Disclosed is a method for controlling a backlight of a portable terminal, which includes from a memory previously stored backlight brightness values that correspond to backlight steps, retrieving a stored brightness value corresponding to one of a plurality of brightness steps selected by a user, regulating the brightness of the portable terminal according to the retrieved brightness value, and displaying the currently selected brightness step on the display unit, wherein the brightness steps correspond to incremental levels of brightness.

**Abstract**

**Flowchart Description**

1. **START**
2. **STORING PRESET BACKLIGHT BRIGHTNESS VALUES SO THAT THE BACKLIGHT BRIGHTNESS VALUES CORRESPOND TO BACKLIGHT STEPS**
   - Yes: **S130**
   - No: **S120**
3. **REQUEST FOR BACKLIGHT REGULATION OF A USER?**
   - Yes: **S130**
   - No: **S140**
4. **DISPLAYING BACKLIGHT STEP SELECTION SCREEN**
   - Yes: **S150**
   - No: **S160**
5. **SELECT BACKLIGHT STEP?**
   - Yes: **S150**
   - No: **S160**
6. **DETECTING A BRIGHTNESS VALUE CORRESPONDING TO THE SELECTED BACKLIGHT STEP**
   - Yes: **S170**
   - No: **S160**
7. **REGULATING THE BACKLIGHT BRIGHTNESS OF A DISPLAY UNIT ACCORDING TO THE DETECTED BRIGHTNESS VALUE**
8. **END**
FIG. 1
STORING PRESET BACKLIGHT BRIGHTNESS VALUES SO THAT THE BACKLIGHT BRIGHTNESS VALUES CORRESPOND TO BACKLIGHT STEPS

REQUEST FOR BACKLIGHT REGULATION OF A USER?

YES

CONVERTED TO A BACKLIGHT REGULATION MODE

DISPLAYING BACKLIGHT STEP SELECTION SCREEN

SELECT BACKLIGHT STEP?

YES

DETECTING A BRIGHTNESS VALUE CORRESPONDING TO THE SELECTED BACKLIGHT STEP

REGULATING THE BACKLIGHT BRIGHTNESS OF A DISPLAY UNIT ACCORDING TO THE DETECTED BRIGHTNESS VALUE

END

FIG.2
STORING NUMBERS ALLOCATED TO NUMBER KEYS RESPECTIVELY SO THAT THE NUMBERS INDICATE BACKLIGHT STEPS

REQUEST FOR BACKLIGHT REGULATION OF A USER?

YES

CONVERTED TO A BACKLIGHT REGULATION MODE

INPUT STORED NUMBER KEY?

NO

NO

DETECTING A BACKLIGHT BRIGHTNESS VALUE OF A BACKLIGHT STEP CORRESPONDING TO THE INPUT NUMBER KEY

REGULATING THE BACKLIGHT BRIGHTNESS OF A DISPLAY UNIT ACCORDING TO THE DETECTED BRIGHTNESS VALUE

END

FIG. 3
<table>
<thead>
<tr>
<th>Setting Backlight</th>
<th>SETTING BACKLIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Illumination Time</td>
<td></td>
</tr>
<tr>
<td>2. Button Illumination</td>
<td></td>
</tr>
<tr>
<td>3. State Display Information</td>
<td></td>
</tr>
<tr>
<td>4. Brightness Regulation</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 4A**

<table>
<thead>
<tr>
<th>Brightness Regulation</th>
<th>BRIGHTNESS REGULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Step 1</td>
<td></td>
</tr>
<tr>
<td>□ Step 2</td>
<td></td>
</tr>
<tr>
<td>□ Step 3</td>
<td></td>
</tr>
<tr>
<td>□ Step 4</td>
<td></td>
</tr>
<tr>
<td>✅ Step 5</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 4B**
PORTABLE TERMINAL CAPABLE OF CONTROLLING BACKLIGHT AND METHOD FOR CONTROLLING BACKLIGHT THEREOF

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a portable terminal. More particularly, the present invention relates to a portable terminal capable of controlling a backlight and a method for controlling a backlight thereof.

2. Description of the Related Art

A conventional portable terminal having a backlight function turns on and off the backlight at a predetermined level of brightness for a period of time which is set by a user. Therefore, a user can operate the portable terminal containing the backlight function at night while using a lower illumination intensity.

The portable terminal can be programmed to set the on time of the backlight. Namely, in the case in which a user sets the on time of the backlight to thirty seconds, the portable terminal turns the backlight on for thirty seconds when the power is turned on or there are key input data, and the backlight is turned off after thirty seconds.

The backlight is generally turned on at a candela value of a predetermined brightness that is determined during the manufacturing process of the portable terminal. If a backlight of a predetermined brightness is turned on at night, however, the battery is unnecessarily consumed. Due to the low exterior illumination intensity at night, a user can see the display screen even with a backlight of a low brightness.

On the other hand, a user having a weak visual acuity may feel that the brightness of the fixed or predetermined backlight is too dark when the user uses the portable terminal at night with a low illumination intensity. In this case, if the brightness of the backlight can be made brighter, the user can operate the portable terminal more conveniently.

A need therefore exists for an improved portable terminal wherein the backlight can be controlled to reduce battery consumption or to better suit the needs of users requiring more backlight brightness than is provided by the initial manufacturers setting.

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made to address the above-mentioned problems, and an object of the present invention is to provide a portable terminal and a method for controlling a backlight.

It is another object of the present invention to provide a method for reducing battery consumption in a portable terminal having a backlight function.

In order to accomplish these objects, according to an exemplary embodiment of the present invention, a method for controlling a brightness of portable terminal is provided. The method comprises, from a memory previously stored backlight brightness values that correspond to a backlight steps, retrieving a stored brightness value corresponding to one of a plurality of brightness steps selected by a user, regulating the brightness of the portable terminal according to the retrieved brightness value, and displaying the currently selected brightness step on the display unit, wherein the brightness steps correspond to incremental levels of brightness.

According to another exemplary embodiment of the present invention, a portable terminal is provided. The portable terminal includes an input unit for inputting a user manipulation signal, a display unit for displaying data generated in the portable terminal, a memory for storing brightness values that correspond to a plurality of brightness steps, the brightness steps corresponding to incremental levels of brightness, and a control unit for retrieving the stored brightness values corresponding to one of the brightness steps selected by a user through at least one of the input unit and the display unit and regulating the brightness of the display unit, wherein the control unit controls the portable terminal so that currently selected brightness step is displayed on the display unit.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram illustrating a portable terminal according to an exemplary embodiment of the present invention;

FIG. 2 is a flow chart illustrating the operation of a portable terminal according to an exemplary embodiment of the present invention;

FIG. 3 is a flow chart illustrating the operation of a portable terminal according to an exemplary embodiment of the present invention;

FIG. 4A and 4B are exemplary views illustrating the operation of a portable terminal according to an exemplary embodiment of the present invention;

Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Hereinafter, exemplary embodiments of the present invention will be described with reference to the accompanying drawings. In the following description of the present invention, a detailed description of known functions and configurations incorporated herein is omitted for clarity and conciseness.

FIG. 1 is a block diagram illustrating a portable terminal according to an exemplary embodiment of the present invention.

The portable terminal 100 comprises a radio transceiver 110, a modem 120, an audio processing unit 130, a key input unit 140, a memory 150, a control unit 160, a backlight regulating unit 165, a camera module 170, an image processing unit 180, and a display unit 190.

The radio transceiver 110 transmits and receives voice data, letter data, image data, and control data, under the
control of the control unit 160. The radio transceiver 110 comprises a RF transmitter for raising and amplifying the frequencies of transmitted signals and an RF receiver for amplifying received signals with low noise and lowering the frequencies.

[0024] The modem 120 comprises a transmitter for encoding and modulating the transmitted signals and a receiver for decoding and demodulating the received signals.

[0025] The audio processing unit 130 can comprise a codec. The codec comprises a data codec for processing packet data and the like and an audio codec for processing audio signals such as voices and the like.

[0026] The audio processing unit 130 modulates the electrical signals input from a microphone and converts them to voice data, and demodulates the encoded voice data input from the radio transceiver 110 into electrical signals and outputs them to a speaker. Further, it is preferable that the audio processing unit 130 comprises a codec to convert the digital audio signals received by the radio transceiver 110 to analog signals and then reproduce them, or to convert the analog audio signals generated in the microphone to digital audio signals. The codec comprises a data codec for processing packet data and an audio codec for processing audio signals such as voices. The codec can be provided in the control unit 160.

[0027] The key input unit 140 has a key matrix structure (not shown), and comprises letter keys, number keys, function keys, and exterior volume keys to output the key input signals corresponding to the keys input by a user to the control unit 160.

[0028] The memory 150 can comprise a program memory and a data memory, and stores selected information on the basis of the information required for controlling the operation of the portable terminal 100 according to an exemplary embodiment of the present invention and the user selecting information. The memory 150 stores the backlight brightness values corresponding to the backlight steps, such as, the number and amount of incremental increases and correspondingly decreases in brightness level of a backlight that are generally preset during manufacturing of a portable terminal according to an exemplary embodiment of the present invention. The backlight brightness values preferably correspond to candela values (unit: cd) representing luminosity.

[0029] It is preferable that the memory 150 stores the backlight brightness values corresponding to the backlight steps as shown in the following Table 1 wherein an exemplary number of steps=5.

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backlight steps</td>
</tr>
<tr>
<td>Candela values (cd)</td>
</tr>
</tbody>
</table>

[0030] Referring to Table 1, the backlight steps comprise five steps, and a candela value of 100 cd corresponds to the step 1 of the backlight, a candela value of 125 cd corresponds to the step 2 of the backlight, a candela value of 150 cd corresponds to the step 3 of the backlight, a candela value of 175 cd corresponds to the step 4 of the backlight, and a candela value of 200 cd corresponds to the step 5 of the backlight. Referring to Table 1, it can be seen that the backlight brightness is the brightest in step 5 and the candela value corresponding to the step 5 is the highest. On the other hand, although the backlight steps are divided into five steps in an exemplary embodiment of the present invention, they are not restricted thereto and can be divided into more or fewer steps.

[0031] On the other hand, the memory 150 can store the information in which predetermined keys correspond to the backlight steps having predetermined backlight brightness values as shown in the following Table 2.

<table>
<thead>
<tr>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corresponding Keys</td>
</tr>
<tr>
<td>Backlight steps</td>
</tr>
</tbody>
</table>

[0032] Referring to Table 2, the backlight steps are divided into five steps, and the backlight step 1 whose candela value is 100 cd corresponds to the number key 1, the backlight step 2 whose candela value is 125 cd corresponds to the number key 2, the backlight step 3 whose candela value is 150 cd corresponds to the number key 3, the backlight step 4 whose candela value is 175 cd corresponds to the number key 4, and the backlight step 5 whose candela value is 200 cd corresponds to the number key 5.

[0033] Referring to Table 2, the backlight brightness is the brightest in step 5, and it is preferable that the numbers allocated to the number keys indicate the backlight steps. Although the backlight steps are divided into five steps in Table 2, they are not restricted thereto and can be divided into more or fewer steps.

[0034] The control unit 160 controls the overall operation of the portable terminal 100 according to an exemplary embodiment of the present invention. The control unit 160 stores in the memory 150 the predetermined backlight brightness values, that is, the candela values corresponding to the backlight steps. Further, the control unit 160 associates the predetermined keys, for example, the number keys, to the backlight steps having the backlight brightness values, and then stores them in the memory 150. Then, it is preferable that the control unit 160 controls the portable terminal so that the numbers allocated to the number keys correspond to the backlight steps.

[0035] If regulation of the backlight is requested by the user, the control unit 160 converts the operation mode of the portable terminal 100 to the backlight regulation mode and controls the brightness of the backlight by retrieving the backlight brightness values stored in the memory 150 so as to correspond to the backlight steps required by the user through the key input unit 140 in the backlight regulation mode. It is preferable that after converting the operation mode of the portable terminal 100 to the backlight regulation mode, the control unit 160 controls the portable terminal so that the display unit 190 displays a step selecting screen for selecting the backlight step by a user.

[0036] On the other hand, if one of the predetermined keys, for example, one of the number keys, stored in Table 2 is input, the control unit 160 can control the brightness of the backlight in the backlight step corresponding to the input key in the backlight regulation mode. In other words, if the user inputs the number key 5 through the key input unit 140 in the
backlight regulation mode, the brightness of the backlight is regulated to the brightness of the step 5 by the control unit 160.

[0037] It is preferable that the control unit 160 controls the portable terminal so that at least one of the currently regulated backlight steps and the backlight brightness values is displayed on the display unit 190 in order that the user can easily recognize the currently regulated backlight brightness.

[0038] The backlight regulating unit 165 regulates the backlight brightness of the display unit 190 according to the backlight brightness value output by the control unit 160. The backlight regulating unit 165 can be included in the control unit 160.

[0039] In the case in which the portable terminal 100 has a camera function, it can comprise the camera module 170.

[0040] The camera module 170 can comprise a lens unit (not shown) which can be inserted and withdrawn, and photographs image data.

[0041] Further, the camera module 170 comprises a camera sensor (not shown) for converting the photographed optical signals into electrical signals and a signal processing unit (not shown) for converting the analog image signals photographed by the camera sensor to digital data.

[0042] Here, the camera sensor is assumed to be a Charge Coupled Device (CCD) sensor, and the signal processing unit can be embodied with a Digital Signal Processor (DSP). The camera sensor and the signal processing unit can be embodied integrally or separately.

[0043] The image processing unit 180 generates screen data for displaying the image signals output in the camera module 170.

[0044] The image processing unit 180 processes the image signals output in the camera module 170 in frame unit and outputs the frame image data according to the characteristics and size of the display unit 190. Further, the image processing unit 180 comprises an image codec. The image processing unit 180 compresses the frame image data shown on the display unit 190 or restores the compressed frame image data to the original frame image data.

[0045] Further, the image processing unit 180 is assumed to have an On Screen Display (OSD) function and can output the OSD data according to the size of the screen displayed under the control of the control unit 160.

[0046] The display unit 190 can comprise a Liquid Crystal Display (LCD) and the like and outputs the display data generated in the portable terminal. Then, if the LCD is the touch screen type, the display unit 190 can be used as an input unit.

[0047] Further, the display unit 190 displays the image signals output in the image processing unit 180 and displays the user data output in the control unit 160.

[0048] Further, it is preferable that the display unit 190 comprise white light emitting diodes for the backlight function, and according to an exemplary embodiment of the present invention, the light emitting diodes are assumed to emit the light in the brightness of 150 cd to perform the backlight function unless they are otherwise adjusted by the user.

[0049] FIG. 2 is a flow chart illustrating the operation of the portable terminal according to an exemplary embodiment of the present invention.

[0050] Referring to FIGS. 1 and 2, the control unit 160 matches the preset backlight brightness values to the backlight steps and stores them in the memory 150. It is preferable that when the control unit 160 associates the preset backlight brightness values to associated backlight steps and stores them in the memory 150 at step S110, they are stored in a table as in Table 1.

[0051] The control unit 160 examines whether there is a request for backlight regulation by the user, for example, a request through menu key input by the user. On the other hand, in an exemplary embodiment of the present invention, the backlight means the screen backlight brightness of the display unit 190 at step S120.

[0052] The control unit 160 converts the operation mode of the portable terminal 100 to the backlight regulation mode if there is the request for the backlight regulation at step S130.

[0053] If the operation mode of the portable terminal 100 is converted to the backlight regulation mode, the control unit 160 displays the backlight step selection screen for selecting a backlight step on the display unit 190 at step S140.

[0054] The control unit 160 checks whether a backlight step is selected on the basis of the selection information of the user at step S150.

[0055] If a backlight step is selected on the basis of the selection information of the user, the control unit 160 detects the brightness value corresponding to the selected backlight step from the memory 150 at step S160.

[0056] The control unit 160 regulates the backlight brightness of the display unit 190 by controlling the backlight regulating unit 165 according to the retrieved backlight brightness value at step S170. Then, the control unit 160 can display the backlight step or the brightness value on the display unit so that the user can easily recognize the currently regulated backlight brightness.

[0057] FIG. 3 is a flow chart illustrating the operation of a portable terminal according to an exemplary embodiment of the present invention.

[0058] Referring to FIGS. 1 and 3, the control unit 160 assigns predetermined keys (for example, number keys) to the backlight steps having predetermined backlight brightness values and stores them in the memory 150 at step S210. Then, it is preferable that the numbers allocated to the number keys indicate the backlight steps.

[0059] The control unit 160 examines whether there is a request for the backlight regulation of the user, for example, a request through menu key input of the user at step S220.

[0060] If there is a request for backlight regulation, the control unit 160 converts the operation mode of the portable terminal 100 to the backlight regulation mode at step S230.

[0061] The control unit 160 determines whether the number keys, such as the number keys registered in Table 2, stored in the memory are input through the key input unit 140 at step S240.

[0062] If one of the number keys registered in Table 2 is input, the control unit 160 retrieves from memory the backlight brightness value of the backlight step corresponding to the input number key at step S250. For example, if the number key 5 to which the step 5 is allocated input through the key input unit 140, the backlight brightness is regulated to the backlight brightness value that corresponds to the step 5.

[0063] The control unit 160 regulates the backlight brightness of the display unit 190 by controlling the backlight regulating unit 165 according to the detected backlight brightness value at step S260. Then, the control unit 160 can display the backlight step or the brightness value on the display unit so that the user can easily recognize the currently regulated backlight brightness.
FIGS. 4Aa and 4B are exemplary views illustrating the operation of a portable according to an exemplary embodiment of the present invention.

Hereinafter, FIGS. 4A and 4B will be explained with reference to FIGS. 1 to 3.

FIG. 4A shows a screen for requesting for backlight regulation of the portable terminal by a user.

If the user selects the "4 illumination brightness regulation" menu item in the screen of FIG. 4A through a direction key or other input and inputs the confirmation key, the portable terminal shows a screen for regulating the illumination brightness as shown in FIG. 4B.

In FIG. 4B, the backlight regulation steps comprise total five steps, and selection flags are provided in the front of the items representing the steps respectively so that the selected item can be checked whenever the backlight step is selected. In FIG. 4B, the user has selected the step 5.

On the other hand, it is preferable that the backlight of the display unit 190 is regulated to the brightness corresponding to the step selected by the user so that the user can recognize the backlight brightness corresponding to each step.

According to an exemplary embodiment of the present invention, the user can properly regulate the backlight of the portable terminal 100 according to the situation, and can reduce the consumption of the battery due to the user of the backlight of unnecessary brightness.

Although exemplary embodiments of the present invention describe the backlight brightness regulation of the display unit of the portable terminal, the present invention can be applied to the backlight regulation of a keypad. Further, while the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

As mentioned above, the present invention can properly regulate the backlight brightness of a portable terminal, if necessary, by providing a portable terminal controlling the backlight and a method for controlling the backlight.

Further, since the present invention can regulate the backlight brightness at night so that the illumination intensity is low, battery consumption can be reduced.

What is claimed is:

1. A portable terminal brightness controlling method, comprising:
   from a memory previously stored backlight brightness values that correspond to a backlight steps, retrieving a stored brightness value corresponding to one of a plurality of brightness steps selected by a user;
   regulating the brightness of the portable terminal according to the retrieved brightness value;
   and displaying the currently selected brightness step on the display unit, wherein the brightness steps correspond to incremental levels of brightness.

2. A method according to claim 1, wherein the retrieving step comprises:
   converting an operation mode of the portable terminal to a brightness regulation mode in response to a brightness regulation request of a user;
   displaying a brightness step selection screen for selecting a brightness step if the operation mode of the portable terminal is converted to the brightness regulation mode;
   and retrieving a brightness value corresponding to the brightness step selected.

3. A method according to claim 1, wherein information to associate predetermined inputs with brightness steps having preset brightness values respectively is stored in a memory.

4. A method according to claim 3, wherein a brightness value of a brightness step corresponding to a predetermined input is retrieved in the retrieving step if one of the predetermined inputs is input in the brightness regulation mode.

5. A method according to claim 4, wherein the predetermined inputs are provided in at least one of an input unit and a display unit of the portable terminal.

6. A method according to claim 5, wherein the predetermined inputs comprise keys.

7. A method according to claim 6, wherein the predetermined inputs comprise number keys and the number keys are stored so as to correspond to the brightness steps, and the numbers allocated to the number keys indicate the brightness steps.

8. A method according to claim 1, wherein the brightness values are backlight brightness values and the brightness steps are backlight brightness steps.

9. A method according to claim 2, wherein the brightness step selection screen provides a plurality of brightness steps for the user to select therefrom.

10. A portable terminal comprising:
   an input unit for inputting a user manipulation signal;
   a display unit for displaying data generated in the portable terminal;
   a memory for storing brightness values that correspond to a plurality of brightness steps, the brightness steps corresponding to incremental levels of brightness; and
   a control unit for retrieving the stored brightness values corresponding to one of the brightness steps selected by a user through at least one of the input unit and the display unit and regulating the brightness of the display unit, wherein the control unit controls the portable terminal so that currently selected brightness step is displayed on the display unit.

11. A portable terminal according to claim 10, the control unit further comprising a brightness regulating unit adapted to regulate the brightness of the display unit according to the brightness values retrieved by the control unit.

12. A portable terminal according to claim 11, wherein the control unit is adapted to convert an operation mode of the portable terminal to a brightness regulation mode in response to a brightness regulation request of a user and to display a brightness step selection screen for selecting a predetermined brightness step on the display unit.

13. A portable terminal according to claim 10, wherein if a predetermined brightness step is selected through at least one of the input unit and the display unit, the control unit is adapted to retrieve the brightness value corresponding to the selected brightness step from the memory.

14. A portable terminal according to claim 10, wherein the memory stores information to which predetermined inputs correspond according to brightness steps having the preset brightness values respectively.
15. A portable terminal according to claim 12, wherein if a stored predetermined input is input through at least one of the input unit and the display unit in the brightness regulating mode, the control unit is adapted to retrieve the brightness value of the brightness step corresponding to the inputted predetermined input from the memory and to regulate the brightness.

16. A portable terminal according to claim 14, wherein the predetermined inputs comprise keys.

17. A portable terminal according to claim 16, wherein the predetermined inputs comprises number keys and the memory stores information so that the numbers allocated to the number keys indicate the brightness steps under the control of the control unit.

18. A portable terminal according to claim 10, wherein the brightness values are backlight brightness values and the brightness steps are backlight brightness steps.

19. A portable terminal according to claim 12, wherein the brightness step selection screen provides a plurality of brightness steps for the user to select therefrom.

* * * * *