US008763907B2

(12) **United States Patent**
Harris

(10) **Patent No.: US 8,763,907 B2**
(45) **Date of Patent: *Jul. 1, 2014**

(54) **BARCODE DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/788,400**

(22) Filed: **Mar. 7, 2013**

(65) **Prior Publication Data**

US 2013/0181053 A1 Jul. 18, 2013

Related U.S. Application Data

(60) Continuation of application No. 13/425,612, filed on Mar. 21, 2012, which is a continuation of application No. 13/083,558, filed on Apr. 9, 2011, now Pat. No. 8,141,783, which is a continuation of application No. 12/103,815, filed on Apr. 16, 2008, now Pat. No. 7,963,446, which is a continuation of application No. 10/714,097, filed on Nov. 14, 2003, now Pat. No. 7,967,207, which is a division of application No. 09/618,988, filed on Jul. 18, 2000, now Pat. No. 6,666,377.

(51) **Int. Cl.**

G06K 7/10	(2006.01)
G07D 11/00	(2006.01)
G07F 19/00	(2006.01)
G06K 5/00	(2006.01)
G06K 9/18	(2006.01)
G06Q 20/00	(2012.01)

(52) **U.S. Cl.**
USPC **235/462.01**; 235/379; 235/380; 235/382; 235/462.09; 705/64; 705/65

(58) **Field of Classification Search**
USPC 235/462.01, 379, 380, 382, 462.09; 902/3; 705/64, 65, 67, 39, 44; 713/186; 382/115
See application file for complete search history.

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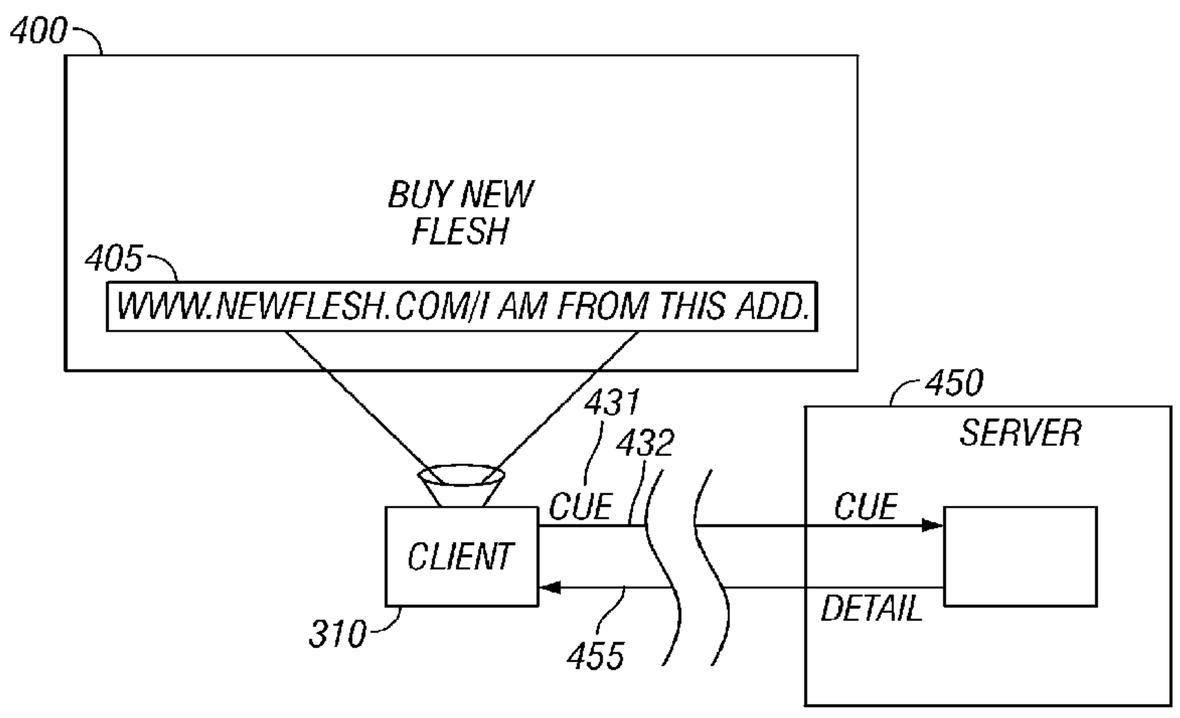
(Continued)

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(57) **ABSTRACT**

Bar codes used for various applications. A bar code can be used for biometrics, or for computer data entry. A special bar code is described that has additional information, but can be read by other readers.

18 Claims, 4 Drawing Sheets



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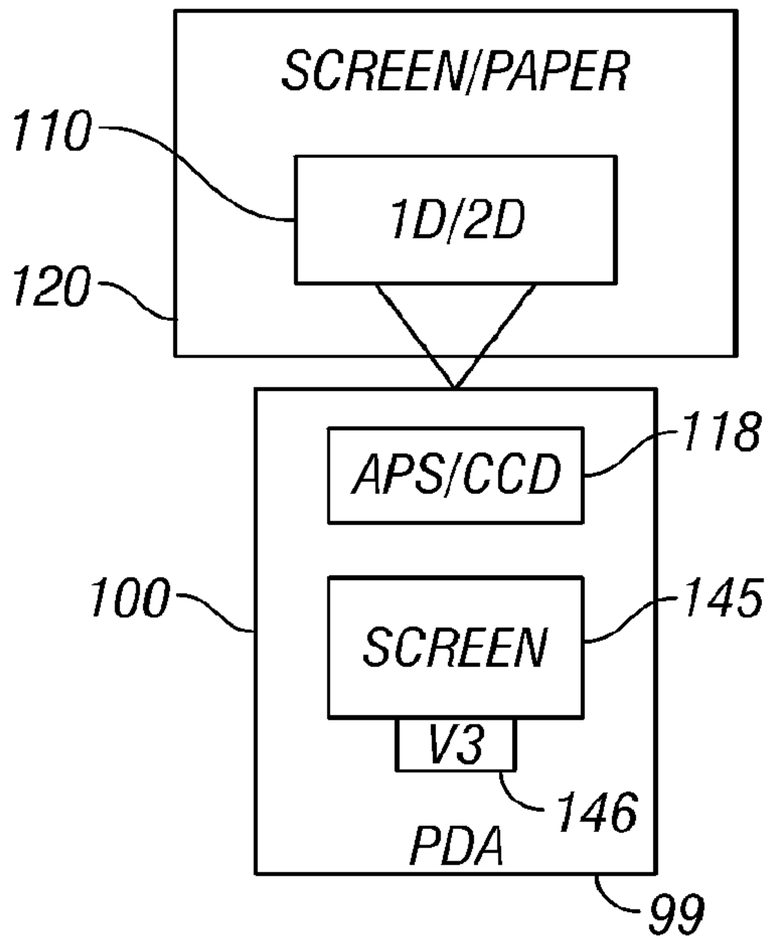


FIG. 1A

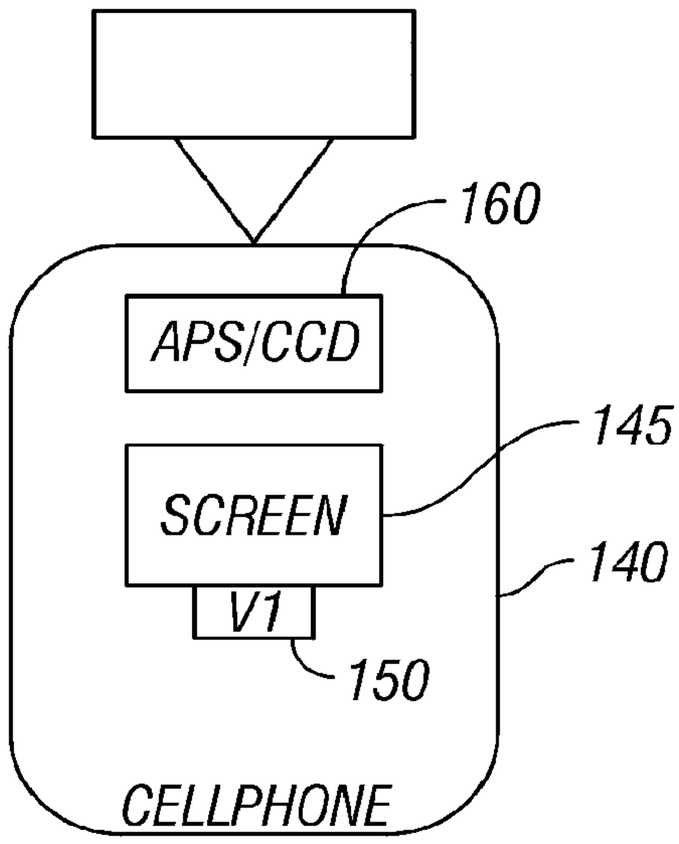


FIG. 1B

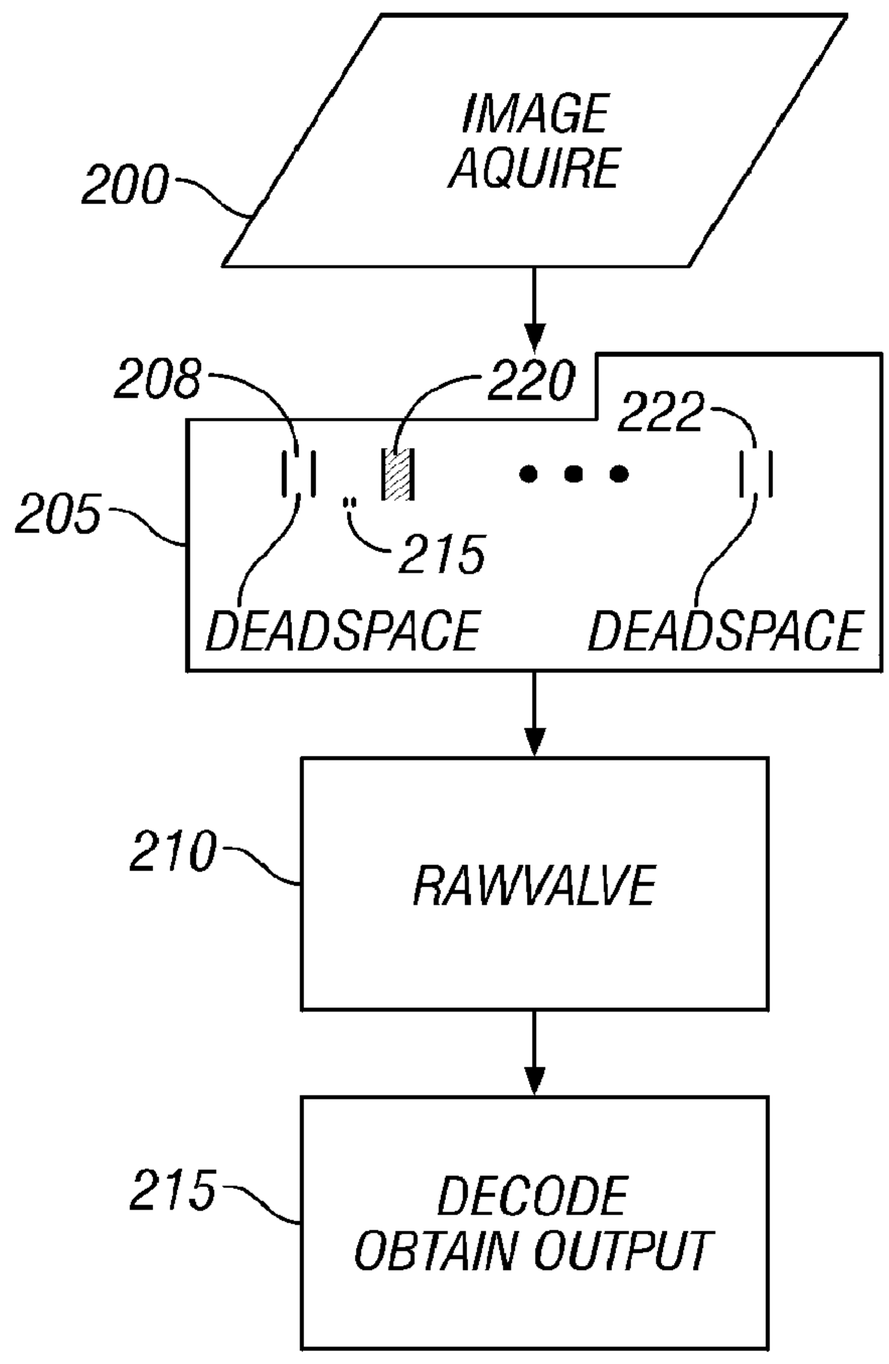
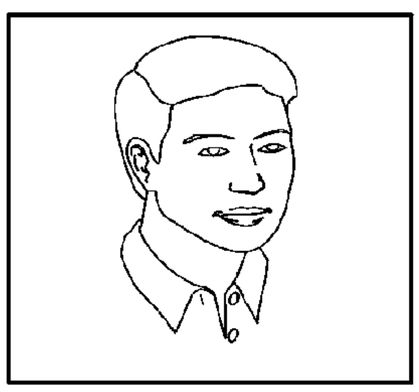


FIG. 2



64X64
8 BIT/PIXEL =
3 COLORS/PIXEL~100K.
~1KBYTE

BITMAP
JPG
320
20 K BYTES
2000
X8
305

CVT160IC^{VC} INTO LEASE 41

OR ENCRYPT
PRIVATE
???
OR HASH

DECRYPT
PUBLIC
???

BAR
CODE

CVT
BASE
41

310

315
BARCODE

320
ENERGY

9 0-9
27 A-7
5 T5
41

BASE 41

335
DISPLAY
LEAD
OR
330

DC/CREDIT CARD
305

TO AVOID THE
"I LOOK SO STUPID"

PROBLEM W/
SMART CARDS
EXPENSIVE

$$41^8 41^7 41^6 41^5 41^4 41^3 41^2 41 = \frac{41^n - 1}{8} \text{ BYTES } \frac{3.27X10^{14}}{8} \approx {}^{-3}/_{8}\, X10^{14} \text{ BYTES}$$

FIG. 3

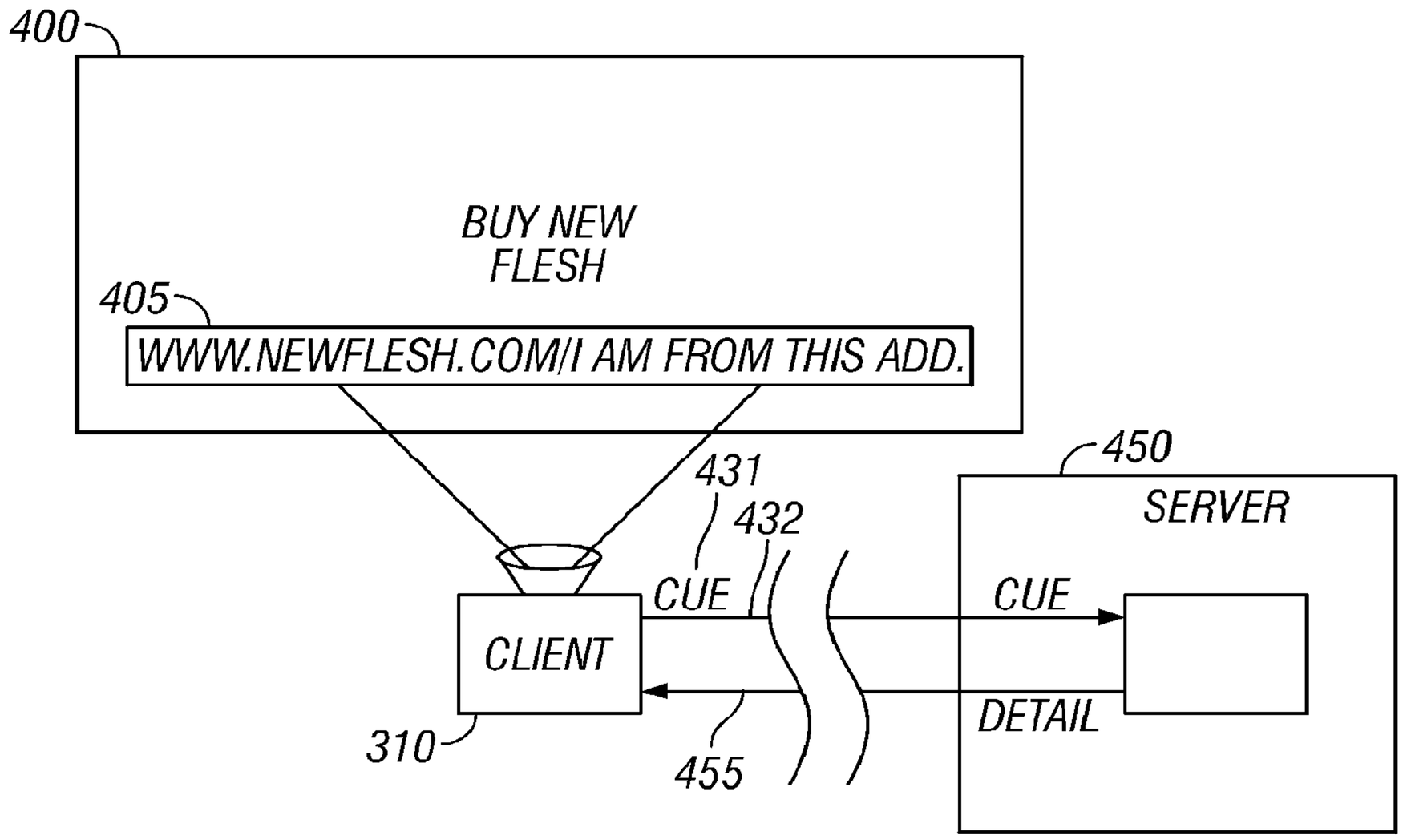


FIG. 4

FROM: S@COM0.COM

TO: X@COM0.COM

SUBJECT: BARCODE MEETING

BARCODE MEETING, TOMMOROW AT 5

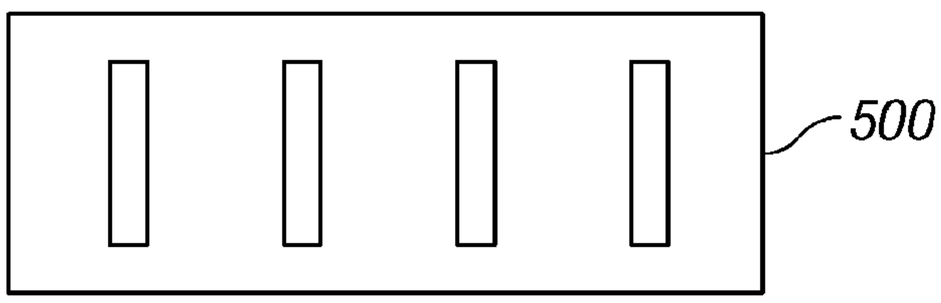


FIG. 5

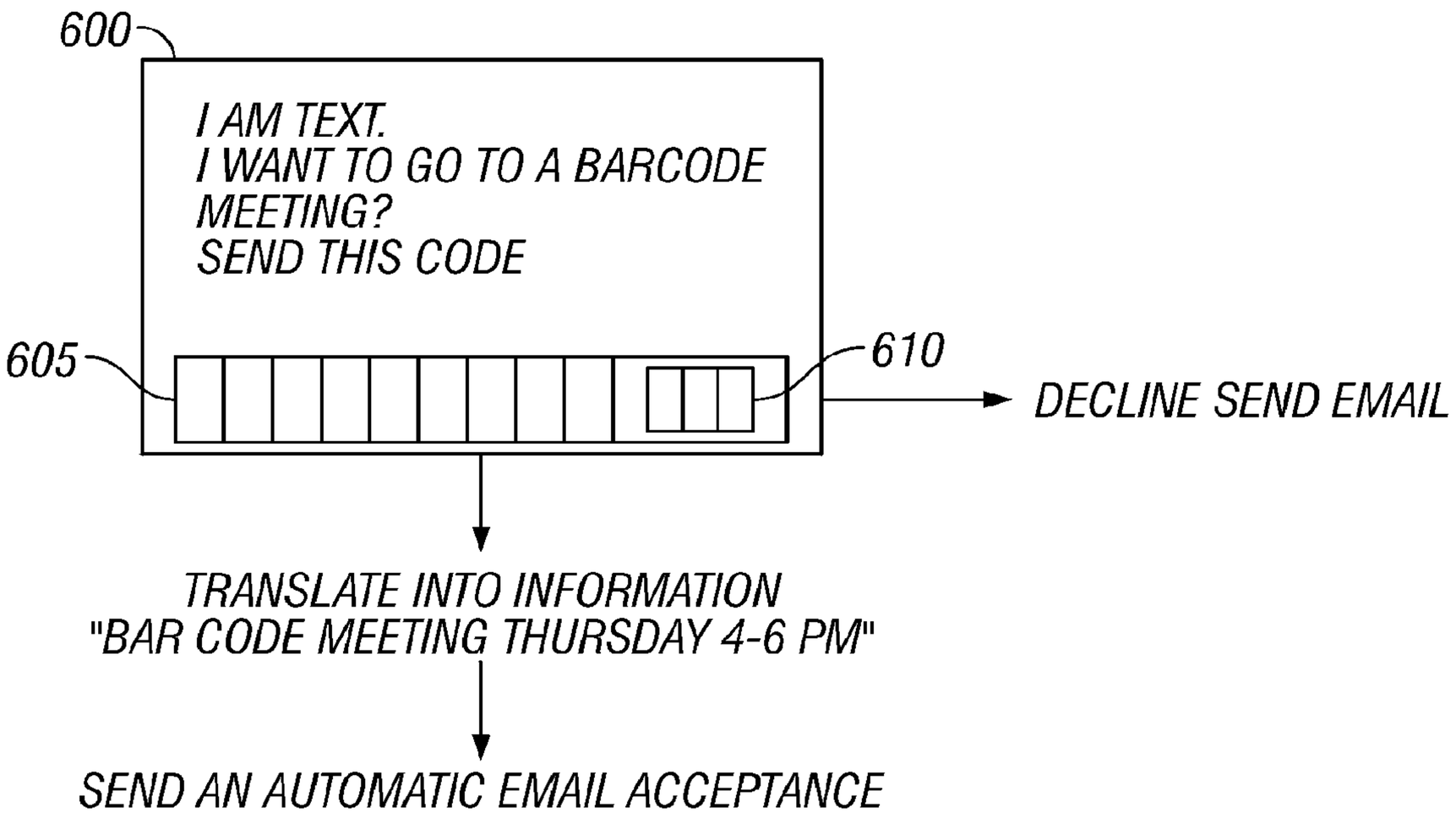


FIG. 6

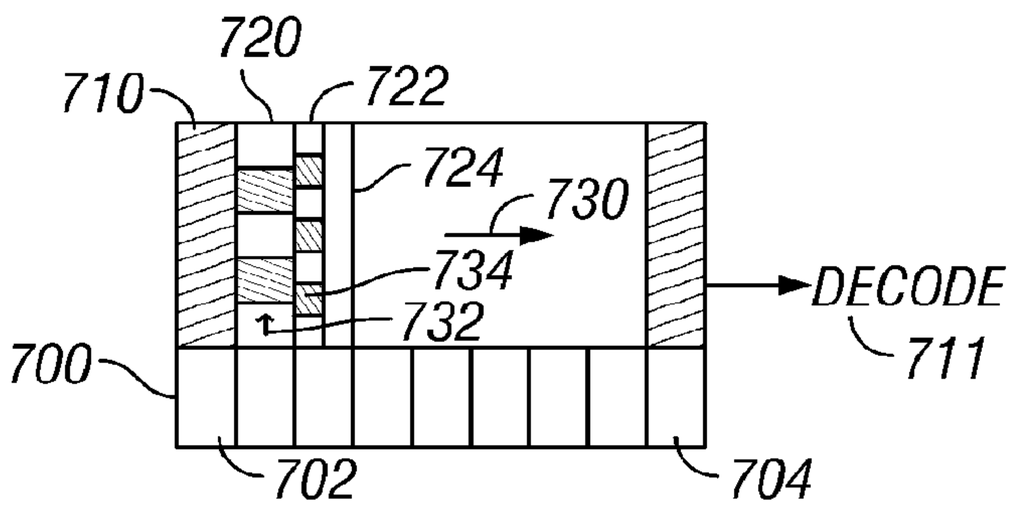


FIG. 7A

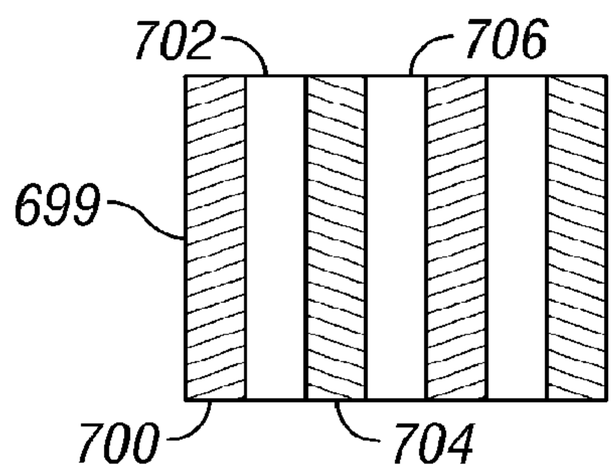


FIG. 7B

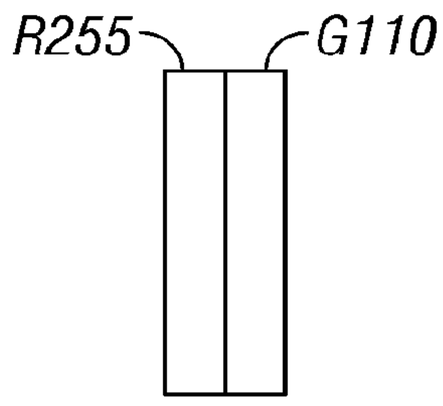


FIG. 7C

BARCODE DEVICE

This application is a continuation of U.S. application Ser. No. 13/425,612 filed Mar. 21, 2012, which is a continuation of U.S. application Ser. No. 13/083,558 filed Apr. 9, 2011, now U.S. Pat. No. 8,141,783 issued Mar. 27, 2012, which is a continuation of U.S. Ser. No. 12/103,815 filed Apr. 16, 2008, now U.S. Pat. No. 7,963,446 issued Jun. 21, 2011, which is a continuation of Ser. No. 10/714,097 filed Nov. 14, 2003, now U.S. Pat. No. 7,967,207 issued Jun. 28, 2011, which is a division of Ser. No. 09/618,988 filed Jul. 18, 2000, now U.S. Pat. No. 6,666,377 issued Dec. 23, 2003, the disclosures of all of which are herewith incorporated by reference in their entirety.

BACKGROUND

The present application relates to bar codes, and to scanning of bar codes and other scannable type codes to obtain and enter information.

Bar codes are often used in scanning of information. A bar code provides information based on sizes of its different parts.

Typical linear/one-dimensional bar codes provide white and dark bars forming a bar code image. Linear bar codes may include Universal Product Codes (UPCs), Type 39 bar codes and type 128 bar codes. Two-dimensional bar codes, including a "matrix" code and the "Gettysburg Address" type bar code, are also known. Bar codes have been used for many purposes including inventory control.

SUMMARY

The present application teaches using scanned information from a scannable code to enter special kinds of information. One embodiment describes using the scannable code in place of a photo. Another embodiment describes bar codes being sent as part of a message, where the message can be an advertisement, an email, or the like. The information in the bar code relates to some aspect of the message. For example, one embodiment describes using the bar code to represent a meeting time that is described in an email. Another embodiment describes using the bar code to represent a time and place of a function being advertised, e.g. an event. The bar codes can represent the information itself, or can represent an address from a look up database which includes more information about the bar code.

Another embodiment describes special kinds of bar codes which store additional information in a different way than previously carried out. One of these information types is a progressive information type where the bar code can be read by either a linear or a two-dimensional bar code scanner.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects will now be described in detail with respect to the accompanying drawings, wherein:

FIGS. **1**A and **1**B show an image used in a cellular telephone and/or a portable computer;

FIG. **2** shows a flowchart of operation of the sensor;

FIG. **3** shows a diagram of encoding of a photo;

FIG. **4** shows a message with an associated bar code entry part;

FIG. **5** shows a client-server Internet embodiment;

FIG. **6** shows a bar code meeting system; and

FIGS. **7**A-**7**C show new specialized bar code schemes.

DETAILED DESCRIPTION

The present application teaches using a symbolical code, such as a bar code, to enter information into a computer device. The computer device can be a portable computer which is described herein as being any computer in which the display and user interface are within the same housing, or a personal digital assistant which is a smaller version of the personal computer, which again has data entry parts and display within a single housing, but has outer perimeters which are sized to fit any user's hand, e.g. less than ten inches by ten inches. Another embodiment describes a special kind of PDA which includes a portable telephone such as a cellular telephone, included therein.

The bar codes can be imaged/scanned in a number of different ways. One embodiment discloses using a camera to input and decode these bar codes. The embodiments are shown in FIGS. **1**A and **1**B. FIG. **1**A describes using a personal digital assistant **100** as the input device. One preferred input device of this type is the Palm V™ type hand held computer. A bar code scanner can be used, such as the commercially available Symbol Technology SPT 1700. Alternatively, a camera add-on unit can be added to the Palm V and used as described herein. The PDA includes a screen **145** and user interface **146** all within the same housing **99**.

FIG. **1**B shows the client being a cellular telephone which also may include a screen **145** and user interface **150**. The cellular telephone can be associated with either a dedicated bar code scanner or an image sensor **160** of the type used to obtain photographs for video telephony.

In both devices, the input device obtains either a scan of the bar code, or an image of the bar code on a medium. The medium can be a display screen such as a computer display screen, or can be a sheet of paper. The information in the bar code is entered into the computer.

If a dedicated bar code scanner is used, then the value of the bar code is automatically output from the scanner by the operating system associated with the bar code scanner. FIG. **2** shows the flowchart which is used to obtain scanning information from a camera.

First the scan of the barcode image is acquired at **200**. This image may be a pixel based bitmap.

Each bar code has certain rules constraining how the bar code is recognized. In two-dimensional bar codes, the spacing/pitch/size of and between the black and white bars often represent the information. Certain rules constrain what is a legal bar code. One such rule is the dead space rules, which defines legal characteristics of the edges of the bar code. The following description defines using the dead space rules, however, it should be understood that other constraining rules could alternately be used.

The bitmap is processed at **205** to look for dead space **208** in the bar code. The amount of spacing, which represents sizes of white and black parts, is then determined. The number of pixels which will represent each part can be ascertained. The image is then processed to find the number of white or black spaces **215**, the next number of white or black spaces **220**, and continuing until the ending dead space **222**. Each blank space can be defined as being a certain number of pixels in the image sensor **118**.

Image straightening algorithms can be used to rotate the image and straighten it in order to avoid improper values.

Then, these raw values at **210** that are indicative of the content of the bar code can be decoded by a conventional bar code decoding technique at **215**. This system describes using an alphanumeric bar code such as the type 39 or type 128 bar code. **215** shows decoding these raw values to obtain the output representing the content of the bar code.

In this way, the image sensor which can be used for video output in a portable telephone, or for obtaining for digital pictures in a PDA, can become a bar code scanner. This

system also facilitates using the special kinds of bar codes which are described herein with reference to the additional embodiments.

First Embodiment

Personal Identification

Personal cards such as driver license's and credit cards may include a user's personal identifying information. Signatures are conventionally used, but can be imitated by a clever forger. Photographs can also be used. However, a forger may slice out the photograph and replace it with a duplicate in order to spoof the system. The present application defines printing a bar code on the personal identification card. The bar code can be encrypted, and can include additional personal identifying information.

U.S. Pat. No. 5,420,924 describes putting a bar code on a personal identification card. However, this system recognized that not enough information can be stored. Therefore, this system took a slice of the overall image.

The information which is stored using this technique can include any personal identifying information, including a picture of the user's face, fingerprint information, dynamic information about the user's signature, i.e. the way that the user actually makes the signature. This can include the speed of signing, the technique of holding the pen, and the like. These latter features are more difficult for a forger to copy. This information is stored as data (e.g. dv/dt of the pen, time, angles, etc.) and stored in the bar code. If an image is used, the image should be of reduced resolution e.g. 20 by 20 pixels. Fingerprints can be stored as vectorized images of the fingerprint (e.g. using Adobe Streamline) or the like. The information is also preferably encrypted using a one way code e.g. such as public key cryptography. All of the public, that is every decoding station, is given the decoding key. Only authorized coders, such as the issuers of the cards are given the encoding key. An unauthorized user cannot make an authorized item of information in this way.

Each item of information can be tested using a hash function. Only information from the authorized user will pass the hash function.

The system described herein uses a type 39 bar code. A typical type 39 bar code has an unlimited number of total digits. Each digit can represent any of 0 through 9, A through Z or any of five punctuation characters. According to the present system, it is recognized that this combination provides the possibility of 41 different values for each digit.

FIG. **3** also shows the encoding operation. The bytes representing the code, shown as **320**, are converted into a base N number at **305**, where N is preferably the highest base that can be represented by all of the digits of the bar code or at least 80% of the digits. Here, a base 41 number is used. The digits zero through 9 represent their own value zero through 9, A through Z represent 10.sub.41 through 37.sub.41, and the punctuation characters represent, respectfully, 38.sub.41 through 41.sub.41. This same scheme can be used for any base of numbers.

At **310**, the file representative of the personal information is converted to base 41. This is then encoded as a type 39 bar code at **315**. The value is then encrypted at **320** using a one way function, and stored on the credit card at **325**. Since the type 39 bar code has no limit on length, any amount of information can be stored in this way.

The bar code is read out and reconverted back to the original number at **330** and is used to drive a display device shown as **335** to display the characteristics. In the case of dynamic signature information or other such information, the stored characteristics may be directly compared against the sample instead of being displayed.

Alternatively, the information can represent a pointer to a database, e.g. a publicly available database. This database can later be accessed as part of an information transfer.

In this system, the information can represent an address, e.g. a number that is associated with a special function. The address is used to access a publicly available information network, e.g. by direct connection or by the Internet. As an example, the bar code may store an address command AD, followed by a base **39** alphanumeric value 4DMKDP. The bar code is scanned to obtain the command to obtain the image from address 4DMKDP. The value 4DMKDP may be converted to hex or binary prior to the request.

The database returns the image of the person.

Another embodiment shown in FIG. **4** uses bar codes to enter information into the computer. The FIG. **4** embodiment stores scannable non-alphanumeric information, e.g. bar code information, as some part of a communication—here an advertisement. The advertisement can be a print advertisement, a television advertisement, or an Internet advertisement for example. The advertisement **400** includes a bar code **405** therein. The bar code **405** is associated with the advertisement, and includes some additional information about the advertisement. For example, the bar code may include the web site address of the company preparing the advertisement, or appointment information about the advertisement, or a "vcf file" or the like which is an importable file with address information about the company or author sponsoring the advertisement.

In operation, the user brings one of the clients, either the cellular telephone **310** or PDA **315**, into range of the bar code **405**. The client reads the bar code and decodes it as noted above. The decoded information can represent ASCII information, a compressed file such as a zip file, G code information, or any other compressed or non-compressed information. The contents are automatically input into the client. The contents can directly represent that information, in which case the information is input into the client. For example, the information can directly represent the ASCII information indicating the website. Alternatively, the information can represent a pointer to a database, e.g. a publicly available database. This database can later be accessed as part of an information transfer.

For example, Palm systems enable a hot sync where the portable computer is synced with another computer that is running hot sync software.

In this system, the information can represent a cue, e.g. a number, that is associated with a special function. The cue is used during a hot sync to access a publicly available information network, e.g. by direct connection or by the Internet. The cue **431** is sent over the Internet **432** to the server **450**, and addresses more detailed information in a memory of the server. The server returns that information as **455**, and the client receives the more detailed information.

As an example, the bar code may store an cue command CX, followed by a base **39** alphanumeric value 4DMKDP. The bar code is scanned to obtain the command to cue to value 4DMKDP during the next hot sync. The value 4DMKDP may be converted to hex or binary prior to the hot sync.

During hot sync, the database returns the full text of the detailed information, e.g., "visit the website at http://www.p-dascan.com/.about.more to get a free gift." Any desired length or size of information can be returned.

As described above, therefore, this system enables the information in the bar code to be used as an address for look up address from a database. The database can be accessible

over the Internet. During a later hot sync, this information can be translated into more detailed information which can be returned from the hot sync.

This information can be a hyperlink. The hyperlink can also use the techniques disclosed in co-pending application No. 60/161,700, entitled Internet Browsing From A Television, in which the origin of the hyperlink is included within the hyperlink itself. In this embodiment, a hyperlink may be stored for later visitation. The hyperlink also include a code therein which indicate the source from which the hyperlink originated. For example, the source may indicate the name of the print magazine, or the web page from which the hyperlink originated, or the like. In this way, the advertisement service can keep track of which advertising forms produce the best results. In addition, this facilitates a paradigm whereby the advertiser pays an advertising fee which is based on the number of website visits from the advertisement.

FIG. **5** shows using this system as part of a communication which is an email. A displayable bar code **500**, in image format, e.g. a GIF, JPEG or PDF, is stored as part of the message. This bar code is then displayed in the specified format to a user. The bar code includes the information described above.

FIG. **6** shows an alternative display which is presented to a user. The email is displayed with its usual text part **600**, which describes text of the message. The text indicates information about something to happen in the future e.g. a meeting. If the user wants to go to the meeting, they are invited to scan the bar code **605**. The bar code, once scanned is translated into information for a PDA, e.g. in Palm or Outlook format. The information may say "bar code meeting"; Thursday 4:00-6:00 p.m. This information is then automatically input into the PDA. As above, this text can represent the actual text information, as is shown in FIG. **6**. It can represent a compressed form of the actual information, such as compressed using G code. Alternatively, the information can represent a cue address to be used for a look up table during a hot sync or other information transfer, as previously described herein. This information can be printed, and scanned off the printer, or can be scanned directly off the screen. The system shown in FIG. **6** shows scanning the code to input the information.

The communication can also include auxiliary codes **610**. A first code can be scanned to send an automatic acceptance or declining by email. The format for the email acceptance can also be included within the code, or can simply be a pre-stored email saying a user name A (filled in by the scanning software) has accepted your meeting B (filled in from the information from the bar code).

The present system defines using bar codes to enter relatively large amounts of information into the computer. FIGS. **7**A through **7**C shows special new bar codes which are described according to the present system, which enable this storage of additional information.

Many different kinds of bar codes, that allow storing larger amounts of information, are known. One such bar code is the "Gettysburg Address" type matrix code. This requires, however specialized scanning equipment. This equipment represents a capital investment and has been slow to catch on. The present system teaches, in FIG. **7**A, a special bar code which includes increased capacity bar code information, as well as backwards compatibility with previous bar code scanners. The code shown in FIG. **7**A includes two parts. A first part **710** is found as legal when scanned for linear codes. A second part **710** registers as invalid/illegal when scanned in this way.

The linear part **700** is a standard and commercially available linear bar code such as a UPC, Type 39 or Type 128 bar code. A conventional linear bar code reader will read and decode this portion. Part of the standard for these bar codes includes certain spacing requirements. For example, dead space at the edges of the bar code may be one of the required characteristics. These are shown as **702**, **704**. When this dead space is detected, and all other aspects of the bar code are detected, the bar codes can be read and decoded, shown as **711**.

The remainder of the bar code may be a code which fails the decoding requirements for the linear bar code **700**. This failure type bar code can represent a matrix code, for example, of any desired type. For example, this can be a Gettysburg Address or Vericode type matrix code. In addition, however, it can be a special kind of matrix code in which each bar shown as **720** is itself made up of another bar code extending in the vertical direction. The spacing between the bars **720**, **722**, **724** may also include information. Within each bar **720**, for example, the pattern also provides additional information. In this way, the bar code is actually formed of two different bar code scans. A scan in the direction **730** obtains first information, and a scan across each line in the direction **732** obtains additional information. After scanning the line **732**, the system scans along the line **734** to obtain the next item of information. If this is obtained from a camera, however, the whole image can be obtained and later processed using processing techniques to obtain the scan information. In addition, scan information can be obtained from the linear bar code part **700**. FIG. **7**A shows the linear part taking up approximately twenty-five percent of the area of the entire bar code. However, the two-dimensional scan can take up much less area, e.g. as little as five to ten percent. When scanning with a conventional bar code scanner of the linear type, the bottom portion may be scanned to obtain the two-dimensional bar code information. Enhanced bar code information can be obtained from the additional portion. This enhanced information can be additional information, or it can be the same information as in the first bar code portion, as well as additional information.

In the context of this system, the linear bar code information can represent an address for look up code of the type described above with reference to FIG. **4**. The enhanced or non-linear information **710** can represent the total information. A person with a sufficiently advanced bar code scanner can read the entire information. A person with only a linear bar code scanner, however, may scan only the information **700**, and then updates the information via a hot sync.

An additional way of using this information, for example for scanning products, is also contemplated. Scan part **700** may include a Universal Product Code or UPC. Scanning part **710** may include additional information about the product, such as a description, or picture. The picture of the product may be displayed to the sales clerk, so that the sales clerk can verify that the product being purchased is actually the product that the user is presenting. Both parts of the bar code may represent information about the product. The part **700** represents basic information and the part **710** represents advanced information.

A second enhanced bar code shown in FIG. **7**B is a standard linear bar code or two-dimensional bar code with additional information stored in the gray scale. FIG. **7**B show the system configured as a two-dimensional bar code. A first stripe **700** represents a dark (i.e. non-white) stripe. A second stripe **702** represents a white stripe and a third stripe **704** representing another dark stripe. Similarly, the code **699** alternates between white stripes and dark stripes throughout the entire code. In this embodiment, however, the dark stripes **700** are not actually black, but may be a color that is a shade of gray. For example, 16 or 256 different grayscale levels may be

defined. Each time a code is detected, its grayscale value is obtained as a numeric value. Similarly, the white stripes **702**, **706** may actually be a shade of gray. In this system, rather than simply obtaining spacing information, spacing information and grayscale information are both obtained from the scanning of the code. The gray scale information can be obtained when a camera type imager is used, since the color of the stripes can be obtained in addition to the spacing of the stripes. An alternative is that the white areas **702** are not pure white, but are rather some shade of white which can be characterized between zero and sixteen for example.

Information is obtained from both the shade(s) of gray of the dark portion(s), the white portion(s), and the spacing.

In one embodiment, the sequence of the numbers defining the gray scale levels provides the information. For example, hex value is defined by grayscale values of each gray line. This information is used totally separately from the information that is obtained from the linear barcode information.

Yet another alternative does not use black portions and white portions, but rather uses alternating grayscale portions, with each alternating portion representing a grayscale value. Preferably a system is used whereby the gray scale is itself coded as either the gray scale or the compliment of the gray scale to provide maximum contrast between the bars **700**, **702**.

An alternative system shown in FIG. **7**C uses color bars in the bar code. Not only is the spacing between the bars determined, but also the numerical value representing the bar values themselves. For example, each color can be represented by an eight bit value. That eight bit value is obtained, and used as part of the retrieved information. The eight bit value can represent 2 hex digits. Again, this information can be used as supplemental to the spacing information obtained by the bar code.

In the latter two systems, color is described as being used with a two-dimensional bar code but can also be used with a three-dimensional bar code. In addition, in this system, the color and the spacing can both be used. By taking the available number of digits, and representing the color by that available number of digits, a number in base n, where n can be a very large number, can be obtained. This facilitates storing even more information into a bar code.

These codes preferably follow the paradigm described above, that scanning with a monochrome scanner may return only a part of the information, e.g. an address to be later used for lookup. The color/grey scale information can be used to provide the actual information. For example, the digits represented by the grey scales or colors can be concatenated to form the overall information. Scanning the code gives the bar code information; while looking at the detailed information gives the enhanced information.

Any of these enhanced information codes can be used with the dual information code described above.

Other embodiments are contemplated.

What is claimed is:

1. A mobile device that can read and use a barcode comprising:

a mobile device including a digital camera operable to obtain an image of a two dimensional barcode having first information, a display, and circuitry operable to make a wireless communication over a channel; said mobile device operable to make a telephone call over a channel; said display is operable to display information, including a barcode that has been obtained; wherein the digital camera is also operable to capture photographs and the display is operable to display said photographs; said mobile device including a processor operable to obtain said first information by the mobile device reading the two dimensional barcode; wherein the first information includes a first uniform resource locator; said mobile device, responsive to the reading, being operable to address a database on the internet using the first uniform resource locator and to receive a second uniform resource locator from the database on the internet, when accessed through the first uniform resource locator; and said mobile device operable to display the second uniform resource locator and content associated with the second uniform resource locator on the display.

2. The mobile device of claim **1**, where the mobile device is also operable to display information on the display of the mobile device obtained from accessing the first uniform resource locator.

3. The mobile device of claim **1**, further comprising:

a non-transitory storage medium operable to store the first uniform resource locator for later visitation.

4. The mobile device of claim **1**, wherein said processor is operable to receive the second uniform resource locator from the database addressed by the first uniform resource locator; and

wherein said mobile device is operable to display the information located at the second uniform resource locator on the display of the mobile device.

5. The mobile device of claim **1**, wherein the second uniform resource locator is longer than the first uniform resource locator.

6. The mobile device of claim **1**, wherein the second uniform resource locator points to a photo.

7. The mobile device of claim **1**, wherein a full text of the second uniform resource locator is returned by using the first uniform resource locator.

8. The mobile device of claim **1**, wherein the camera is operable to capture images for use in video telephony and the mobile device is capable of performing video telephony.

9. The mobile device of claim **1**, wherein the processor is operable to perform image straightening algorithms when obtaining a barcode.

10. The mobile device of claim **1**, wherein the processor is operable to rotate an image of the barcode.

11. The mobile device of claim **1**, wherein the processor is operable to prepare email information automatically based on obtaining said first information of the image of the barcode information.

12. A mobile device for reading and using a barcode comprising:

a mobile device including a processor able to obtain a two dimensional barcode having a first portion, said mobile device having a display and circuitry operable to make a wireless communication over a channel; the mobile device operable to make a telephone call as said wireless communication; the mobile device also operable to receive email information; the mobile device operable to display the two-dimensional barcode on the display; the mobile device able to obtain first information by the mobile device reading the two dimensional barcode, wherein the first information represents a first uniform resource locator; wherein the mobile device includes a digital camera that is operable to capture photographs and the display is operable to display such photographs; wherein the processor, responsive to the reading, operable to use the first uniform resource locator to address a database on the internet; said mobile device is operable to access the database, receive a response from the database including a different uniform resource locator, and

display the different uniform resource locator and content associated with the different uniform resource locator.

13. The mobile device of claim **12** where the mobile device is also operable to display information on the display of the mobile device obtained from accessing the first uniform resource locator.

14. The mobile device of claim **12**, wherein the mobile device is capable of performing video telephony.

15. The mobile device of claim **12**, wherein the processor is operable to perform image straightening algorithms when obtaining a barcode.

16. The mobile device of claim **12**, wherein the processor is operable to rotate an image of the barcode.

17. The mobile device of claim **12**, wherein the processor is operable to prepare email information automatically based on obtaining said first information of the barcode information.

18. The mobile device of claim **12**, wherein the processor is operable to automatically access information using the first uniform resource locator and to display the information that is accessed using the first uniform resource locator.

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