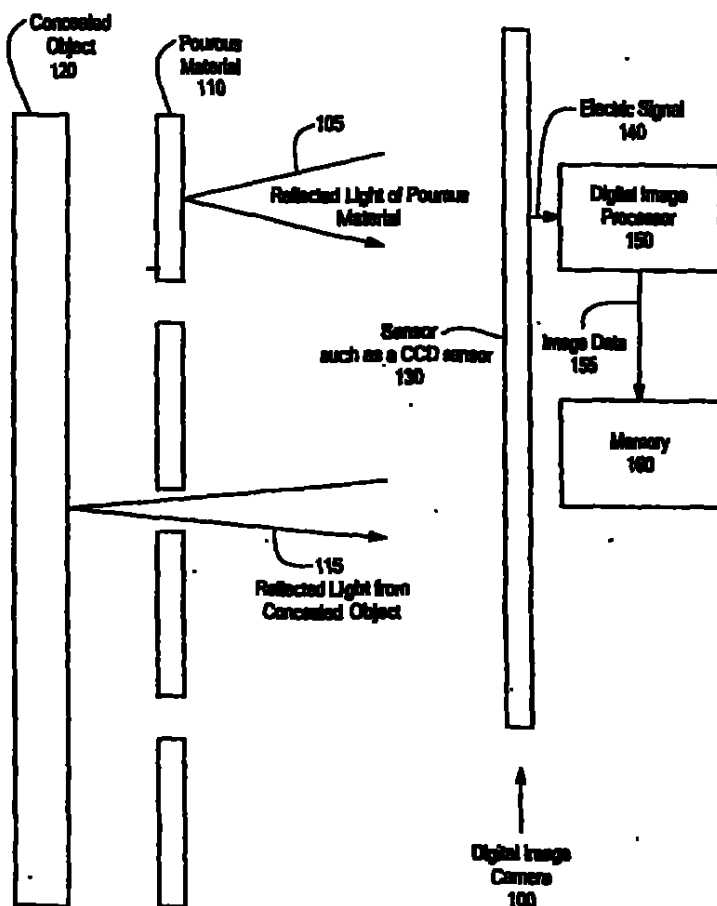
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(54) Title: CONCEALED OBJECT RECOGNITION



(57) Abstract: A method for viewing a first object that is obstructed by a second object. In such a method, the first object has a contrasting color to the second object and the second object is constructed from a material that allows visible light to pass therethrough. The amount of visible light that passes through the second object is not enough such that the first object is visible to the human eye. The method involves taking a digital image of the first and second object using a visible light sensor, such as a CCD camera sensor. The digital image data that is received into a computer system contains both first object data and second object data. It should be understood that the first object data and the second object data include color information. The amount of contrast between the first and the second object should be approximately 10% of the total scale such that on a 256 color scale the difference is approximately 25 levels. The computer system substantially filters out the second object data and then the values associated with the first object data are increased until the data is visibly displayable.

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Concealed Object Recognition

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Technical Field

The present invention relates to analysis of digital images. More specifically, the present invention relates to viewing of obstructed objects in digital images.

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Background

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Systems have been designed for viewing objects which are obstructed by other objects. For instance, x-ray detectors and infra-red detectors allow a user to subject an object to either infra-red light, x-rays, or another signal other than visible light in order to expose obstructed objects. Such systems require that the object is exposed to the signal in order for the object to be observed. It would be desirable to have a method and system for viewing obstructed objects within a digital image without having to first expose the objects to a created signal.

Summary of the Invention

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The invention in one embodiment is a method for viewing a first object that is obstructed by a second object. In such a method the first object has a contrasting color to the second object and the second object is constructed from a material that allows visible light to pass therethrough. The amount of visible light that passes through the second object is not enough such that the first object is visible to the human eye. The method involves taking a digital image of the first and second object using a visible light sensor, such as a CCD camera sensor. The digital image data that is received into a computer system contains both first object data and second object data. It should be understood that the first object data and the second object data include color information. The amount of contrast between the first and the second object should be approximately 10% of the total scale such that on a 256 color scale the difference is approximately 25 levels. The computer system substantially filters out the second object data and then the values associated with the first object

data are increased until the data is visibly displayable.

The computer system may create a histogram of the digital image data to allow a user of the system to select second object data based upon the histogram. In such an embodiment, the histogram is displayed to the user and a user selection mechanism is provided for selecting data from the histogram. The step of substantially filtering out the second object data and increasing the first object data may be achieved by increasing gamma correction to a value that is outside of the range of current graphics programs. For example, the gamma correction value may be set to a value above 2.5 and more generally in the range above 6. Filtering of the second object data can also be achieved by increasing the brightness in combination with increasing the gamma correction value.

The first object data is generally increased such that the original first object data is mapped to values where the contrast between data levels is visible to the human eye when the first object data is displayed on a display device. The mapping is also such that the original values that are low level light values which cannot be perceived when displayed on a display device are mapped to values that can be perceived by a human eye.

The method may include the step of converting the color information to greyscale before filtering the second object data and increasing/remapping the color information of the first object data.

The computer system may identify whether the first object is lighter than the second object or darker than the second object. If the second object is substantially lighter than the first object, the system may invert the first and second object data such that the second object appears darker when represented on a display device prior to filtering. The second object data may be filtered by decreasing all of the values of the second object data until the values are that for black which generally is value 0 on a scale from 0-255.

The methodology as described may also be created in a computer program product for use with a computer wherein the computer program

product contains computer code thereon. The method in one embodiment is completely automated. The methodology may also be borne out in a system that includes a camera for taking a digital image using visible light wherein the digital image that is created by the digital camera contains data representative of the first object and of the second object. The system further includes a processor for receiving the digital image and processing the digital image to filter out the second object data and increasing the values of the first object data until visibly displayable. The system may be automated or receive user activation signals for the identification of data as belonging to the second object and also gamma correction values for example.

Brief Description of the Drawings

The features of the invention will be more readily understood by reference to the following detailed description, taken with reference to the accompanying drawings, in which:

Fig. 1 shows one environment for implementing a first embodiment for concealed object recognition;

Fig 2 is a flow diagram illustrating recognition of a first object concealed by a second object from a video image;

Fig. 3 shows a more detailed flowchart of the steps that are taken for concealed object recognition;

Fig. 4 is a sample histogram;

Fig. 5 is a flow chart showing one method for implementing concealed object recognition; and

Fig. 6 is a flow chart showing an automated version of the method for concealed object recognition.

Detailed Description of Specific Embodiments

As used in the following text, the term "digital video" implies a digital representation of a sequence of images which may be temporally displayed on a display device. Typically, digital video contains a plurality of frames wherein

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each frame represents a separate image. The frames may be further subdivided such that the frames are made up of a series of pixels. As used in the following description the term "pixel" shall mean a single point of an image. The greater the number of pixels that are contained in an image, the greater the resolution of the video. Resolutions are conventionally referenced by length and width measurements of the number of pixels, for example, in a resolution of 800x600, there are 800 pixels along the length of an image by 600 pixels along the width of the image.

The term "brightness" shall mean the attribute of a visual sensation according to which an area appears to emit more or less light. Brightness is a relative expression of the intensity of the energy output of a visible light source. The term "gamma" and "gamma correction value" shall mean the exponent of the luminance power law response to voltage. The term "gamma correction" shall mean the insertion of a nonlinear output-input characteristic for the purpose of changing the system transfer characteristic. The term "normal video signal" shall mean a video signal that is produced using visible light as opposed to infrared or subjecting the subject matter of the image to some type of signal other than visible light waves. The term "porous material" is any material that allows a portion of direct light to reflect through the material.

In an embodiment of the present invention, a method of detecting concealed objects using analysis of video image frames is presented. Under certain conditions, objects under a porous material can be detected in a video frame. Examples of porous materials include clothing (cotton, silk etc.), fabric and glass. The concealed object can be displayed if the concealed object and the porous material are of contrasting colors. A contrasting color is a color which when transferred to a greyscale varies by approximately 10% in grey scale level. For example, if there are 256 greyscale levels the porous material and the concealed object should vary by 25 levels or more.

Fig. 1 shows a digital image camera capturing image data that is the

result of reflected light. The majority of the direct light 105 is reflected off of a porous object 110. A small portion of the direct light 115 passes through the porous material and is reflected off of the concealed object 120. Some of the reflected light from the concealed object passes through the porous material and is captured by a video image sensor 130. The video image sensor 130 turns the reflected light 105, 115 from both the porous material and the concealed material into an electric signal 140 which is processed by a digital image processor 150. The digital image processor 150 then sends the image data 155 to memory in a digital format such as RGB for each pixel/receptor in the sensor.

When the image data 155 is then displayed on a display device the concealed object is not visible, due to the fact that the pixel values which represent the porous material are much greater than that for the concealed object. As a result, the light for the porous material that is emitted from the display device engulfs the emitted light which results from the pixels values of the concealed object.

Therefore, the human eye cannot perceive the concealed object. In general, the human eye is not capable of observing intensity levels below 80 on a grey-scale between 0-255. As such, values below 80 will appear to be black. In Fig. 1 the concealed object is shown to be a solid object, although the concealed object could also be porous.

Fig.2 shows a flow chart of the steps that are taken for altering digital image data in order to display a concealed object. The method is performed on a computer system using video or image editing software. First information which is digital data that is representative of a first digital image/frame is received 200. The data is then converted from color digital image data to greyscale data. The digital greyscale data is then filtered 210. Filtering occurs in the following manner. If the porous object is not black, all of the pixel values are adjusted such that the pixel values associated with the porous object default to black. This may be done by applying a filter that cuts off values above a threshold greyscale value. Then the remaining values which are generally representative of the concealed object are increased 220. The remaining values

which have not been set to 0 (black) are increased such that the values are in a range which is visibly perceptible. For example, assuming a greyscale between 0-255 all of the values would be increased above 100 for example. The values are thus remapped, such that the values are spread out causing the levels of contrast to be perceivable and the overall brightness/intensity level for the pixels representative of the concealed object are increased such that the pixels are visible to the human eye. It should be understood by one of ordinary skill in the art that the human eye does not readily differentiate between pixels that have closely proximate greyscale values. Therefore, one object of the filter is to spread out the low level pixel values such that the human eye can perceive the contrast.

Fig. 3 shows a more detailed flowchart of the steps that are taken for concealed object recognition. As previously stated once the digital image information is received into a computer system, the color information is converted to greyscale information by techniques known to those of ordinary skill in the art. Although the same methodology could also be applied to the color information.

First, a histogram of the digital image data forming a first image in a sequence of images is produced 300. A sample histogram is shown in Fig. 4. The number of occurrences of a value is represented on the vertical axis and the greyscale values are represented on the horizontal axis. This histogram thus indicates how many times intensity occurs for a given image. The histogram provides a weighting to allow a user to select the low intensity levels. In general the high intensity values will predominate and the less visible values (low intensity values) will be much smaller both in intensity and generally in number of occurrences. Thus, the visible values can be readily identified and removed through filtering or other techniques known to one of ordinary skill in the art.

In one embodiment, the computer system allows a user to view the histogram and determine the low level intensity light portions from the

graphical representation of the histogram 310. Low light intensity levels are those which result from visible light but which would not be perceived by the human eye if displayed on a display device. The user then selects a filter and filters out all other light (high intensity light) 320. Normally the low level intensity light can be visually determined and selected by a user of the computer system. Once the high intensity light is filtered out, the low level light is re-mapped to higher level values so that a display device will display the re-mapped values 330. These values are also spread out so that the contrast is more dramatic. For example, if the cut off between low and high intensity is 40 on a scale from 0-255 and the values are being mapped between 135 and 255, contrast is increased by three such that a value of 1 and 2 would not be 135 and 139. The two mapped low intensity levels are then displayed to a user of the system 340. If the object represented by the low intensity levels is visible, the user responds that the image is unacceptable 350. The user indicates this through a user input device such as a keyboard or mouse. The method then provides for the user to either re-determine the threshold between low and high intensity levels or provide for a new remapping of the low intensity values such that the values are either brighter, more contrast is provided between values or both. The system may also let the user select a new value for separating between a low-level intensity value and high-level intensity value 350. If the user indicates that the concealed object is visible, the process ends.

The process may also be achieved by increasing gamma correction and/or brightness as shown in Fig. 5, first the brightness and/or the gamma correction value is applied to the digital image data 410. By increasing the brightness level, the high level intensity light eventually saturates toward white, thus filtering the high level intensity light. All values that are saturated can then be removed leaving the low level values. The gamma correction can then be used to increase the remaining values. Adjusting gamma increases the intensity values without over-amplifying the noise that occurs by just increasing brightness proportionally across all values. Increasing the gamma

increases the intensity in a non-linear fashion such that the new intensity is:

$$\text{new intensity} = \left(\frac{\text{current intensity}}{255} \right)^{\frac{1}{\text{gamma}}}$$

Because of the non-linear nature of gamma correction, the noise is also increased in a non-linear fashion.

5 In this embodiment of the invention, the gamma correction value applied must be greater in value than is normally used with a cathode ray tube ("CRT") display. Typically the gamma correction value should be between six to ten for this embodiment wherein a standard cathode display has a gamma correction value of approximately 2.2-2.5 and prior art video editing software
10 have maximum gamma correction values of 5.

Once a filter has been applied to the video image data and the low level intensity video image data has been amplified, the low level intensity video image data representing the current frame is displayed 420 to the user. The data that is displayed to the user may also include some of the high level
15 intensity video data. The user can then interactively change 430 the gamma and brightness values and the resulting values are again displayed to the user. Through this process, the image represented by a low level light is displayed. When the image is satisfactory, the user causes the computer system to write the altered video data of the frame 450 to the video store. Succeeding video
20 frames are processed in a similar manner until all frames have been processed 480. Concealed object recognition is then complete 490.

In a first example of the method for concealed object recognition, an image of a person wearing a black shirt with a white gun underneath is analyzed. A digital image is captured of the person under normal lighting
25 conditions. If the digital image is displayed on a display device, the human eye can only see a black shirt which has a value of zero for the pixels displayed on the screen. The light that is reflected through by the white gun is muted in the process and thus may be of such an intensity level that is not perceivable by the human eye. Although the light is not perceivable, the light information is
30 captured by the sensor of the digital image device. If gamma and brightness are

increased the black values will not increase. However, the slight amount of light coming from the white gun will be amplified since it is not a zero value. Some noise will also be amplified and thus displayed, but if enough light, preferably 500 Lux or more, is available to the camera, the system will clearly show the white gun. In another example, an image of a person wearing a white shirt with a black gun underneath is analyzed. In such an image, the video is inverted thus filtering the high intensity data, such that the shirt now appears black and therefore provides a 0 intensity value. The low level intensity data is then mapped to a range in which the values are in the visible range, for example, between 100-255 on a scale from 0-255. This may be achieved by first converting the data to greyscale data or using the color-based data that is the result of the digital imaging sensor. Additionally, the values are spaced such that the distance between values is increased, thus making contrast perceptions more likely to the human eye.

In a third example, an image of a person wearing a dark grey shirt and having a light grey gun underneath the shirt is analyzed. The intensity level corresponding to the dark grey suit is decreased such that it is set to black. The light grey gun will then be at some value which is above that of black. The values corresponding to the light grey gun as well as noise can then be increased using either brightness or gamma correction, thus the low-light values of the light grey gun are filtered and mapped to values which are perceivable by the human eye, as previously explained.

This process can be automated as shown in Fig. 5. In one variation, the mean for all the digital data of the image is computed 510. The mean determines where the high intensity values are. Next a standard deviation from the mean is determined 520. All of the values within one standard deviation below the mean are then identified as high intensity values as well as all values above the mean 530. The high intensity values are then filtered and thus removed from the digital data set that makes up the image 540. The low level values are then mapped to values that are visible 550. The spacing between

values is also increased such that the contrast between values is more perceptible to the human eye. For example, the automated system may determine the lowest and highest value within the low level values and subtract the two values to determine the range. This range is then mapped to a visible light range. For example, if the scale is between 0-255 and the low level values are between 1-41 the range is 40. Values above 80 are normally perceivable to the human eye so the range of 40 would be mapped to a range of 175 (80-255). Thus, all values from the low level light would extend between the values of 80 and 255. The low level data values are then displayed on a display device. 560.

The system may be further automated to change the color data to greyscale data for processing. It should be understood, that although the data may be converted to grayscale for determining high intensity and low intensity values, the color information is still maintained and may be used for the remapping of the low intensity values, such that, the low intensity values may be displayed in color after being remapped to visible values.

The camera angle should be within plus or minus 40 degrees of normal to the object for best results. If the outside clothing is very light or white, then the video may be inverted so that light objects become dark and contrasting objects underneath the porous materials are detected. An ambient light condition of 500 Lux or greater should illuminate the object under study.

It should be noted that the flow diagrams are used herein to demonstrate various aspects of the invention, and should not be construed to limit the present invention to any particular logic flow or logic implementation.

The described logic may be partitioned into different logic blocks (e.g., programs, modules, functions, or subroutines) without changing the overall results or otherwise departing from the true scope of the invention. Oftentimes, logic elements may be added, modified, omitted, performed in a different order, or implemented using different logic constructs (e.g., logic gates, looping primitives, conditional logic, and other logic constructs) without

changing the overall results or otherwise departing from the true scope of the invention.

The present invention may be embodied in many different forms, including, but in no way limited to, computer program logic for use with a processor (*e.g.*, a microprocessor, microcontroller, digital signal processor, or general purpose computer), programmable logic for use with a programmable logic device (*e.g.*, a Field Programmable Gate Array (FPGA) or other PLD), discrete components, integrated circuitry (*e.g.*, an Application Specific Integrated Circuit (ASIC)), or any other means including any combination thereof.

Computer program logic implementing all or part of the functionality previously described herein may be embodied in various forms, including, but in no way limited to, a source code form, a computer executable form, and various intermediate forms (*e.g.*, forms generated by an assembler, compiler, linker, or locator.) Source code may include a series of computer program instructions implemented in any of various programming languages (*e.g.*, an object code, an assembly language, or a high-level language such as Fortran, C, C++, JAVA, or HTML) for use with various operating systems or operating environments. The source code may define and use various data structures and communication messages. The source code may be in a computer executable form (*e.g.*, via an interpreter), or the source code may be converted (*e.g.*, via a translator, assembler, or compiler) into a computer executable form.

The computer program may be fixed in any form (*e.g.*, source code form, computer executable form, or an intermediate form) either permanently or transitorily in a tangible storage medium, such as a semiconductor memory device (*e.g.*, a RAM, ROM, PROM, EEPROM, or Flash-Programmable RAM), a magnetic memory device (*e.g.*, a diskette or fixed disk), an optical memory device (*e.g.*, a CD-ROM), a PC card (*e.g.*, PCMCIA card), or other memory device. The computer program may be fixed in any form in a signal that is transmittable to a computer using any of various communication technologies,

including, but in no way limited to, analog technologies, digital technologies, optical technologies, wireless technologies, networking technologies, and internetworking technologies. The computer program may be distributed in any form as a removable storage medium with accompanying printed or electronic documentation (e.g., shrink wrapped software or a magnetic tape), preloaded with a computer system (e.g., on system ROM or fixed disk), or distributed from a server or electronic bulletin board over the communication system (e.g., the Internet or World Wide Web.)

Hardware logic (including programmable logic for use with a programmable logic device) implementing all or part of the functionality previously described herein may be designed using traditional manual methods, or may be designed, captured, simulated, or documented electronically using various tools, such as Computer Aided Design (CAD), a hardware description language (e.g., VHDL or AHDL), or a PLD programming language (e.g., PALASM, ABEL, or CUPL.)

The present invention may be embodied in other specific forms without departing from the true scope of the invention. The described embodiments are to be considered in all respects only as illustrative and not restrictive.

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We claim:

1. A method for viewing a first object having a contrasting color to a second object, wherein the second object obstructs visibility of the first object, wherein visible light passes through the second object, the method comprising:

5 receiving digital image data representative of the first object obstructed by the second object into a computer system; wherein the digital image data contains at least first object data and second object data produced by visible light and each datum has an associated value;

substantially filtering out the second object data; and

10 increasing the value of the first object data until visibly displayable.

2. The method according to claim 1, further comprising creating a histogram of the digital image data; and

15 selecting the second object data based upon the histogram.

3. The method according to claim 1, wherein substantially filtering out the second object data and increasing the first object data is achieved at least by increasing gamma correction.

20 4. The method according to claim 3 wherein the gamma correction is set above 2.5.

5. The method according to claim 3 wherein the gamma correction is set at or above 6.

25 6. The method according to claim 1, wherein increasing the first object data includes mapping the first object data to values such that the contrast between data levels is such that a human eye can detect the contrast when the first object data is displayed on a display device.

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7. The method according to claim 6, wherein mapping is performed such that the mapping is to data values which when displayed by a display device are observable to the human eye.

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8. The method according to claim 1, wherein increasing the first object data is achieved at least by increasing brightness.

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9. The method according to claim 1, wherein the first object and the second object have contrasting colors.

10. The method according to claim 1, wherein the first object and the second object have contrasting colors which average more than 25 levels apart on a 256 level scale.

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11. The method according to claim 1, wherein the image data is represented on a scale of values and wherein the first object and the second object have contrasting colors such that the colors of the first object data and the second object data vary approximately by ten percent of the scale.

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12. The method according to claim 1, wherein the process is automated.

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13. The method according to claim 2 wherein the process is automated.

14. The method according to claim 1, wherein the first object data and the second object data contain color information.

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15. The method according to claim 14, further comprising:
converting the color information from the first object data and the
second object data to greyscale.

5 16. A method for displaying first object data representative of a first
object in a digital image on a display device wherein the first object is
obstructed by a second object, visible light passing through the second object,
the first object and the second object having contrasting colors, the method
comprising:
10 receiving digital data representative of the digital image into a computer
system; and
filtering the first and second object data such that the first object data is
visibly displayed on the display device and the second object data is clipped.

15 17. The method according to claim 16, further comprising:
taking a digital image of the first object and the second object using a
visible light sensor that produces the first object data and the second object
data.

20 18. The method according to claim 16, wherein filtering comprises:
mapping the first object data to a scale such that contrasts between data
values when displayed are visible to a human eye.

25 19. The method according to claim 16, further comprising:
displaying the first object data on a display device.

30 20. The method according to claim 19, further comprising:
providing manual adjustment of the filtering after displaying the first
object data on the display device.

21

21. The method according to claim 16 wherein filtering includes:
creating a visually displayable histogram of the digital data
representative of the digital image;
providing user selection of a group of the digital data representative of
the digital image;
removing the selected group from the digital data representative of the
digital image; and
adjusting data values of the remaining digital data by applying gamma
correction to the digital data by increasing a gamma correction value until the
first object is displayable when the digital data is displayed on a display
device.

22. The method according to claim 16, wherein the first object data
and the second object data contain color information.

23. The method according to claim 22, further comprising:
converting the color information of the first object data and the second
object data to greyscale.

24. The method according to claim 23, wherein if the second object is
darker than the first object, adjusting at least the second object data until
substantially all of the second object data produces zero output when
represented on a display.

25. The method according to claim 23, wherein if the second object is
substantially lighter than the first object, inverting the first and second object
data such that the second object appears darker when represented on a display
device.

22

26. The method according to claim 25, adjusting at least the second object data until substantially all of the second object data produces zero output when represented on a display.

5

27. The method according to claim 25 further comprising:
mapping the first object data to data values such that the data values when presented on a display are visible and scaling between data values is increased over scaling between the first object data.

10

28. The method according to claim 26 further comprising:
mapping the first object data to data values such that the data values when presented on a display are visible and scaling between data values is increased over scaling between the first object data.

15

29. A computer program product having computer readable computer code for viewing first object data representative of a first object having a contrasting color to a second object, wherein the second object obstructs visibility of the first object, wherein the visible light passes through the second object, the computer code comprising:

20

computer code for receiving digital image data representative of the first object obstructed by the second object into a computer system; wherein the digital image data contains at least first object data and second object data produced by visible light;

25

computer code for substantially filtering out the second object data; and
computer code for increasing the first object data until visibly displayable.

30

30. The computer program product according to claim 29, further comprising:

computer code for creating a histogram of the digital image data; and
computer code for selecting the second object data based upon the
histogram.

31. The computer program product according to claim 29, wherein the computer code for substantially filtering out the second object data and increasing the first object data increases gamma correction.

32. The computer program product according to claim 31 wherein the gamma correction is set above 2.5.

33. The computer program product according to claim 31 wherein the gamma correction is set at or above 6.

34. The computer program product according to claim 1, wherein the computer code for increasing the first object data includes computer code for mapping the first object data to values such that the contrast between data levels is such that a human eye can detect the contrast.

35. The computer program product according to claim 34, wherein the computer code for mapping is performed such that the mapping is to data values which when displayed by a display device are observable to the human eye.

36. The computer program product according to claim 29, wherein the computer code for increasing the first object data increases the first object data at least by increasing brightness.

24

37. The computer program product to claim 29, wherein the first object and the second object have contrasting colors.

38. The computer program product according to claim 29, wherein the first object and the second object data represent contrasting colors which average more than 25 levels on a 256 level scale.

39. The computer program according to claim 29, wherein the image data is associated with a scale and the first object and the second object have contrasting colors such that the first object data and the second object data vary substantially by ten percent of the scale.

40. The computer program product according to claim 29, wherein the first object data and the second object data contain color information and the computer program product further includes computer code for converting the color information from the first object data and the second object data to greyscale.

41. Computer code on a computer readable medium for displaying first object data representative of a first object in a digital image on a display device wherein the first object is obstructed by a second object, visible light passing through the second object, the first object and the second object having contrasting colors, the computer code comprising:

computer code for receiving digital data representative of the digital image into a computer system; and

computer code for filtering the first and second object data such that the first object data is visibly displayed on the display device and the second object data is clipped.

42. The computer program product according to claim 41, wherein the computer code for filtering includes:

computer code for mapping the first object data to a scale such that contrasts between data values when displayed are visible to a human eye.

5

43. The computer program product according to claim 41, further comprising:

computer code for displaying the first object data on a display device.

10

44. The computer program product according to claim 41, further comprising:

computer code for providing user adjustment of the filtering after displaying the first object data on the display device.

15

45. The computer program product according to claim 41 wherein the computer code for filtering includes:

computer code for creating a visually displayable histogram of the digital data representative of the digital image;

20

computer code for providing user selection of a group of the digital data representative of the digital image;

computer code for removing the selected group from the digital data representative of the digital image; and

25

computer code for adjusting data values of the remaining digital data by applying gamma correction to the digital data by increasing a gamma correction value until the first object is displayable when the digital data is displayed on a display device.

30

46. The computer program product according to claim 41, wherein the first object data and the second object data contain color information and wherein the computer program product further comprises:

computer code for converting the color information of the first object data and the second object data to greyscale.

5 47. The computer program product according to claim 46, further comprising computer code for adjusting at least the second object data until substantially all of the second object data produces zero output when represented on a display if the second object is darker than the first object.

10 48. The computer program product according to claim 46, further comprising computer code for inverting the first and second object data such that the second object appears darker when represented on a display device if the second object is substantially lighter than the first object.

15 49. The computer program product according to claim 48, further comprising computer code for adjusting at least the second object data until substantially all of the second object data produces zero output when represented on a display.

20 50. The computer program product according to claim 48 further comprising:

 computer code for mapping the first object data to data values such that the data values when presented on a display are visible and scaling between data values is increased over scaling between the first object data.

25 51. The computer program product according to claim 49 further comprising:

 computer code for mapping the first object data to data values such that the data values when presented on a display are visible and scaling between data values is increased over scaling between the first object data.

30

27

52. A system for detecting a first object concealed by a second object, the system comprising:

a camera for taking a digital image using visible light, the digital image containing data representative of the first object and of the second object;

5 a processor for receiving the digital image and processing the digital image to filter out the second object data and increasing the values of the first object data until visibly displayable.

10 53. The system according to claim 52 wherein the processor receives a user activated signal and the processor increases a gamma correction value.

54. The system according to claim 53 wherein the gamma correction value is increased at or above 5.

15 55. The system according to claim 51 wherein the processor both increases the values of the first object data, wherein the first object data is on a scale and increases the scaling between first object data.

20

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1/6

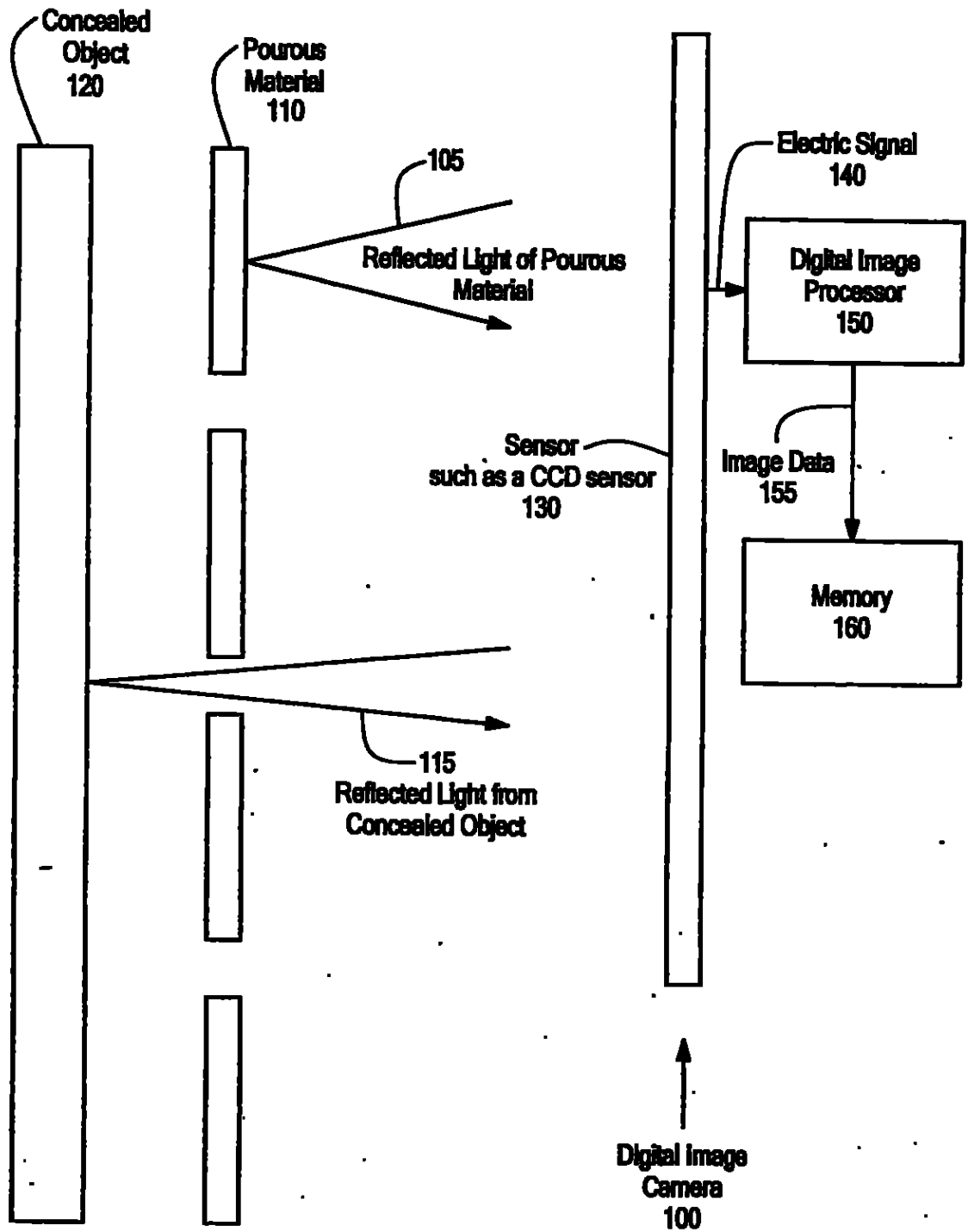
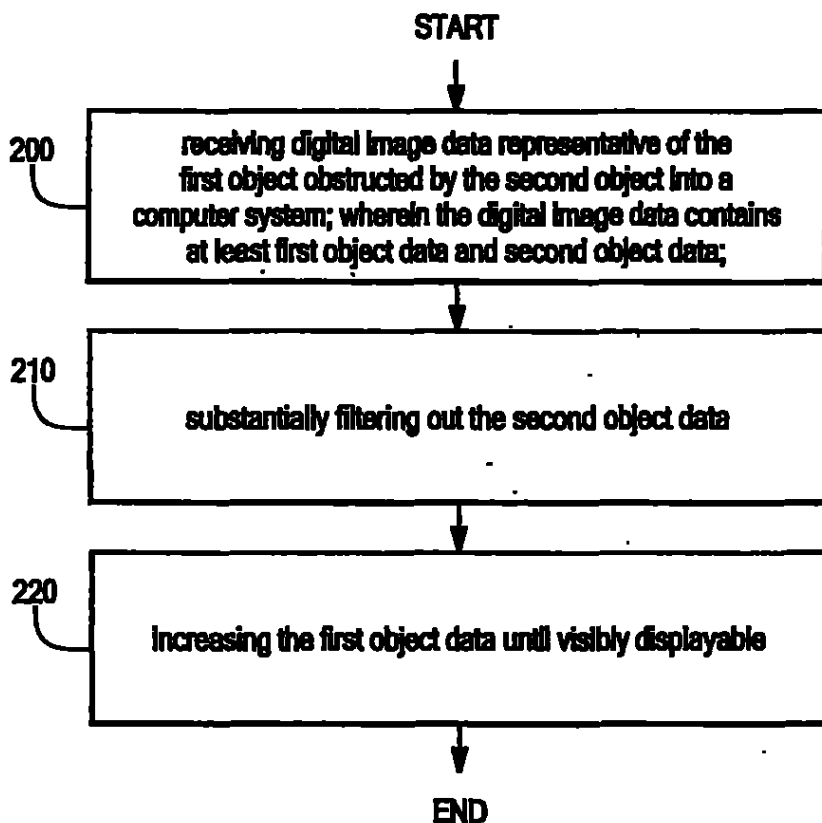


FIG. 1

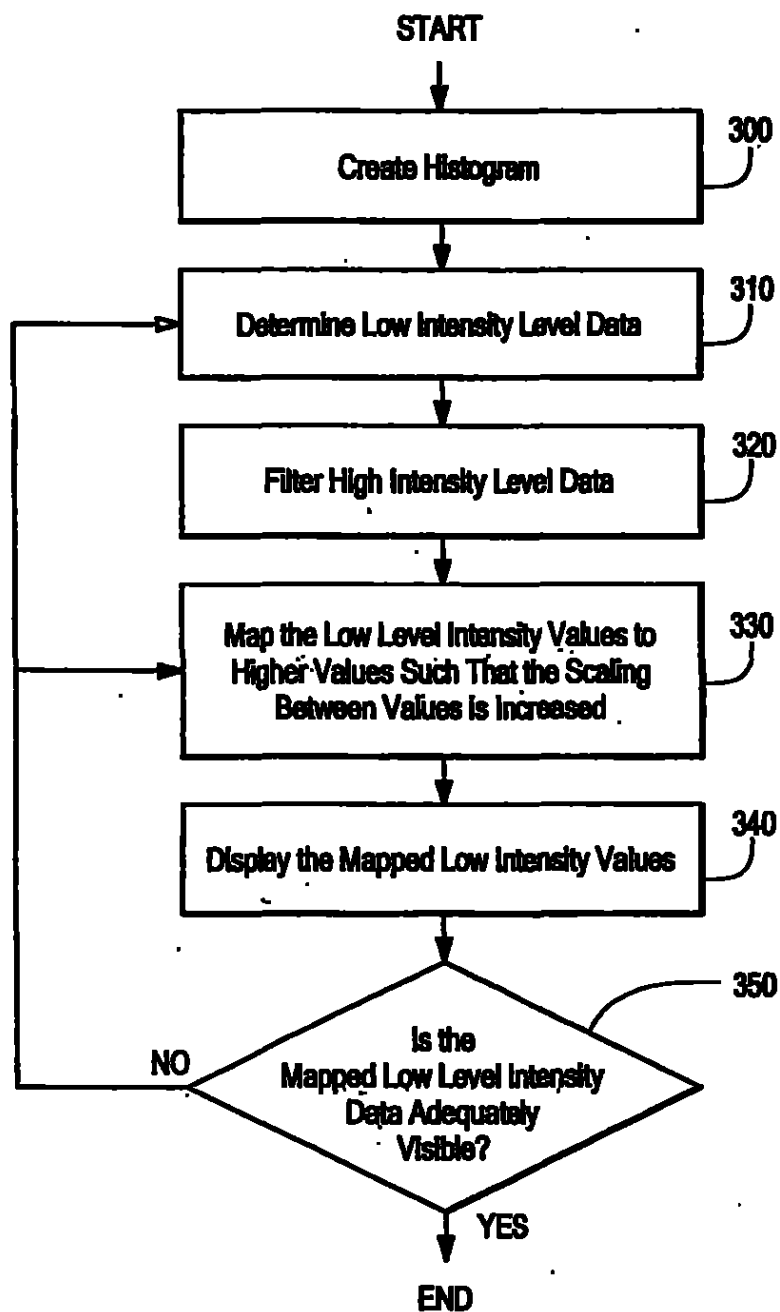
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2/6

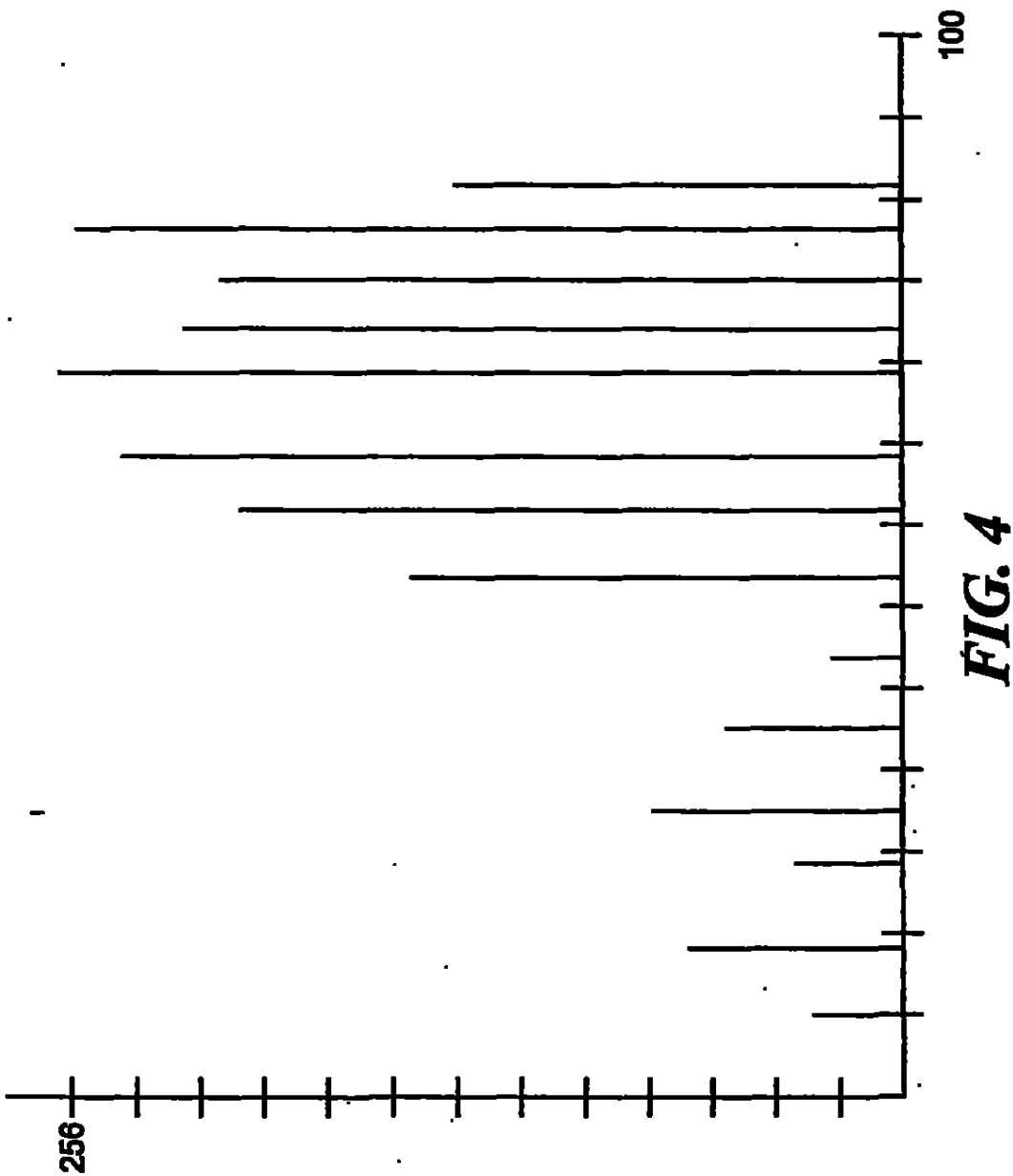
**FIG. 2**

30

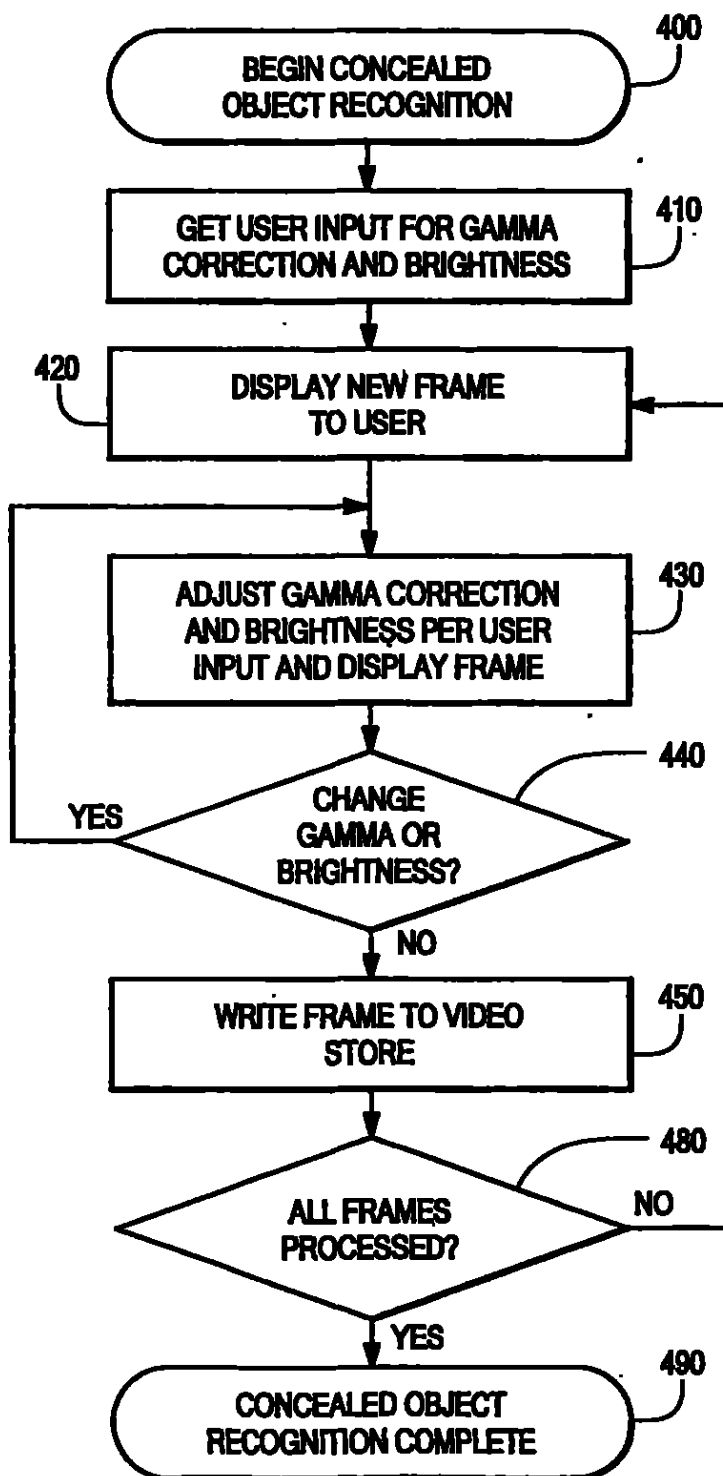
3/6

**FIG. 3**

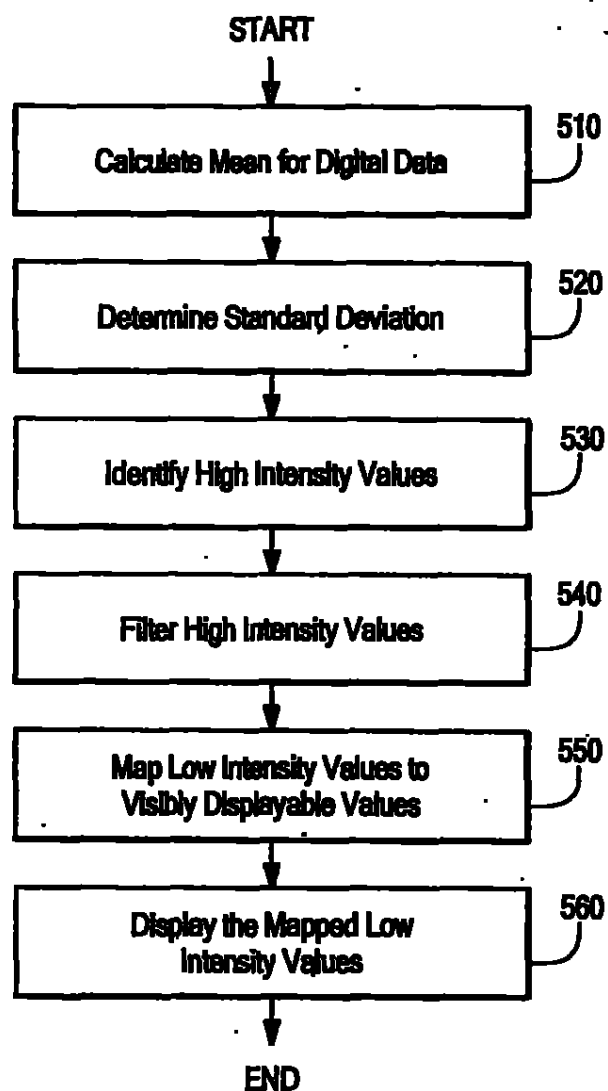
4/6



5/6

**FIG. 5**

6/6

**FIG. 6**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/28351

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 606T5/00 606T5/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 606T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SHEINSHLEIGER V B ET AL: "A new type of device to locate objects hidden under the clothes of people" 2001 CIE INTERNATIONAL CONFERENCE ON RADAR PROCEEDINGS (CAT NO.01TH8559), 2001 CIE INTERNATIONAL CONFERENCE ON RADAR PROCEEDINGS, BEIJING, CHINA, 15-18 OCT. 2001, pages 227-230, XP002224810 2001, Piscataway, NJ, USA, IEEE, USA ISBN: 0-7803-7000-7 the whole document	1-55
A	US 6 108 576 A (CAI WEI ET AL) 22 August 2000 (2000-08-22) abstract; figures 7A,7B,8A,10A -/-	1-55



Further documents are listed in the continuation of box C.



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Date of the actual completion of the international search

12 December 2002

Date of mailing of the international search report

09/01/2003

Name and mailing address of the ISA

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Fax (+31-70) 340-3016

Authorized officer

Herter, J

INTERNATI NAL SEARCH REP RT

International Application No

PCT/US 02/28351

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 974 111 A (EILBERT RICHARD F ET AL) 26 October 1999 (1999-10-26) abstract; figures 1,1A _____	1-55
A	GB 2 341 507 A (ROBINSON ALAN WILLIAM) 15 March 2000 (2000-03-15) the whole document _____	1-55

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/28351

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6108576	A	22-08-2000	US 5931789 A US 5813988 A	03-08-1999 29-09-1998
US 5974111	A	26-10-1999	AU 7513196 A EP 0793804 A1	17-04-1997 10-09-1997
GB 2341507	A	15-03-2000	NONE	

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To:
BROMBERG & SUNSTEIN LLP
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125 Summer Street
BOSTON, MA 02110-1618
UNITED STATES OF AMERICA

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

DOCKETED

(PCT Rule 44.1)

Date of mailing (day/month/year) 09/01/2003	
Applicant's or agent's file reference 1247/A66 WO	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US 02/ 28351	International filing date (day/month/year) 06/09/2002
Applicant INTERGRAPH HARDWARE TECHNOLOGIES COMPANY	

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the International application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the International application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for International publication.

Within 18 months from the priority date, a demand for International preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Tanja Touysserkani
---	---

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers;
claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 1247/A66 WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 02/ 28351	International filing date (day/month/year) 06/09/2002	(Earliest) Priority Date (day/month/year) 07/09/2001

Applicant

INTERGRAPH HARDWARE TECHNOLOGIES COMPANY

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 04 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1

None of the figures.

INTERNATIONAL SEARCH REPORT

40

International Application No
PCT/US 02/28351

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06T5/00 G06T5/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SHTEINSHLEIGER V B ET AL: "A new type of device to locate objects hidden under the clothes of people" 2001 CIE INTERNATIONAL CONFERENCE ON RADAR PROCEEDINGS (CAT NO.01TH8559), 2001 CIE INTERNATIONAL CONFERENCE ON RADAR PROCEEDINGS, BEIJING, CHINA, 15-18 OCT. 2001, pages 227-230, XP002224810 2001, Piscataway, NJ, USA, IEEE, USA ISBN: 0-7803-7000-7 the whole document	1-55
A	US 6 108 576 A (CAI WEI ET AL) 22 August 2000 (2000-08-22) abstract; figures 7A,7B,8A,10A -/-	1-55

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Date of the actual completion of the international search

12 December 2002

Date of mailing of the international search report

09/01/2003

Name and mailing address of the ISA

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Fax (+31-70) 340-3016

Authorized officer

Herter, J

INTERNATIONAL SEARCH REPORT

41

International Application No
PCT/US 02/28351

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 974 111 A (EILBERT RICHARD F ET AL) 26 October 1999 (1999-10-26) abstract; figures 1,1A	1-55
A	GB 2 341 507 A (ROBINSON ALAN WILLIAM) 15 March 2000 (2000-03-15) the whole document	1-55

INTERNATIONAL SEARCH REPORT

Information on patent family members

42
International Application No

PCT/US 02/28351

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6108576	A	22-08-2000	US 5931789 A US 5813988 A	03-08-1999 29-09-1998
US 5974111	A	26-10-1999	AU 7513196 A EP 0793804 A1	17-04-1997 10-09-1997
GB 2341507	A	15-03-2000	NONE	



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REEL/FRAME: 012441/0671
NUMBER OF PAGES: 5

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

MCKAY, THERMAN WARD III

DOC DATE: 11/15/2001

ASSIGNOR:

GRINDSTAFF, GENE

DOC DATE: 11/16/2001

ASSIGNOR:

FLETCHER, SUSAN HEATH CALVIN

DOC DATE: 11/15/2001

ASSIGNEE:

INTERGRAPH CORPORATION
ONE MADISON INDUSTRIAL PARK
HUNTSVILLE, ALABAMA 35894-0001

SERIAL NUMBER: 60318164
PATENT NUMBER:

FILING DATE: 09/07/2001
ISSUE DATE:

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To the Honorable Commissioner of Patent

attached original documents or copy thereof.

1. Name of conveying party(ies):

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Gene Arthur Grindstaff
Susan Heath Calvin Fletcher

Additional name(s) of conveying party(ies) attached? ☐ Yes ☒ No

3. Nature of conveyance:

- ☒ Assignment ☐ Merger
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☐ Other

Execution Date: November 16, 2001

2. Name and address of receiving party(ies):

Name: Intergraph Corporation

Internal Address:

Street Address: One Madison Industrial Park

City: Huntsville State: AL ZIP: 35894-0001

Additional name(s) & address(es) attached? ☐ Yes ☒ No

4. Application number(s) or patent number(s):

If this document is being filed together with a new application, the execution date of the application is:

A. Patent Application No.(s)

60/318,164

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Additional numbers attached?

B. Patent No.(s)

JAN - 7 2002

☐ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed:

Name: John L. Conway

Internal Address: Bromberg & Sunstein LLP

Street Address: 125 Summer Street

City: Boston State: MA ZIP: 02110

6. Total number of applications and patents involved:

1

7. Total fee (37 CFR 3.41) \$ 40.00

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Washington, D.C. 20231

(Form PTO-1505-Recordation Form Cover Sheet - page 1 of 3)

ASSIGNMENT

ASSIGNORS: Therman Ward McKay III
Gene Arthur Grindstaff
Susan Heath Calvin Fletcher

ASSIGNEE: Intergraph Corporation
One Madison Industrial Park
Huntsville, AL 35894-0001

STATE OF INCORPORATION OF ASSIGNEE: Delaware

TITLE: Method, Device and Computer Program Product for Analysis of
Video Images

ATTORNEY DOCKET: 1247/A62

APPLICATION NO.: 60/318,164

FILED: September 7, 2001

Assignor is an inventor of a certain new and useful invention (the "Invention") described in a United States patent application (the "Application") bearing the above attorney docket number and having the above title. If a filing date and application number are shown, the Application has a Patent and Trademark Office filing date and application number as indicated above.

For valuable consideration, receipt of which is acknowledged, each Assignor hereby assigns to Assignee (which term shall include Assignee's successors and assigns), all of Assignor's right, title and interest in the Invention, all improvements therein, the Application and all priority rights arising therefrom, and any patents, and any reissues and extensions thereof, which issue in any country upon any patent applications which correspond with any of the following: the Application; any application that claims priority from the Application (including as a divisional, continuation-in-whole or continuation-in-part, or as an application claiming priority from a

provisional application); or any application based in whole or in part on any of the foregoing.

Each Assignor further agrees that such Assignor and Assignor's heirs and legal representatives will, without further consideration, cooperate with Assignee in the prosecution of all of the above applications, execute, verify, acknowledge and deliver all such further papers, including applications for patents and for reissues and extensions therefor, and instruments of assignment and transfer thereof, and will communicate any facts known to Assignor relating to the Invention, to obtain or maintain or enforce patents for the Invention and improvements therein in any and all countries and to vest title thereto in Assignee. Each Assignor further agrees that such Assignor will, without further compensation to Assignor during the term of such Assignor's employment by Assignee and thereafter for reasonable compensation as determined by Assignee, perform such other acts as may be reasonably required when requested by Assignee, including attending depositions, preparing and executing declarations and affidavits and testifying as a witness, to obtain or maintain or enforce patents for the Invention and improvements therein in any and all countries and to vest title thereto in Assignee.

IN WITNESS WHEREOF, each Assignor hereby executes this instrument on the date set forth below.

Date: Nov. 15, 2001

Therman Ward McKay III
Therman Ward McKay III, Assignor

STATE OF ALABAMA)

COUNTY OF MADISON) ss.

Before me, a notary public in and for said county and state, personally appeared Therman Ward McKay III, to me known to be the person described in the foregoing instrument, who, being first duly sworn, acknowledged his signature on the foregoing instrument in my presence and declared the same to be his free act and deed on the date written above opposite his signature.

Dwenda M. Col
Notary Public
My Commission Expires: 1-20-2004

(seal)

Date: Nov. 16, 2001

Gene Arthur Grindstaff
Gene Arthur Grindstaff, Assignor

STATE OF ALABAMA)

COUNTY OF MADISON) ss.

Before me, a notary public in and for said county and state, personally appeared Gene Arthur Grindstaff, to me known to be the person described in the foregoing instrument, who, being first duly sworn, acknowledged his signature on the foregoing instrument in my presence and declared the same to be his free act and deed on the date written above opposite his signature.

Dwenda M. Col
Notary Public
My Commission Expires: 1-20-2004

(seal)

Date: Nov. 15, 2001

Susan Heath Calvin Fletcher
Susan Heath Calvin Fletcher, Assignor

STATE OF ALABAMA

COUNTY OF MADISON

Before me, a notary public in and for said county and state, personally appeared Susan Heath Calvin Fletcher, to me known to be the person described in the foregoing instrument, who, being first duly sworn, acknowledged his signature on the foregoing instrument in my presence and declared the same to be his free act and deed on the date written above opposite his signature.

Dwenda M. Coy

Notary Public

My Commission Expires: 1-20-2004

(scal)

Practitioner's Docket No. 1247/A66 WO

DOCKETED**CHAPTER II****IN THE UNITED STATES INTERNATIONAL PRELIMINARY
EXAMINATION AUTHORITY (IPEA/US)**

<u>PCT/US02/28351</u>	<u>06 September 2002 (6.09.02)</u>	<u>07 September 2001 (7.09.01)</u>
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED

Concealed Object Recognition
TITLE OF INVENTION

INTERGRAPH HARDWARE TECHNOLOGIES COMPANY
APPLICANT(S)

Box PCT
Commissioner for Patents
Washington, D.C. 20231
ATTENTION: IPEA/US

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I hereby certify that this paper, along with any document referred to, is being deposited with the United States Postal Service on this date, 21 January 2003, in an envelope addressed to the Commissioner for Patents, Washington D.C. 20231 as "Express Mail Post Office to Addressee" Mailing Label No. EV 101936087 US.

John J. Stickvers

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Date: 21 January 2003

John J. Stickvers
Signature of person certifying

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51
The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:
IPEA/US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty.
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only		
Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 1247/A66 WO
International application No. PCT/US02/28351	International filing date (day/month/year) 6 September 2002 (06.09.02)	(Earliest) Priority date (day/month/year) 7 September 2001 (07.09.01)
Title of invention		
Concealed Object Recognition		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) INTERGRAPH HARDWARE TECHNOLOGIES COMPANY 2325B Renaissance Drive Suite #16 Las Vegas, NV 89119 US		Telephone No. 702-968-5208
		Facsimile No.
		Teleprinter No.
		Applicant's registration No. with the Office
State (that is, country) of nationality: US		State (that is, country) of residence: US
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:		State (that is, country) of residence:
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality:		State (that is, country) of residence:
☐ Further applicants are indicated on a continuation sheet.		

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*SUNSTEIN, Bruce D.; ASHER, Robert M.; MURPHY, Timothy M.; SAUNDERS, Steven G.; PETUCHOWSKI, Samuel J.; KLAYMAN, Jeffrey T.; STICKEVERS, John J.; MORANO, Elizabeth P.; SANDVOS, Jay; SMOLENSKI, JR., Alexander J.; CONWAY, John L.; CHERNOMAS, Morton; CARTER, Barbara J.
BROMBERG & SUNSTEIN LLP125 Summer Street
Boston, MA 02110-1618
US

Telephone No.

617-443-9292

Facsimile No.

617-443-0004

Teleprinter No.

Agent's registration No. with the Office

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☐ the international application as originally filedthe description ☐ as originally filed☐ as amended under Article 34the claims ☐ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☐ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (specify) | : | sheets |

For international Preliminary Examining Authority use only
received not received

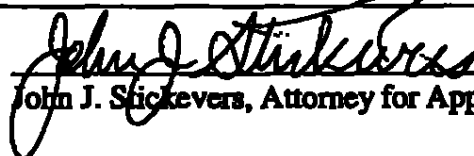
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. ☒ fee calculation sheet | 5. ☐ statement explaining lack of signature |
| 2. ☐ original separate power of attorney | 6. ☐ sequence listings in computer readable form |
| 3. ☐ original general power of attorney | 7. ☐ tables in computer readable form related to sequence listings |
| 4. ☐ copy of general power of attorney; reference number, if any: | 8. ☐ other (specify): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).


John J. Stickevers, Attorney for Applicant

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

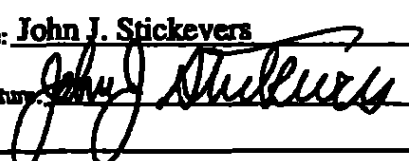
For International Bureau use only

Demand received from IPEA on:

PCT

FEE CALCULATION SHEET

Annex to the Demand

International application No. PCT/US02/28351		For International Preliminary Examining Authority use only	
Applicant's or agent's file reference 1247/A66 WO		Date stamp of the IPEA	
Applicant INTERGRAPH HARDWARE TECHNOLOGIES COMPANY			
CALCULATION OF PRESCRIBED FEES			
1. Preliminary examination fee		750.00	P
2. Handling fee (<i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i>)		146.00	H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box		USD 896.00	
		TOTAL	
MODE OF PAYMENT			
☐ authorization to charge deposit account with the IPEA (see below)	☐ cash		
☒ cheque	☐ revenue stamps		
☐ postal money order	☐ coupons		
☐ bank draft	☐ other (specify):		
AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT (This mode of payment may not be available at all IPEAs)			
☐ Authorization to charge the total fees indicated above.		IPEA/ US	
☒ (This check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.		Deposit Account No.: 19-4972	
		Date: 21 January 2003	
		Name: John J. Stickevers	
		Signature: 	

SN 2809EBTOT A3

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Label T17 October 2001



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Time In		Time Out		☐ AM ☐ PM		☐ First Day ☐ Last Day		Military Pledge Fee Insurance Fee	
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 ADDRESS: **2 SUNSTEIN WAY
 123 SUMMER ST STE 1000
 BOSTON MA 02130-1618**

TO: **BOX 907**
 COMMISSIONER FOR PATENTS
 WASHINGTON DC 20231-0062
 Attn: **PEA/US**

124714600 1/21/03

FOR PICKUP OR TRACKING, CALL 1-800-225-1111 WWW.USPS.COM

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NON
ON
U. 3

841

Abstract

PLEASE DATE, STAMP AND RETURN

The Commissioner for Patents has received from Rosenberg & Shustain the following

**Black PCT
JAMES W. PHELPS**

**THE FETTER
AND THE FETTER**

Applicant: Intagraph Hardware Technologies Company

Title: Curved Object Recognition

WI/Amendment No. PGTJ00200001

Product No: 124728 WD

Birth Filing Date: 0 September 2002

Date: January 21, 1968

Expanded Mail Net EV 19700007 US

1	2
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- () Requested: _____ page(s)

- () Description - _____

- () Chapters - _____ pages

- Abstract2

- () check drawings .
() drawn, () intended

- () PCT Power of Attorney
Signed by Applicant(s)

- ☐ U.S. National Phase Application

- (K) Demand for Preliminary Examination**

- ☐ Letter & Article 34 Amendment

- (x) Fee Calculation Sheet**

- (x) Check in the amount of \$100.00

57

BROMBERG & SUNSTEIN LLP
125 SUMMER STREET
BOSTON, MA 02110

CENTURY BANK & TRUST COMPANY
BOSTON, MASSACHUSETTS

53-139/113

47

1/21/2003

PAY
TO THE
ORDER OF

Director of the USPTO

896.00

Eight Hundred Ninety-Six and 00/100*****

GENERAL ACCOUNT

MEMO

1247/A66


AUTHORIZED SIGNATURE

⑈047892⑈ ⑆011301390⑆ ⑈05 61935 1⑈

BROMBERG & SUNSTEIN LLP

Director of the USPTO
5910 - PTO

1/21/2003

476

896.0

Cash - Century

1247/A66

896.0

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

1247/A66 WO

Box No. I TITLE OF INVENTION

CONCEALED OBJECT RECOGNITION

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

INTERGRAPH HARDWARE TECHNOLOGIES COMPANY
2325B Renaissance Drive
Suite #16
Las Vegas, NV 89119
USA

☐ This person is also inventor.

Telephone No.

702-968-5208

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant
for the purposes of:



all designated
States



all designated States except
the United States of America



the United States
of America only



the States indicated in
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

GRINDSTAFF, Gene Arthur
2202 Essex Drive SW
Decatur, AL 35603
US

This person is:

☐ applicant only

☐ applicant and inventor

☒ inventor only (if this check-box
is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant
for the purposes of:



all designated
States



all designated States except
the United States of America



the United States
of America only



the States indicated in
the Supplemental Box



Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf
of the applicant(s) before the competent International Authorities as:



agent



common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

STICKEVERS, John J.; SUNSTEIN, Bruce D.; ASHER, Robert M.; MURPHY, Timothy M.;
SAUNDERS, Steven G.; STRIMPEL, Harriet M.; BUCHANAN, Karen A.; PETUCHOWSKI,
Samuel J.; KLAYMAN, Jeffrey T.; MORANO, Elizabeth P.; SANDVOS, Jay; WOOD, Keith
J.; SMOLENSKI, JR., Alexander J.; CONWAY, John L.; CHIRNOMAS, Morton
Bromberg & Sunstein LLP
125 Sumner Street
Boston, MA 02110-1618
US

Telephone No.

617-443-9292

Facsimile No.

617-443-0004

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) FLETCHER, Susan Heath Calvin 333 Ruby Drive Huntsville, AL 35811 US	This person is: ☐ applicant only ☐ applicant and inventor ☒ inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.) MCKAY III, Therman Ward 6603 Willow Springs Blvd. Huntsville, AL 35806 US	This person is: ☐ applicant only ☐ applicant and inventor ☒ inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|--|
| ☒ AE United Arab Emirates | ☒ LC Saint Lucia |
| ☒ AG Antigua and Barbuda | ☒ LR Sri Lanka |
| ☒ AL Albania | ☒ LB Liberia |
| ☒ AM Armenia | ☒ LS Lesotho |
| ☒ AT Austria | ☒ LT Lithuania |
| ☒ AU Australia | ☒ LU Luxembourg |
| ☒ AZ Azerbaijan | ☒ LV Latvia |
| ☒ BA Bosnia and Herzegovina | ☒ MA Morocco |
| ☒ BB Barbados | ☒ MD Republic of Moldova |
| ☒ BG Bulgaria | ☒ MG Madagascar |
| ☒ BR Brazil | ☒ MK The former Yugoslav Republic of Macedonia |
| ☒ BY Belarus | ☒ MN Mongolia |
| ☒ BZ Belize | ☒ MW Malawi |
| ☒ CA Canada | ☒ MX Mexico |
| ☒ CH and LI Switzerland and Liechtenstein | ☒ MZ Mozambique |
| ☒ CN China | ☒ NO Norway |
| ☒ CR Costa Rica | ☒ NZ New Zealand |
| ☒ CU Cuba | ☒ PL Poland |
| ☒ CZ Czech Republic | ☒ PT Portugal |
| ☒ DE Germany | ☒ RO Romania |
| ☒ DK Denmark | ☒ RU Russian Federation |
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| ☒ GD Grenada | ☒ TJ Tajikistan |
| ☒ GE Georgia | ☒ TM Turkmenistan |
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| ☒ GM Gambia | ☒ TT Trinidad and Tobago |
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| ☒ ID Indonesia | ☒ UG Uganda |
| ☒ IL Israel | ☐ US United States of America |
| ☒ IN India | ☒ UZ Uzbekistan |
| ☒ IS Iceland | ☒ VN Viet Nam |
| ☒ JP Japan | ☒ YU Yugoslavia |
| ☒ KE Kenya | ☒ ZA South Africa |
| ☒ KG Kyrgyzstan | ☒ ZW Zimbabwe |
| ☒ KP Democratic People's Republic of Korea | Check-box reserved for designating States which have become party to the PCT after issuance of this sheet: |
| ☒ KR Republic of Korea | ☒ ... See 1 in Addendum |
| ☒ KZ Kazakhstan | |

Precautionary Designation statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Addendum

1. CO Colombia; EC Ecuador; GQ Equatorial Guinea; OM Oman; PH Philippines; TN Tunisia; ZM Zambia

Box No. VI PRIORITY CLAIM		☐ Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
Item (1) 7 September 2001 (7.09.01)	60/318.164	US		
Item (2)				
Item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 1

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

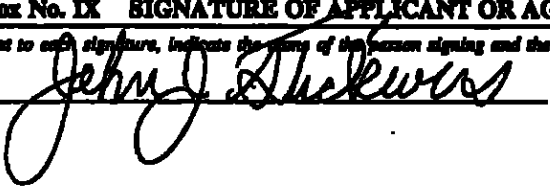
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):	Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):
ISA / EP	Date (day/month/year) Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets: request : 4 sheets description (excluding sequence listing part) : 12 sheets claims : 10 sheets abstract : 1 sheets drawings : 6 sheets sequence listing part of description : Total number of sheets : 33 sheets	This international application is accompanied by the item(s) marked below: 1. ☒ fee calculation sheet 2. ☐ separate signed power of attorney 3. ☒ copy of general power of attorney; reference number, if any: 4. ☐ statement explaining lack of signature 5. ☐ priority document(s) identified in Box No. VI as item(s): 6. ☐ translation of international application into (language): 7. ☐ separate indications concerning deposited microorganism or other biological material 8. ☐ nucleotide and/or amino acid sequence listing in computer readable form 9. ☒ other (specify): Transmittal Letter to US/RO; return postcard
Figure of the drawings which should accompany the abstract: 1	Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

 John J. Stickevers, Attorney for Applicant

For receiving Office use only	
1. Date of actual receipt of the purported international application:	2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority (if two or more are competent): ISA /	6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only
Date of receipt of the record copy by the International Bureau:

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET
Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's
file reference

1247/A66 WO

Applicant

INTERGRAPH HARDWARE TECHNOLOGIES COMPANY

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE 240 T

2. SEARCH FEE 866 S

International search to be carried out by EP
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 33 sheets.

first 30 sheets 407 b1

3 x 9 27.00 b2

remaining sheets additional amount

Add amounts entered at b1 and b2 and enter total at B 434.00 B

Designation Fees

The international application contains 93 designations.

5 x 88 440.00 D

number of designation fees amount of designation fee payable (maximum 6)

Add amounts entered at B and D and enter total at I 874.00 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) 15.00 P

5. TOTAL FEES PAYABLE USD 1,995.00

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☐ authorization to charge deposit account (see below)

☐ bank draft

☐ coupons

☒ cheque

☐ cash

☐ other (specify):

☐ postal money order

☐ revenue stamps

DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

The RO/ US ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☒ (this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

19-4972

6 September 2002

Deposit Account No.

Date (day/month/year)

Signature

John J. Stickevers

RECONOCIMIENTO DE OBJETO OCULTO

Campo Técnico

La presente invención se relaciona con el análisis de imágenes digitales. Más específicamente, la presente invención se relaciona con la visualización de objetos obstruidos en imágenes digitales.

Antecedentes

Se han diseñado sistemas para visualizar objetos que son obstruidos por otros objetos. Por ejemplo, detectores de rayos X y detectores de rayos infrarrojos le permiten a un usuario someter un objeto a luz infrarroja, rayos X, u otra señal diferente de luz visible con el fin de exponer los objetos obstruidos. Tales sistemas requieren que el objeto se exponga a la señal con el fin de que el objeto sea observado. Sería deseable tener un método y sistema para visualizar objetos obstruidos dentro de una imagen digital sin tener que exponer primero los objetos a una señal creada.

Resumen de la Invención

La invención en una modalidad es un método para visualizar un primer objeto que está obstruido por un segundo objeto. En tal método el primer objeto tiene un color contrastante con el segundo objeto y el segundo o objeto está construido de un material que le permite a la luz visible pasar a través de él. La cantidad de luz visible que pasa a través del segundo objeto no es suficiente para que el primer objeto sea visible al ojo humano. El método involucra tomar una imagen digital del primer y segundo objetos utilizando un sensor de luz visible, tal como un sensor de cámara CCD. Los datos de imagen digital que son recibidos en un sistema de computador contienen tanto los datos del primer objeto como los datos del segundo objeto. Se debe entender que los datos del primer objeto y los datos del segundo objeto incluyen información de color. La cantidad de contraste entre el primero y segundo objetos deben ser de aproximadamente el 10% de la escala total de tal forma que en una escala de 256 colores la diferencia es de aproximadamente 25 niveles. El sistema de computador sustancialmente filtra los datos del segundo objeto y luego los valores asociados con los datos del primer

objeto se incrementan hasta que los datos son visiblemente exponibles.

El sistema de computador puede crear un histograma de datos de imagen digital para permitirle a un usuario del sistema seleccionar datos del segundo objeto basados en el histograma. En tal modalidad, el histograma es exhibido al usuario y un mecanismo de selección de usuario se suministra para seleccionar los datos del histograma. La etapa de filtrar sustancialmente los datos del segundo objeto e incrementar los datos del primer objeto se puede lograr al incrementar la corrección gama a un valor que este por fuera del rango de los programas gráficos habituales. Por ejemplo, el valor de corrección gama se puede establecer en un valor por encima de 2,5 y más generalmente e el rango de aproximadamente 6. Filtrar los datos del segundo objeto también se puede lograr al incrementar el brillo en combinación con el incremento del valor de la corrección gama.

Los datos del primer objeto son generalmente incrementados de tal forma que los datos del primer objeto original son mapeados a valores donde el contraste entre los niveles de datos es visible al ojo humano cuando los datos del primer objeto son exhibidos sobre un

dispositivo de exhibición. El mapeo es también de tal forma que los valores originales que son valores de luz de bajo nivel que no pueden ser percibidos cuando se exhiben sobre un dispositivo de exhibición son mapeados a valores que pueden ser percibidos por un ojo humano.

El método puede incluir la etapa de convertir la información de color a escalas de gris antes de filtrar los datos del segundo objeto e incrementar/remapear la información de color a los datos del primer objeto.

El sistema de computador puede identificar si el primer objeto es más claro que el segundo objeto o más oscuro que el segundo objeto. Si el segundo objeto es sustancialmente más claro que el primer objeto, el sistema puede invertir los primeros y segundos datos de objeto de tal forma que el segundo objeto aparezca más oscuro cuando se representa sobre un dispositivo de exhibición antes de filtrarse. Los datos del segundo objeto pueden ser filtrados al disminuir todos los valores de los datos del segundo objeto hasta que los valores sean tales para negro que generalmente es valor 0 sobre una escala de 0-255.

La metodología como se describió también puede ser creada en un producto de programa de computador para uso con un computador en donde el producto de programa de computador contiene código de computador sobre este. El método en una modalidad es completamente automatizado. La metodología también puede ser corroborada en un sistema que incluye una cámara para tomar una imagen digital utilizando luz visible en donde la imagen digital que es creada por la cámara digital contiene datos representativos del primer objeto y del segundo objeto. El sistema incluye además un procesador para recibir la imagen digital y procesar la imagen digital para filtrar los segundos datos de objeto e incrementar los valores de los primeros datos de objeto hasta que sea visiblemente exhibible. El sistema puede ser automatizado o recibir señales de activación de usuario para la identificación de los datos que pertenecen al segundo objeto y también valores de corrección gama por ejemplo.

Breve Descripción de los Dibujos

Las características de la invención serán más fácilmente entendibles mediante las referencias a la

siguiente descripción detallada tomada con referencia a los dibujos que la acompañan, en los cuales:

La figura 1 muestra un ambiente para implementar la primer modalidad para reconocimiento de objetos ocultos;

La figura 2 es un diagrama de flujo que ilustra el reconocimiento de un primer objeto oculto por un segundo objeto de una imagen de video.

La figura 3 muestra un diagrama de flujo más detallado de las etapas que son realizadas para reconocimiento de objeto oculto;

La figura 4 es un histograma de muestra.

La figura 5 es un diagrama de flujo que muestra un método para implementar reconocimiento de objeto oculto;

La figura 6 es un diagrama de flujo que muestra una versión automatizada del método para reconocimiento del objeto oculto.

Descripción Detallada de las Modalidades Específicas

Como se utiliza en el siguiente texto, el término "video digital" implica una representación digital de una secuencia de imágenes que pueden ser temporalmente exhibidas sobre un dispositivo de exhibición. Típicamente, el video digital contiene una pluralidad de

cuadros en donde cada cuadro representa una imagen separada. Los cuadros pueden ser además subdivididos de tal forma que los cuadros sean hechos de una serie de pixeles. Como se utiliza en la siguiente descripción el término "píxel" significará un punto simple de una imagen. Entre mayor sea el número de pixeles que este contenido en una imagen, mayor será la resolución del video. Las resoluciones son convencionalmente referenciadas por las medidas de longitud y ancho del número de pixeles, por ejemplo, en una resolución 800x600, existen 800 pixeles a lo largo de la longitud y de una imagen por 600 pixeles a lo largo del ancho de la imagen.

El término "brillo" significará el atributo de una sensación visual de acuerdo a la cual un área parece emitir más o menos luz. El brillo es una expresión relativa de la intensidad de la intensidad de la salida de energía de una fuente de luz visible. El término "gama" y "valor de corrección gama" significará el exponente de la respuesta de la ley de potencia de luminiscencia a voltaje. El término "corrección gama" significará la inserción de una característica de salida-entrada no lineal para el propósito de cambiar las

características de transferencia del sistema. El término "señal de video normal" significará una señal de video digital que es producida utilizando luz visible o puesta a infrarroja o sometida la materia objeto de la imagen a algún tipo de señal diferente a ondas de luz visible. El término "material poroso" es cualquier material que permita una porción de luz directa reflejarse a través del material.

En una modalidad de la presente invención, se presenta un método para detectar objetos ocultos utilizando análisis de cuadros de imágenes de video. Bajo ciertas condiciones, los objetos bajo un material poroso se pueden detectar en u cuadro de video. Ejemplos de materiales porosos incluyen prendas (algodón, seda), tela y vidrio. El objeto oculto se puede exhibir si el objeto oculto y el material poroso son de colores contrastantes. Un color contrastante es un color que cuando es transferido a una escala de grises varía en aproximadamente el 10% en el nivel de escala de grises. Por ejemplo, si existen 256 niveles de escalas de gris el material poroso y objeto oculto deben variar en 25 niveles o más.

La figura 1 muestra una cámara de imagen digital 100 capturando datos de imagen que es el resultado de la luz reflejada. La mayoría de la luz directa 105 es reflejada de un objeto poroso 110. Una porción pequeña de la luz directa 115 pasa a través del material poroso y es reflejada del objeto oculto 120. Algo de la luz reflejada del objeto oculto pasa a través del material poroso y es capturada por un sensor de imagen de video 130. El sector de imagen de video 130 cambia la luz reflejada 105, 115 de tanto el material poroso como de material oculto en una señal eléctrica 140 la cual es procesada por un procesador de imagen digital 150. El procesador de imagen digital 150 envía entonces los datos de imagen 155 a la memoria en un formato digital tal como RGB para cada píxel/receptor en el sensor. Cuando los datos de imagen 155 son entonces exhibidos en un dispositivo de exhibición el objeto oculto no es visible, debido al hecho de que los valores de píxel que representan el material poroso son mucho mayores que aquellos para el objeto oculto. Como resultado, la luz para el material poroso que es emitida del dispositivo de exhibición engolfa la luz emitida que resulta de los valores de píxeles del objeto oculto. Por lo tanto, el ojo humano no puede percibir el objeto oculto. En general, el ojo

humano no es capaz de observar niveles de intensidad por debajo de 80 sobre una escala de grises entre 0-255. Como tal, los valores por debajo de 80 parecerán ser negros. En la figura 1 el objeto oculto es mostrado como un objeto sólido, aunque el objeto oculto podría también ser poroso.

La figura 2 muestra un diagrama de flujo de las etapas que son observadas para alterar los datos de imagen digital con el fin de exhibir un objeto oculto. El método es desarrollado sobre un sistema de computadora que utiliza software de edición de video o imagen. La primer información que son los datos de señal digital que son representativos de una primer imagen/cuadro digital son recibidos 200. Los datos son entonces convertidos de datos de imagen digital de color a datos de escala de gris. Los datos de escala de gris digitales son entonces filtrados 210. El filtrado ocurre de la siguiente manera. Si el objeto poroso no es negro, todos los valores de píxel son ajustados de tal forma que los valores de píxel asociados con el objeto poroso sean por defecto negro. Esto puede ser hecho al aplicar un filtro que corta los valores por encima del valor de escala de gris umbral. Luego los valores restantes que son generalmente

representativos del objeto oculto son incrementados 220. Los valores restantes que no han sido ajustados a 0 (negro) son incrementados de tal forma que los valores están en un rango que es visiblemente perceptible. Por ejemplo, asumiendo una escala de grises entre 0-255 todos los valores se incrementarían por encima de 100, por ejemplo. Los valores son así remapeados, de tal forma que los valores son esparcidos causando que los niveles de contraste sean percibibles y el nivel de brillo/intensidad total para los pixeles representativos del objeto oculto se incrementen de tal forma que los pixeles sean visibles al ojo humano. Se debe entender por un experto en la técnica que el ojo humano no diferencia fácilmente entre pixeles que tengan valores de escala de gris cercanamente próximos. Por lo tanto, un objeto del filtro es esparcir los valores de píxel de bajo nivel de tal forma que el ojo humano pueda percibir el contraste.

La figura 3 muestra un diagrama de flujo más detallado de las etapas que son observadas para reconocimiento de un objeto oculto. Como se estableció previamente, una vez que la información de la imagen digital es recibida en un sistema de computador, la información de color es convertida a una información de

escala de grises mediante técnicas conocidas por aquellos expertos en el arte. Aunque la misma metodología podría ser aplicada a la información de color.

Primero, un histograma de los datos de imagen digital que forman una primer imagen y una secuencia de imágenes es producida 300. Un histograma de muestra es mostrado en la figura 4. El número de ocurrencias de un valor es representado sobre el eje vertical y los valores de escala de grises son representados sobre el eje horizontal. El histograma indica así cuantas veces ocurre la intensidad para una imagen dada. El histograma suministra un pesaje para permitirle al usuario seleccionar los niveles de baja intensidad. En general los valores de alta intensidad predominarán y los valores de luz visible (valores de baja intensidad) serán mucho más pequeños tanto en intensidad como generalmente en el número de ocurrencias. Así, los valores visibles pueden ser fácilmente identificados y removidos a través del filtro u otras técnicas conocidas por un experto en el arte.

En una modalidad, el sistema de computador le permite al usuario ver el histograma y determinar las

porciones de luz de bajo nivel de intensidad de la representación gráfica del histograma 310. Los bajos niveles de intensidad de luz son aquellos que resultan de luz visible pero que no serían percibidos por el ojo humano si se exhibe sobre un dispositivo de exhibición. El usuario selecciona entonces un filtro y filtra toda la otra luz (luz de alta intensidad) 320. Normalmente la luz de baja intensidad de nivel puede ser visualmente determinada y seleccionada por un usuario del sistema de computador. Una vez que la luz de alta intensidad es filtrada, la luz de bajo nivel es remapeada a valores de nivel mayor de tal forma que el dispositivo de exhibición exhibirá los valores remapeados 330. Estos valores son también esparcidos de tal forma que el contraste es más dramático. Por ejemplo, si el corte entre la baja y alta intensidad es 40 sobre una escala de 0-255 y los valores están siendo mapeados entre 135-55, el contraste de incrementa por 3 de tal forma que un valor de 1 y 2 no serían 135 y 139. Los dos niveles de baja intensidad, mapeado son entonces exhibidos a un usuario del sistema 340. Si el objeto representado por uniones de baja intensidad es visible, el usuario responde que la imagen es inaceptable 350. El usuario indica esto a través del dispositivo de entrada de usuario tal como un teclado o

ratón. El método entonces suministra al usuario redeterminar el umbral entre niveles de baja y alta intensidad o suministrar un nuevo remapeo de valores de baja intensidad de tal forma que los valores sean más brillantes, suministrando más contraste entre valores o ambos. El sistema también puede permitirle al usuario seleccionar un nuevo valor para separar entre valor de bajo nivel de intensidad y valor de alto nivel de intensidad 350. Si el usuario indica que el objeto oculto es visible, el proceso finaliza.

El proceso también puede lograr al incrementar la corrección gama y/o el brillo como se muestra en la figura 5, primero el brillo y/o y el valor de corrección gama se aplica a los datos de imagen digital 410. Al incrementar el nivel de brillo, la luz de alto nivel de intensidad eventualmente se satura hacia el blanco, filtrando así la luz de alto nivel de intensidad. Todos los valores que son saturados se pueden entonces remover dejando los valores de bajo nivel. La corrección gama puede entonces ser utilizada para incrementar los valores restantes. Ajustado los gama se incrementa los valores de intensidad sin sobre amplificar el ruido que ocurre al solo incrementar el brillo proporcionalmente a través de

todos los valores. Incrementando los gama se incrementa la intensidad de una forma no lineal de tal forma que la nueva intensidad es:

$$\text{Nueva intensidad} = \frac{\text{Intensidad habitual}}{255} \left(\frac{1}{\text{gama}} \right)$$

En razón a la naturaleza no lineal de la corrección gama, el ruido también se incrementa de una forma no lineal.

En esta modalidad de la invención, el valor de corrección gama aplicado debe ser mayor en valor del que es normalmente utilizado con un exhibidor de tubo de rayos catódicos ("CRT"). Típicamente el valor de corrección gama debe estar entre 6 a 10 para esta modalidad en donde el exhibidor de cato estándar tiene un valor de corrección gama de aproximadamente 2,2-2,5 y el soporte lógico de edición de video de la técnica anterior tenga valores de corrección gama máximos de 5.

Una vez que el filtro de ha aplicado a los datos de imagen de video y los datos de imagen de video de bajo

nivel de intensidad que representan el cuadro habitual se exhibe en 420 al usuario. Los datos que son exhibidos al usuario también pueden incluir algo de los datos de video de alto nivel de intensidad. El usuario puede entonces también interactivamente 430 los valores de gama y brillo y los valores resultantes son de nuevo exhibidos al usuario. A través de este proceso, la imagen representada por la luz de bajo nivel es exhibida. Cuando la imagen es satisfactoria, el usuario hace que el sistema de computador escriba los datos de video alterados del cuadro 450 al almacenamiento de video. Teniendo éxito los cuadros de video son procesados de una manera similar hasta que todos los cuadros se hayan procesado 480. El reconocimiento de objeto oculto esta entonces completo 490.

En un primer ejemplo del método de reconocimiento de objeto oculto, una imagen de una persona que porta una camisa negra con una pistola blanca por debajo es analizada. La imagen digital es capturada de la persona bajo condiciones de iluminación normales. Si la imagen digital es exhibida sobre un dispositivo de exhibición, el ojo humano puede solamente ver una camisa negra que tiene un valor de cero para los pixeles exhibidos sobre

la pantalla. La búsqueda es reflejada a través de la pistola blanca queda enmudecida en el proceso y puede ser así de tal nivel de intensidad que no sea percibible por el ojo humano. Aunque la luz no es percibible, la información de la luz es capturada por el censor del dispositivo de imagen digital. Si el gama y el brillo se incrementan los valores de negro no se incrementarán. Sin embargo, la ligera cantidad de luz que entra de la pistola blanca será amplificada en razón a que esta no es de un valor cero.

Algo de ruido también será amplificado y así exhibido, pero sin suficiente luz, preferiblemente 500 Lux o más está disponible para la cámara, el sistema mostrará claramente la pistola blanca. En otro ejemplo, una imagen de una persona que porta una camisa blanca con una pistola negra por debajo se analiza. En tal imagen, el video es invertido filtrando así los datos de alta intensidad, de tal forma que en la camisa no aparezca negra y por lo tanto suministre un valor de intensidad cero. Los datos de intensidad de bajo nivel son entonces mapeados en un rango en el cual los valores están en el rango visible, por ejemplo, entre 100-255 sobre una escala de 0-255. Esto se puede lograr al convertir primero los datos de los datos de escalas de gris o

utilizar los datos basados en color que es el resultado del sensor de imagen digital. Adicionalmente, los valores son espaciados de tal forma que la distancia entre valores se incrementa, produciendo así percepciones de contraste más probablemente al ojo humano.

En un tercer ejemplo, una imagen de una persona que porta una camisa gris oscura y que tiene una pistola gris clara por debajo de la camisa se alisan. El nivel de intensidad que corresponde al vestido gris oscuro se disminuye de tal forma que este se ajusta a negro. La pistola gris clara estará entonces en algún valor que este por encima de aquel del negro. Los valores que corresponden a la pistola gris clara así como también el ruido se pueden incrementar utilizando corrección de brillo o gama, de tal forma que los valores de luz baja de la pistola gris clara son filtrados y mapeados a valores que son percibibles por el ojo humano, como se explicó previamente.

Este Proceso se puede automatizar como se muestra en la figura 5. En una variación, el significado para todos los datos digitales de la imagen son computarizados 510. La media determina donde están los valores de alta

intensidad. Luego una desviación estándar de la media se determina 520. Todos los valores dentro de la desviación estándar por debajo de la media son entonces identificados como valores de alta intensidad así como también los valores por encima de la media 530. Los valores de alta intensidad son entonces filtrados y removidos así de los datos digitales establecidos que configuran la imagen 540. Los valores de bajo nivel son entonces mapeados a valores que son visibles 550. El espaciamiento entre los valores también se incrementa de tal forma que el contraste entre los valores sea más perceptible al ojo humano. Por ejemplo, el sistema automatizado puede determinar el valor más bajo y más alto dentro de los valores de bajo nivel y sustraer los dos valores para determinar el rango. Este rango es entonces mapeado a un rango de luz visible. Por ejemplo, si la escala es 0-255 y los valores de bajo nivel están entre 1-41 el rango es 40. Los valores por encima de 80 son normalmente percibibles por el ojo humano de tal manera que el rango de 40 sería mapeado a un rango de 175 (80-255). Así, todos los valores provenientes de la luz de bajo nivel se extenderían entre los valores de 80 y 255. Los valores de datos de bajo nivel son entonces exhibidos según dispositivo de exhibición 560.

El sistema puede ser adicionalmente automatizado para cambiar los datos de color a datos de escala de gris para procesamiento. Se debe entender, que aunque los datos pueden ser convertidos a escala de gris para determinar los valores de alta intensidad y baja intensidad, la formación de color es aún mantenida y se puede utilizar para el remapeo de los valores de baja intensidad, de tal forma que, los valores de baja intensidad se puedan exhibir en color después de ser remapeados a valores visibles.

El ángulo de la cámara debe estar dentro de más o menos 40 grados con la normal al objeto para mejores resultados. Si el vestido exterior es muy claro o blanco, entonces el video se puede invertir de tal forma que los objetos claros se vuelvan oscuros y sean detectados los objetos contrastantes por debajo de los materiales porosos. Una condición de luz ambiente de 500 Lux o mayor debe iluminar el objeto bajo estudio.

Se debe notar que los diagramas de flujo son utilizados aquí para demostrar varios aspectos de la invención, y no deben constituir como limitante a la

presente invención en ningún flujo lógico particular o implementación lógica. El lógico descrito se puede particionar en diferentes bloques lógicos (por ejemplo, programas, módulos, funciones, o subrutinas) sin cambiar los resultados totales o apartarse de otra manera del alcance real de la invención. A menudo, los elementos lógicos se pueden agregar, modificar, omitir, desarrollar en un orden diferente, o implementar utilizando construcciones lógicas diferentes (por ejemplo puertas lógicas, primitivos de ciclo, lógicos condicionales, y otras construcciones lógicas) sin cambiar los resultados totales o apartarse de otra manera del alcance cierto de la invención.

La presente invención puede tener modalidad en muchas diferentes formas, incluyendo, pero de ninguna manera estando limitado a, lógicos de programa de computador para uso con un procesador (por ejemplo un microprocesador, microcontrolador, procesador de señal digital, o computador de propósito general). Lógico programable para uso con dispositivo lógico programable (por ejemplo, una Disposición de Puerta Programable de Campo) (FPGA) u otro PLD), componentes discretos, circuitos integrados (por ejemplo un Circuito Integrado

de Aplicación Específica (ASIC)), o cualquiera otros medios que incluyen cualquier combinación de estos.

El lógico programa de computador que implementa todo o parte de la funcionalidad previamente descrita aquí puede tener una modalidad en varias formas, incluyendo, pero de ninguna manera estando limitado a, una forma de código fuente, una forma ejecutable por computador, y varias formas intermedias (por ejemplo, formas generadas por un ensamblador, compilador, enlazador, o localizador). El código fuente puede incluir una serie de instrucciones de programa de computador implementados en cualquiera de varios lenguajes de programación (por ejemplo un código objeto, un lenguaje de ensamble, o un lenguaje de alto nivel tal como el Fortran, el C, el C++, JAVA, o HTML) para uso con varios sistemas operativos o ambientes operativos. El código fuente puede definir y utilizar varias estructuras de datos y mensajes de comunicación. El código fuente puede estar en una forma ejecutable por computador (por ejemplo por vía de un interpretador), o el código fuente se puede convertir (por ejemplo por vía de un traductor, ensamblador, o compilador) en una forma ejecutable por computador.

El programa de computador se puede fijar en cualquier forma (por ejemplo, el código fuente, forma ejecutable por computador, o una forma intermedia) bien sea permanentemente o transitoriamente en un medio de almacenamiento tangible, tal como un dispositivo de memoria de semiconductor (por ejemplo, un RAM, ROM, PROM, EEPROM, o RAM Programable-Flash), un dispositivo de memoria magnético (por ejemplo, un disquete o disco fijo), un dispositivo De memoria óptico (por ejemplo un CD-ROM), o una tarjeta de PC (por ejemplo, una tarjeta PCMCIA), u otro dispositivo de memoria. El programa de computador se puede fijar en cualquier forma en una señal que es transmitible a un computador utilizando cualquiera de varias tecnologías de comunicación, incluyendo, pero de ninguna manera limitados a, tecnologías análogas, tecnologías digitales, tecnologías ópticas, tecnologías inalámbricas, tecnologías de red, y tecnologías de trabajo en Internet. El programa a de computador se puede distribuir en cualquier forma como un medio de almacenamiento removible con documentos impresos o electrónicos que lo acompañan (por ejemplo, software empaquetado por consolidación o una cinta magnética), recargada con un sistema de computador (por ejemplo un sistema ROM o un disco fijo), o distribuido de una

tarjeta de boletín de servidor o electrónica sobre el sistema de comunicación (por ejemplo, el Internet o la red amplia mundial).

El lógico de equipo (incluyendo lógico programable para uso con un dispositivo lógico programable) que implementa todo o parte de la funcionalidad previamente descrita aquí se puede diseñar utilizando métodos manuales tradicionales, o se puede diseñar, capturar, simular o documentar electrónicamente utilizando varias herramientas, tales como el Diseño Ayudado por Computador (CAD), un lenguaje de descripción de equipo (por ejemplo VHDL, o AHDL), o un lenguaje de programación PLD (por ejemplo, PALASM, ABEL, o CUPL.)

La presente invención puede tener modalidad en otras formas específicas sin apartarse del alcance verdadero de la invención. Las modalidades descritas deben ser consideradas en todos los aspectos solamente como ilustrativas y no restrictivas.

REIVINDICACIONES

1. Un método para visualizar un primer objeto que tiene un color contrastante con un segundo objeto, en donde el segundo objeto obstruye la visibilidad del primer objeto, en donde la luz visible pasa a través del segundo objeto, el método comprende:

recibir datos de imagen digital representativos del primer objeto obstruido por el segundo objeto en un sistema de computador; en donde los datos de imagen digital contienen al menos los primeros datos de objeto y los segundos datos de objeto producidos por luz visible y cada dato tiene un valor asociado;

filtrar sustancialmente los datos del segundo objeto; y

incrementar el valor de los datos del primer objeto hasta ser visiblemente exhibible.

2. El método de acuerdo a la reivindicación 1, que comprende además crear un histograma de datos de imagen digital; y

seleccionar los segundos datos de objeto basados en el histograma.

3. El método de acuerdo a la reivindicación 1, en donde sustancialmente filtrar los segundos datos de objeto e incrementar los primeros datos de objeto se logran al menos al incrementar la corrección gama.

4. El método de acuerdo a la reivindicación 3 en donde la corrección gama se establece por encima de 2,5.

5. El método de acuerdo a la reivindicación 3 en donde la corrección gama se establece en o por encima de 6.

6. El método de acuerdo a la reivindicación 1, en donde incrementar los primeros datos de objeto incluye mapear los primeros datos de objeto a valores tal que el contraste entre los niveles de datos es tal que el ojo humano puede detectar el contraste cuando los primeros datos de objeto se exhiben sobre un dispositivo de exhibición.

7. El método de acuerdo a la reivindicación 6, en donde el mapeo se desarrolla de tal forma que el

mapeo es para los valores de datos que cuando se exhiben en un dispositivo de exhibición son observables al ojo humano.

8. El método de acuerdo a la reivindicación 1, en donde incrementar los primeros datos de objeto se logra al menos al incrementar el brillo.

9. El método de acuerdo a la reivindicación 1, en donde el primer objeto y el segundo objeto tienen colores contrastantes.

10. El método de acuerdo a la reivindicación 1, en donde el primer objeto y el segundo objeto tienen colores contrastantes que promedian más de 25 niveles de diferencia sobre una escala de 256 niveles.

11. El método de acuerdo a la reivindicación 1, en donde los datos de imagen se representan sobre una escala de valores en donde el primer objeto y el segundo objeto tienen colores contrastantes de tal forma que los colores de los datos del primer objeto

y los datos del segundo objeto varían aproximadamente en 10% de la escala.

12. El método de acuerdo a la reivindicación 1, en donde el proceso es automatizado.

13. El método de acuerdo a la reivindicación 2 en donde el proceso es automatizado.

14. El método de acuerdo a la reivindicación 1, donde los datos del primer objeto y los datos del segundo objeto contienen información de color.

15. El método de acuerdo a la reivindicación 14, que comprende además:

convertir la información de color de los datos del primer objeto y los datos del segundo objeto a escala de grises.

16. El método para exhibir primeros datos de objeto representativos de un primer objeto en una imagen digital sobre un dispositivo de exhibición en donde el primer objeto es obstruido por un segundo objeto, pasándolos visibles a través del segundo objeto, el

primer objeto y el segundo objeto teniendo colores contrastantes, el método comprende:

recibir datos digitales representativos de la imagen digital en un sistema de computador; y

filtrar los primeros y segundos objetos de datos de objeto de tal forma que los primeros datos de objeto son visiblemente exhibidos sobre el dispositivo de exhibición y los segundos datos de objeto son cortados.

17. El método de acuerdo a la reivindicación 16, que comprende además:

tomar una imagen digital del primer objeto y el segundo objeto utilizando un sensor de luz visible que produce los primeros datos de objeto y los segundos datos de objeto.

18. El método de acuerdo a la reivindicación 16, en donde filtrar comprende:

mapear los primeros datos de objeto a una escala tal que el contraste entre el valor de datos cuando se exhiben son visibles a un ojo humano.

19. El método de acuerdo a la reivindicación 16, que comprende además:

desplegar los primeros datos de objeto sobre un dispositivo de exhibición

20. El método de acuerdo a la reivindicación 19, que comprende además:

suministrar ajuste manual del filtro después de exhibir los primeros datos de objetos o un dispositivo de exhibición.

21. El método de acuerdo a la reivindicación 16 en donde el filtro incluye:

crear un histograma visualmente exhibible de los datos digitales representativos de la imagen digital;

suministrar una selección de usuario de un grupo de datos digitales representativos de la imagen digital;

remover el grupo seleccionado de los datos digitales representativos de la imagen digital; y

ajustar los valores de los datos digitales restantes al aplicar corrección gama a los datos digitales al incrementar un valor de corrección gama

hasta que el primer objeto sea exhibible cuando los datos digitables son exhibidos en un dispositivo de exhibición.

22. El método de acuerdo a la reivindicación 16, en donde los primeros datos de objeto y los segundos datos de objeto contienen información de color.

23. El método de acuerdo a la reivindicación 22, que comprende además:

convertir la información de color de los primeros datos de objeto y los segundos datos de objeto a escala de grises.

24. El método de acuerdo a la reivindicación 23, en donde si el segundo objeto es más oscuro que el primer objeto, ajustando al menos los segundos datos de objeto hasta sustancialmente todos los datos del segundo objeto produce salida cero cuando se representa sobre un exhibidor.

25. El método de acuerdo a la reivindicación 23, en donde si el segundo objeto es sustancialmente más claro que el primer objeto, invertir el primer y

segundos datos de objeto de tal forma que el segundo objeto aparezca más oscuro cuando se presenta sobre un dispositivo de exhibición.

26. El método de acuerdo a la reivindicación 25, ajustando al menos los segundos datos de objeto hasta que sustancialmente todos los segundos datos de objeto produzcan salida cero cuando se representan sobre un exhibidor.

27. El método de acuerdo a la reivindicación 25 que comprende además:

mapear los primeros datos de objeto a valores de datos tal que los valores de datos cuando se representan sobre un exhibidor sean visibles y el escalamiento entre valores de datos se incremente sobre el escalamiento entre los primeros datos de objeto.

28. El método de acuerdo a la reivindicación 26 que comprende además:

mapear los primeros datos de objeto a valores de datos de tal forma que los valores de datos cuando se representan sobre un exhibidor sean

visibles y el escalamiento entre valores de datos se incrementa sobre el escalamiento entre los primeros datos de objeto.

29. Un producto de programa de computador que tiene un código de computador legible por computador para visualizar primeros datos de objeto representativos de un primer objeto que tiene un color contrastante con un segundo objeto, en donde el segundo objeto obstruye la visibilidad del primer objeto, en donde la luz visible pasa a través del segundo objeto, el código de computador comprende:

código de computador para recibir datos de imagen digital representativos del primer objeto obstruido por el segundo objeto en un sistema de computador; en donde los datos de imagen digital contienen al menos primeros datos de objeto y segundos datos de objeto producidos por la luz visible;

código de computador para filtrar sustancialmente los segundos datos de objeto; y

código de computador para incrementar los primeros datos de objeto hasta que sean visiblemente exhibibles.

30. El producto de programa de computador de acuerdo a la reivindicación 29, que comprende además:

código de computador para crear un histograma de los datos de imagen digital; y
código de computador para seleccionar los segundos datos de objeto basados en el histograma.

31. El producto de programa de computador de acuerdo a la reivindicación 29, en donde el código del programa para filtrar sustancialmente los segundos datos de objeto e incrementar los primeros datos de objeto incrementan la corrección gama.

32. El producto de programa de computador de acuerdo a la reivindicación 31, en donde la producción gama se ajusta por encima de 2,5.

33. El producto de programa de computador de acuerdo a la reivindicación 31 en donde la producción gama se ajusta en o por encima de 6.

34. El producto de programa de computador de acuerdo a la reivindicación 1, en donde el código de computador para incrementar los primeros datos de objeto incluye código de computador para mapear los primeros datos de objeto a valores tal que el contraste entre los niveles de datos es tal que el ojo humano puede detectar el contraste.

35. El producto de programa de computador de acuerdo a la reivindicación 34, en donde el código de computador para mapear se desarrolla de tal forma que el mapeo es para valores de datos que cuando se exhiben en un dispositivo de exhibición, observables por el ojo humano.

36. El producto de programa de computador de acuerdo a la reivindicación 29, en donde el código de computador para incrementar los primeros datos de objeto incrementa los primeros datos de objeto al menos al incrementar el brillo.

37. El producto de programa de computador de acuerdo a la reivindicación 29, en donde el primer

objeto y el segundo objeto tienen colores contrastantes.

38. El producto de programa de computador de acuerdo a la reivindicación 29, en donde los primeros y los segundos datos de objeto representan colores contrastantes que promedian más de 25 niveles sobre una escala de 256 niveles.

39. El programa de computador de acuerdo a la reivindicación 29, en donde los datos de imagen se asocian con un a escala y el primer objeto y el segundo objeto tienen colores contrastantes de tal forma que los datos del primer objeto y los datos del segundo objeto varían sustancialmente en 10% de la escala.

40. El producto de programa de computador de acuerdo a la reivindicación 29, en donde los primeros datos de objeto y los segundos datos de objeto contienen información de color y el producto de programa de computador incluye además código de computador para convertir la información de color de

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los primeros datos de objeto y los segundos datos de objeto a escala de grises.

41. Código de computador sobre un medio leíble por computador para desplegar primeros datos de objeto representativos de un primer objeto en una imagen digital sobre un dispositivo de exhibición en donde el primer objeto es obstruido por un segundo objeto, pasando la luz visible a través del segundo objeto, el primer objeto y el segundo objeto teniendo colores contrastantes, el código de computador comprende:

código de computador para recibir datos digitales que representan la imagen digital en el sistema de computador; y

código de computador para filtrar los primeros y segundos datos de objeto de tal forma que los primeros datos de objeto son visiblemente exhibidos sobre el dispositivo de exhibición y los segundos datos de objeto son cortados.

42. el producto de programa de computador de acuerdo a la reivindicación 41, en donde el código de computador para filtrar incluye:

código de computador para mapear los primeros datos de objeto a una escala tal que el contraste entre los valores de datos cuando se despliega son visibles al ojo humano.

43. El producto de programa de computador de acuerdo a la reivindicación 41, que comprende además:

código de computador para desplegar los primeros datos de objeto sobre un dispositivo de exhibición.

44. El producto de programa de computador de acuerdo a la reivindicación 41, que comprende además:

código de computador para suministrar ajuste de usuario del filtro después de exhibir los primeros datos de objeto sobre el dispositivo de exhibición.

45. El producto de programa de computador de acuerdo a la reivindicación 41 en donde el código de computador para filtrar incluye:

código de computador para crear un histograma visualmente exhibible de los datos digitales representativos de la imagen digital;

código de computador para suministrar selección de usuario de un grupo de datos digitales representativos de la imagen digital;

código de computador para remover el grupo seleccionado de los datos digitales representativos de la imagen digital; y

código de computador para ajustar los valores de datos de los datos digitales restantes al aplicar corrección gama a los datos digitales al incrementar un valor de corrección gama hasta que el primer objeto es exhibible cuando los datos digitales se exhiben sobre un dispositivo de exhibición.

46. El producto de programa de computador de acuerdo a la reivindicación 41, en donde los datos del primer objeto y los datos del segundo objeto contienen información de color y en donde el producto de programa de computador comprende además:

código de computador para convertir la información de color de los datos del primer objeto y los datos del segundo objeto a escala de grises.

47. El producto de programa de computador de acuerdo a la reivindicación 46, que comprende además código de computador para ajustar al menos los segundos datos de objeto hasta que sustancialmente todos los segundos datos de objeto produzcan salida cero cuando están representados sobre un exhibidor si el segundo objeto es más oscuro que el primer objeto.

48. El producto de programa de computador de acuerdo a la reivindicación 46, que comprende además código de computador para invertir los primeros y segundos datos de objeto de tal forma que el segundo objeto parezca más oscuro cuando se representa sobre un dispositivo de exhibición si el segundo objeto es sustancialmente más claro que el primer objeto.

49. El producto de programa de computador de acuerdo a la reivindicación 48, que comprende además código de computador para ajustar al menos los segundos datos de objeto hasta que sustancialmente todos los segundos datos de objeto produzcan salida cero cuando se representan sobre un exhibidor.

50. El producto de programa de computador de acuerdo a la reivindicación 48, que comprende además:

código de computador para mapear los primeros datos de objeto a valores de datos de tal forma que los valores de datos cuando se representan sobre un exhibidor sean visibles y el escalamiento dentro de los valores de datos se incremente sobre el escalamiento entre los primeros datos de objeto.

51. El producto de programa de computador de acuerdo a la reivindicación 49 que comprende además:

código de computador para mapear los primeros datos de objeto a valores de datos tal que los valores de datos cuando se representan sobre un exhibidor son visibles y el escalamiento entre los valores de datos se incrementa sobre el escalamiento entre los primeros datos de objeto.

52. Un sistema para detectar un primer objeto oculto con un segundo objeto, el sistema comprende:

una cámara para tomar una imagen digital que utiliza luz visible, la imagen digital contiene

datos representativos del primer objeto y el segundo objeto; y

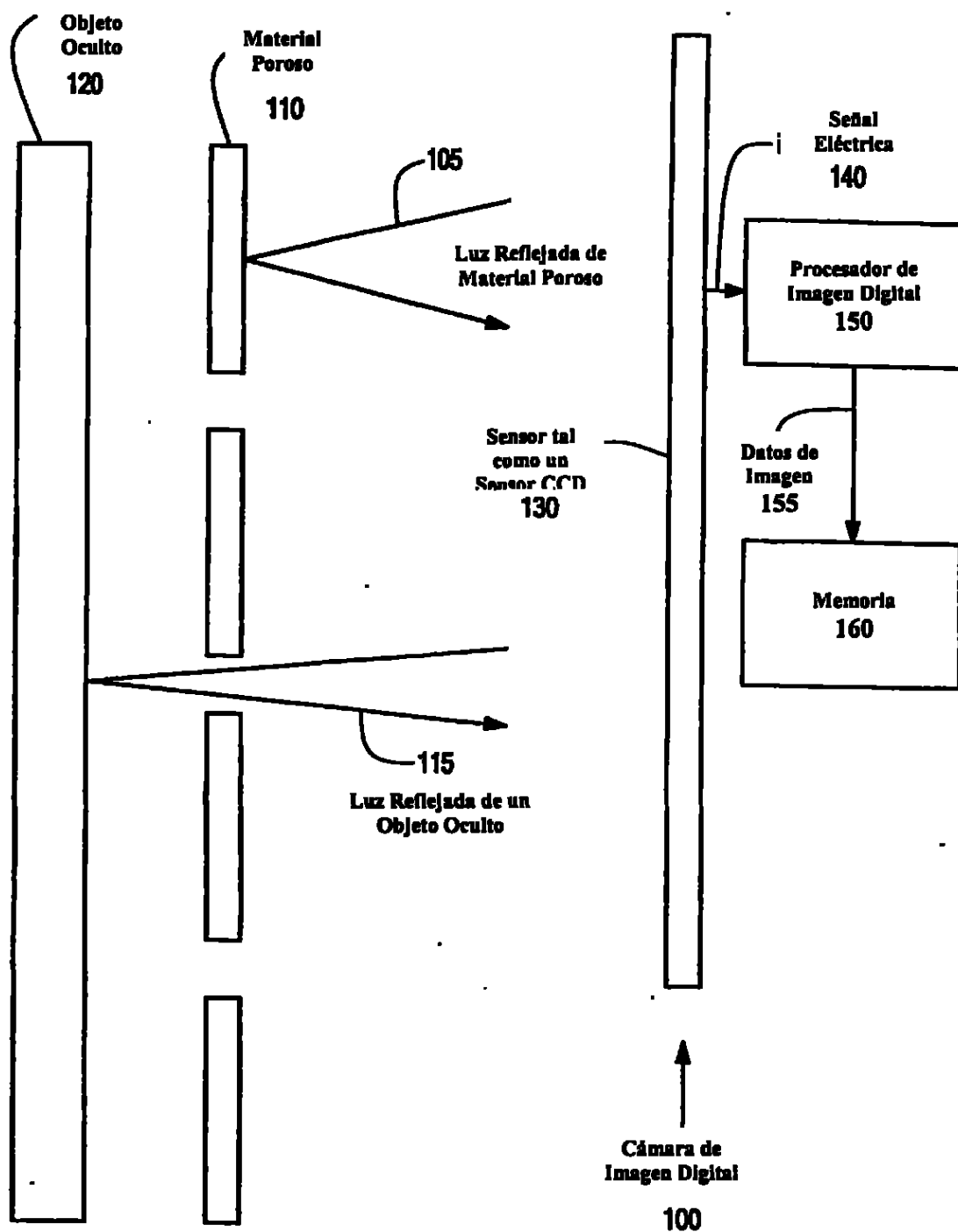
un procesador para recibir la imagen digital y procesar la imagen digital para filtrar los datos del segundo objeto e incrementar los valores de los datos del primer objeto hasta que sean visiblemente exhibibles.

53. El sistema de acuerdo a la reivindicación 52 en donde el procesador recibe una señal activada de usuario y el procesador incrementa el valor de corrección gama.

54. el sistema de acuerdo a la reivindicación 53 en donde el valor de corrección gama se incrementa en o por encima de 5.

55. el sistema de acuerdo a la reivindicación 51 en donde el procesador incrementa los valores de los primeros datos de objeto, en donde los primeros datos de objeto están sobre una escala e incrementa el escalamiento entre los primeros datos de objeto.

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**FIG. 1**

HOJA DE REEMPLAZO (REGLA 26)

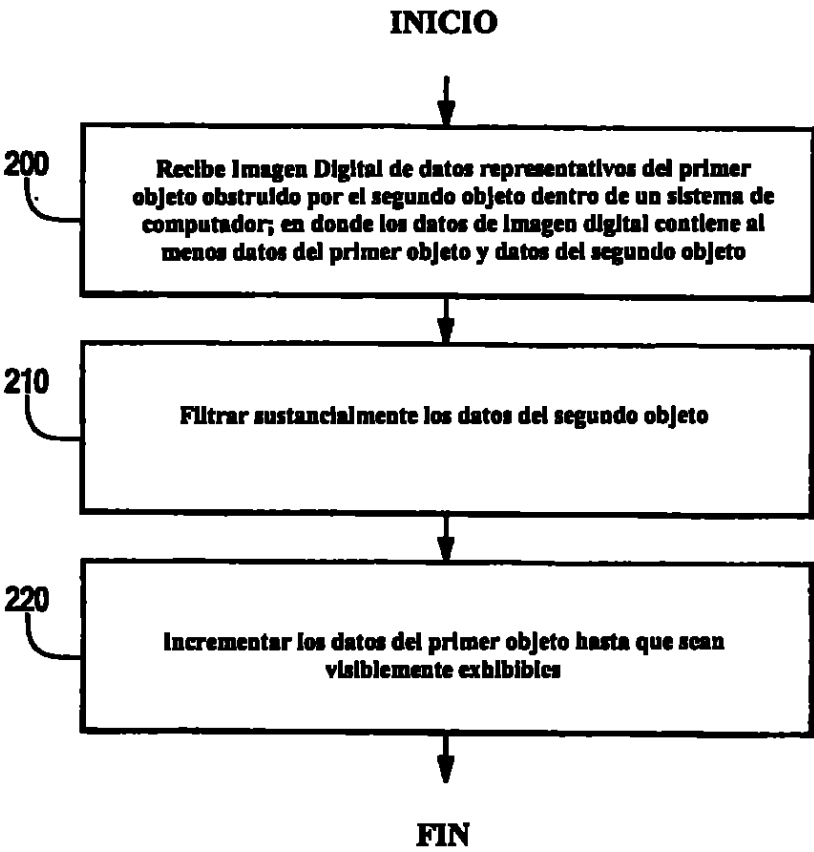


FIG. 2

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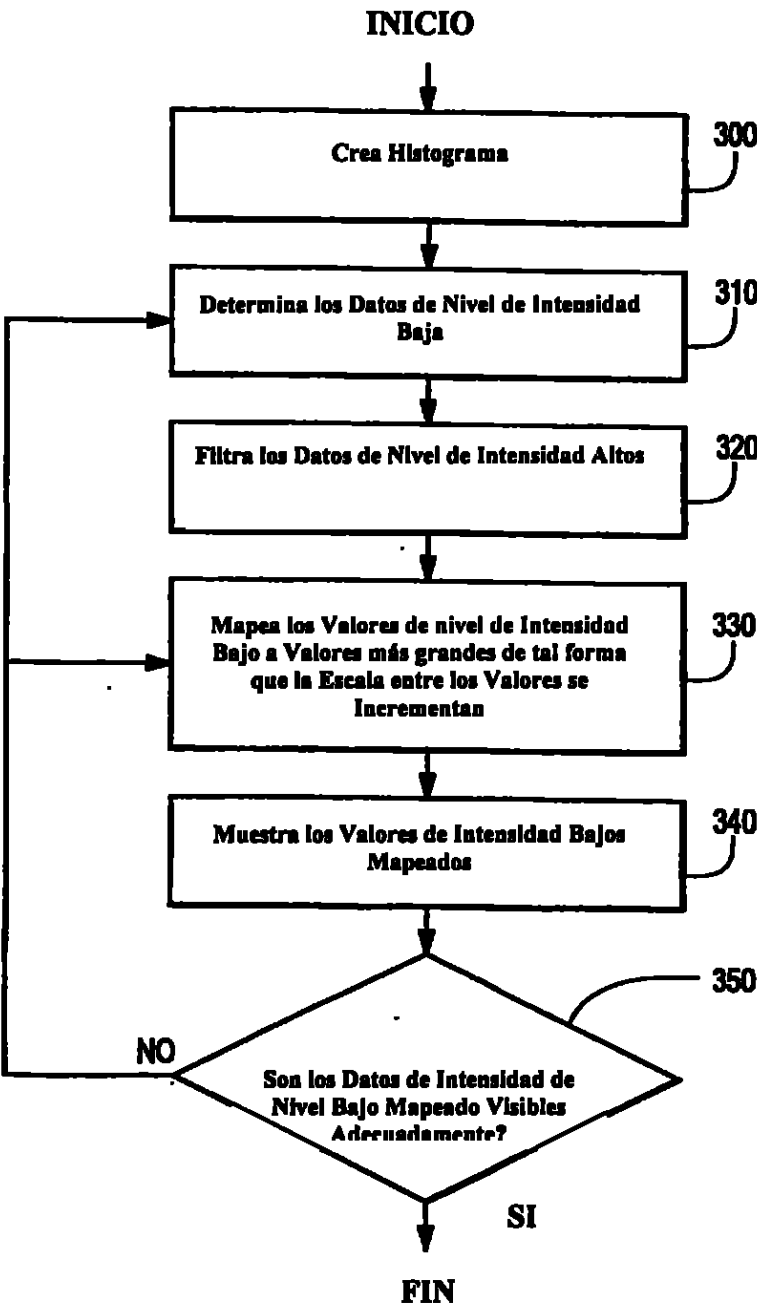
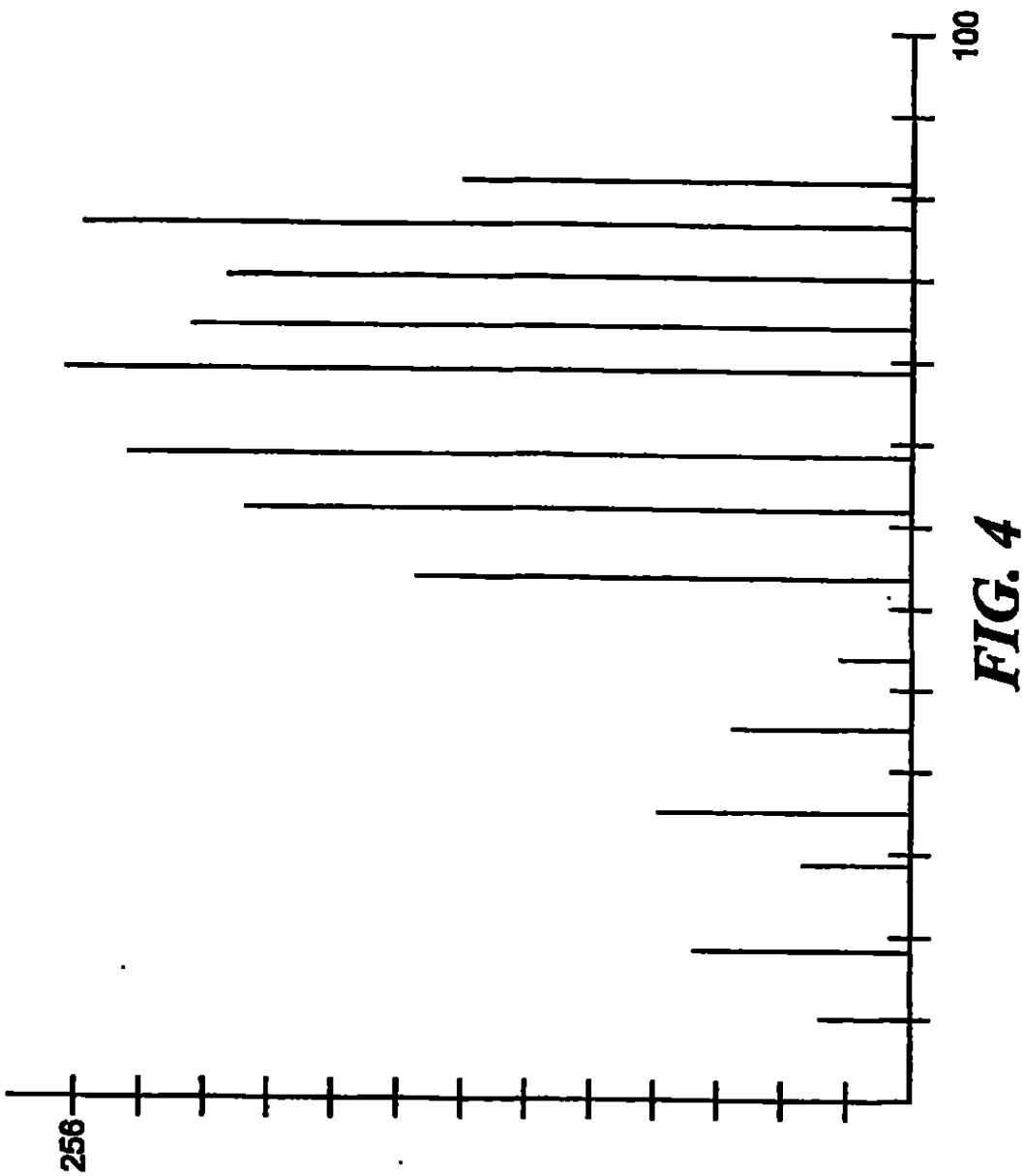


FIG. 3

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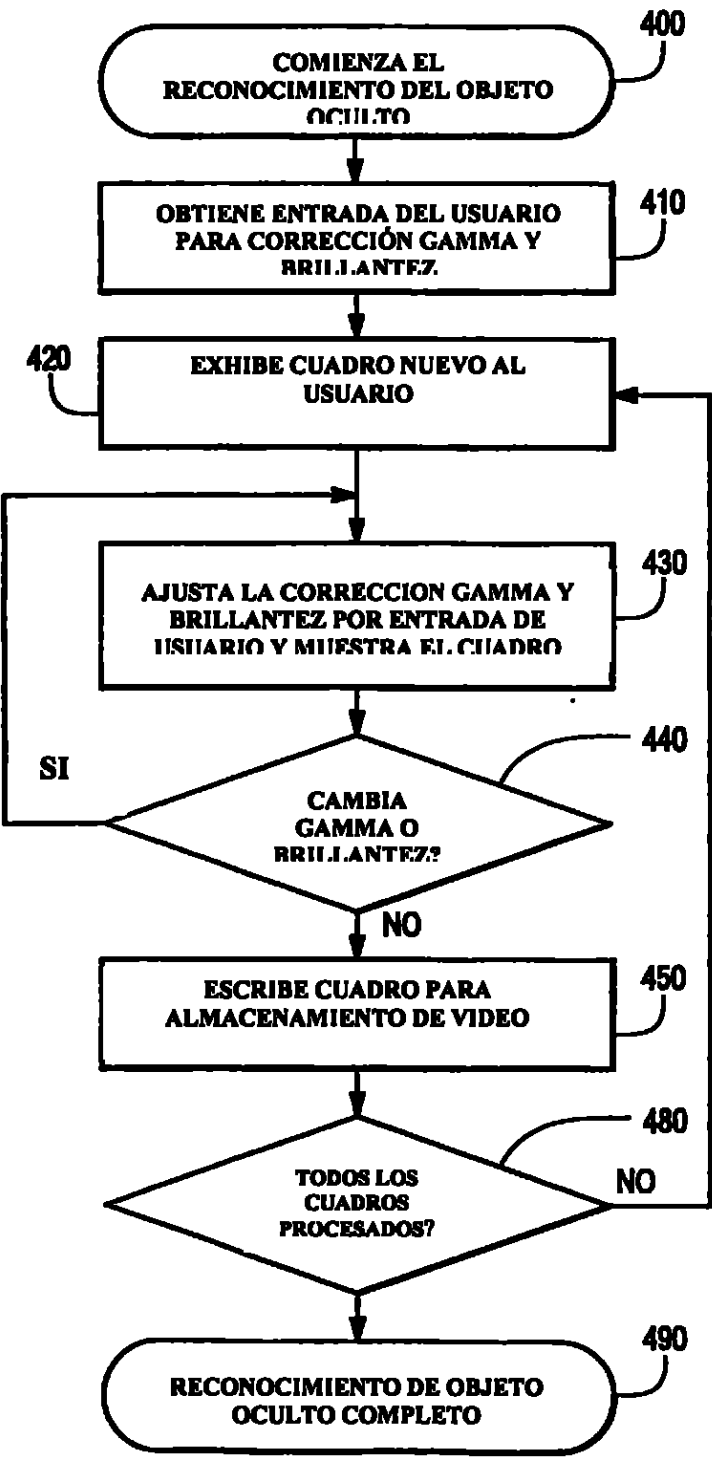


FIG. 5

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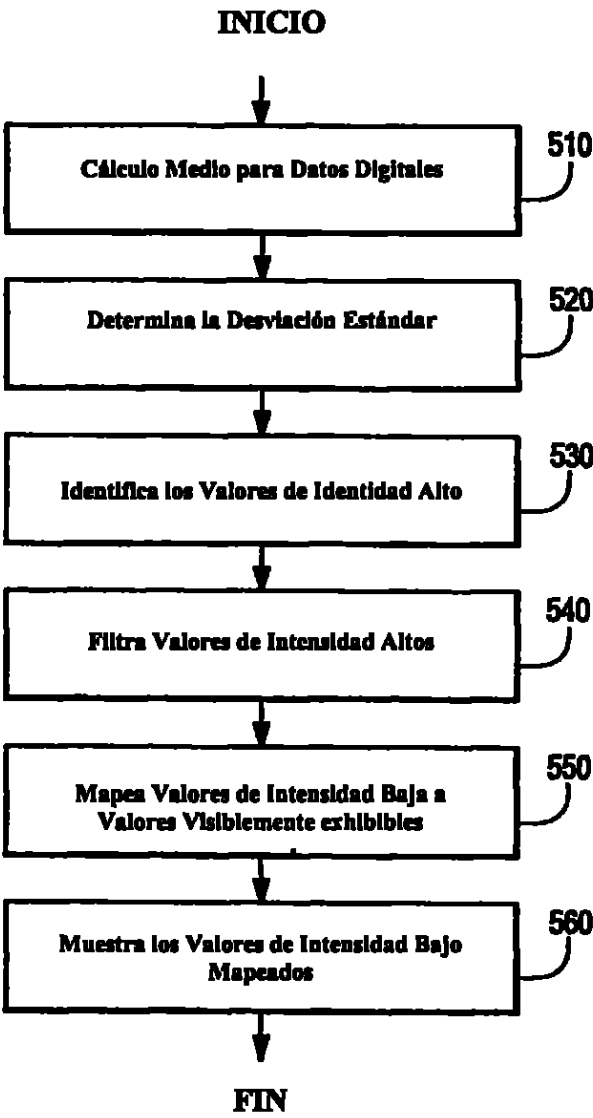


FIG. 6

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SUPERINTENDENCIA : LURENJIU
Radicación : 0403092 00000000 Folios: 111
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Trámite : 011 PCT-PATENT 379 FASE NACI 411 PRESENTAC
Dependencia: 2020 DIVISION DE NUEVAS CREACIONES
NI 3 MOD33

MIT : 800176089-2

RECIBO OFICIAL DE CAJA : 04 - 25,987
FECHA : MARZO 30 DE 2004

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO POPULAR	050-00110-6	22156874	30/03/2004	42,288,000.00

***** CONCEPTO *****

CANT. RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	7 TRANITES DE SOL. DE DISEÑOS INDIA	422,000.00
	TOTAL :	\$ 422,000.00

SON: CUATROCIENTOS VEINTIDOS MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

040 14208-841-001-4

REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL TRAMITE

PATENTE DE INVENCION

MODELO DE UTILIDAD

USUARIO RADICADOR

Indicación de que se solicita la concesión de una patente
 Datos de identificación del solicitante o de la persona que se presenta la solicitud.
 Descripción de la invención
 Dibujos de ser estos pertinentes
 Comprobante de Pago de las tasas establecidas

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COMPLETA ()

INCOMPLETA ()

DISEÑO INDUSTRIAL ()

Indicación de que se solicita el registro de Diseño Industrial
 Datos de identificación del solicitante o de la persona que presenta la solicitud
 Representación gráfica o fotografica del Diseño Industrial o muestra del Material que incorpora el diseño
 Comprobante de pago de las tasas establecidas

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COMPLETA ()

INCOMPLETA ()

ESQUEMA DE TRAZADO ()

Indicacion de que solicita el registro de un Esquema de trazado
 Datos de identificación del solicitante o de la persona que presenta La solicitud
 Representacion gráfica del esquema de trazado
 Comprobante de pago de las tasas establecidas

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COMPLETA ()

INCOMPLETA ()

Firma Responsable

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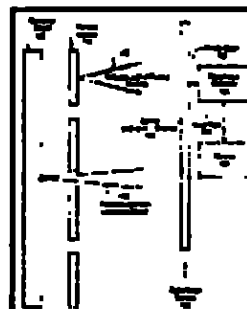
For information on time limits for entry into the national phase please click here

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(57) A method for viewing a first object that is obstructed by a second object. In such a method, the first object has a contrasting color to the second object and the second object is constructed from a material that allows visible light to pass therethrough. The amount of visible light that passes through the second object is not enough such that the first object is visible to the human eye. The method involves taking a digital image of the first and second object using a visible light sensor, such as a CCD camera sensor. The digital image data that is received into a computer system contains both first object data and second object data. It should be understood that the first object data and the second object data include color information. The amount of contrast between the first and the second object should be approximately 10% of the total scale such that on a 256 color scale the difference is approximately 25 levels. The computer system substantially filters out the second object data and then the values associated with the first object data are increased until the data is visibly displayable.



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(54) APPARATUS AND METHOD FOR ANCHORING A DENTAL APPLIANCE

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(81) BR, CN, CO, JP, KP

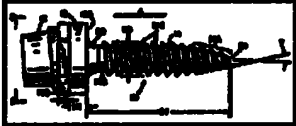
(84) European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR)

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(57) An anchor apparatus having a threaded post (14) for threaded engagement with bone, and an upper circular receptacle (18). An angled support (13) having a lower circular base (20) and an upper female prosthesis receptacle is secured within to the implant anchor, the securing being through lower circular base (20) being engaged with and adhered to the upper circular receptacle (18) of the implant anchor. The circular base (20) has a first longitudinal axis and the upper female prosthesis receptacle has a second longitudinal axis forming a mounting angle with respect to one another. A dental prosthesis (28) having a male extension (30) shaped for cooperative engagement with the upper female prosthesis receptacle of the implant anchor is secured to the implant anchor by such cooperative engagement. An alternate embodiment integrates the threaded post and the female prosthesis receptacle into a single member, for a zero degree angle.

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