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(54)     **Mobile Device Backlight Adjustment Method**

(57)     The present invention discloses a backlight intensity adjustment method for a mobile device comprising a screen, which comprises a backlight, and a positioning system comprising the steps of identifying the device as in indoor use or in outdoor use in accordance with the difference of a first position of the device and a second position of the device; and if the device is in outdoor use, adjusting the backlight intensity of the device screen in accordance with the ambient condition data comprising position of the sun, weather information and effect of the weather on an ambient light. Within the method of the invention, the effective automatic backlight adjustment and consequently power saving are achieved.

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**Description**

**Technical Field**

**[0001]** The present invention is related to mobile devices with adjustable backlight.

**Prior Art**

**[0002]** Mobile devices generally employ a screen as a user interface for displaying visuals of device functions. Most recent devices employ a colour display (Liquid crystal displays, thin film transistor displays) in which the screen is illuminated using at least one backlight.
**[0003]** Since the displays used in mobile devices are prone to lose visibility due to intensity of ambient light, the devices are generally equipped with a backlight having adjustable intensity. By adjusting the intensity of the backlight, it is possible to make the display visible even the ambient light intensity is high.
**[0004]** However, high intensity backlight requires considerable power. Since the mobile devices generally use a battery to power the device, high intensity backlight considerably degrades the operation time of the device. Therefore to achieve long operation time, the dynamic adjustment of the backlight either by the user or automatically is required. An automated adjustment in this case is useful since manual adjustment of backlight can be unreliable and ineffective.
**[0005]** Several methods are developed for dynamic adjustment of the backlight intensity. The most common method of backlight adjustment is the usage of an ambient light sensor to measure ambient light intensity and control of the backlight intensity in accordance with the measurement. However, an ambient light sensor may lead to maladjustments since all the objects around the device may effect the measurement due to their shadows.
**[0006]** A method for backlight adjustment is disclosed in the patent document US 2010/0007638 wherein a global position of the device is determined and the backlight is adjusted according to weather data acquired from a source. However, the weather data is not adequate to determine the ambient light information.
**[0007]** Therefore an advanced method for determination of ambient light and backlight adjustment is required.

**Brief Description of the Invention**

**[0008]** The present invention provides a backlight intensity adjustment method for a mobile device comprising a screen, which comprises a backlight, and a positioning system; comprising the steps of; determining a first position of the device using the positioning system; determining a second position of the device using the positioning system after a predetermined waiting time; calculating a positional deviation of the device by differentiating the first position and the second position; if the

positional deviation of the device is below a predetermined threshold, identifying the device as in indoor use and adjusting backlight intensity to a predetermined indoor level; if the positional deviation of the device is above the predetermined threshold, identifying the device as in outdoor use; if the device is identified as in outdoor use, determining an ambient condition data comprising position of the sun, weather information and effect of the weather on an ambient light; estimating intensity of the ambient light based on the ambient condition data; adjusting the backlight intensity in accordance with the estimated ambient light intensity.
**[0009]** Within the method of the invention, the display backlight intensity is adjusted intelligently, and effective power saving is achieved. Since the embedded systems are used to determine the device ambient condition data, the method can be implemented without any hardware cost.

**The Object of the Invention**

**[0010]** The object of the invention is to provide a backlight adjustment method for mobile devices.
**[0011]** Another object of the invention is to provide a backlight adjustment method in which the device's place of use (indoor/outdoor) is determined, and adjustment is done accordingly. Another object of the invention is to provide a backlight adjustment method which is applicable to the mobile devices with position determination capability.

**Detailed Description of the Invention**

**[0012]** The present invention provides a method for determining the amount of the ambient light and adjusting a backlight of a screen comprised by a mobile device. The method of the invention will now be explained step by step as follows;

-    Determining a first position of the device: The position of the mobile device is determined using a positioning system of the device. The positioning system may be a global positioning system, which uses positioning satellites to determine the position, or an assisted positioning system which uses stations of the global communication system for mobile devices.
-    Determining a second position of the device: The position of the mobile device is re-determined after a waiting time. The waiting time can be determined by the manufacturer or can be adjusted in proportion to a difference between the second position of the device and the first position of the device.
-    Calculating the positional deviation of the device: The positional difference between the first position and the second position is calculated and practically the movement of the device is determined.
-    Indoor / outdoor decision: If the positional deviation

of the device is below a predetermined threshold, the device is identified as in indoor use and the backlight of the display is adjusted to a predetermined indoor level. If the positional deviation is above the threshold that is if the device is moving, it is identified as in outdoor use and further steps are taken.

- Determining the ambient backlight amount: If the device is mobile, it is considered as in outdoor use, and the ambient condition data comprising the position of the sun, weather information and the effect of the weather on the ambient light are determined. Than the ambient light intensity is estimated depending on the ambient condition. The backlight of the display is adjusted based on the estimated ambient light intensity.

[0013]     The method of the invention employs an intelligent adjustment system based on the assumption that the device is in indoor use if the position does not change with respect to a predetermined time internal. If the device is moving, it is considered as in outdoor use and the effect of ambient light should be regarded to adjust the backlight intensity of the display. Therefore, the automated adjustment is used whenever it is required and unnecessary adjustment is eliminated.

[0014]     In various embodiments of the invention, the determination of the first and/or second position of the device can be done using several systems that is applicable within the device. For instance, the position of the device can be determined using global positioning system (GPS). The GPS provides very precise position information as soon as the device is able to communicate with at least 3 satellites. If the device is capable of employing global communication system for mobile devices (GSM), such as GSM phones, 3G modems, it may be preferable to determine positioning using GSM network, which requires no additional positioning device. GSM positioning systems (known as assisted GPS) are less accurate than GPS systems. However, GSM positioning is capable of working indoor wherein some GPS receivers may not be able to communicate to the satellites.

[0015]     Preferably, the limits of the automated adjustment limits, that are maximum backlight intensity and/or minimum intensity, can be limited by the user. The limitation of adjustment level enables the user to control the visibility of the display and also power consumption of the backlight.

[0016]     Alternatively, the adjustment weight can be changed. In other words, the ratio of backlight intensity deviation to the ambient light deviation can be adjusted so that the backlight adjustment due to ambient light can be more or less effective.

[0017]     Within the method of the present invention, devices with the position determination capability are provided with an effective automated display backlight adjustment. The automatic adjustment of the present invention maximized the efficiency of the backlight and decreases the power consumption of the device.

## Claims

1.  A backlight intensity adjustment method for a mobile device comprising a screen, which comprises a backlight, and a positioning system; **characterized in that** said method comprises the steps of;

    - Determining a first position of the device using the positioning system;
    - Determining a second position of the device using the positioning system after a predetermined waiting time ;
    - Calculating a positional deviation of the device by differentiating the first position and the second position;
    - If the positional deviation of the device is below a predetermined threshold, identifying the device as in indoor use and adjusting backlight intensity to a predetermined indoor level;
    - If the positional deviation of the device is above the predetermined threshold identifying the device as in outdoor use;
    - If the device is identified as in outdoor use; determining an ambient condition data comprising position of the sun, weather information and effect of the weather on an ambient light;
    - Estimating intensity of the ambient light based on the ambient condition data;
    - Adjusting the backlight intensity in accordance with the estimated ambient light intensity.

2.  A backlight intensity adjustment method according to claim 1 wherein maximum and/or minimum backlight intensity is limited by a user of the device.

3.  A backlight intensity adjustment method according to claim 1 wherein a ratio of deviation of backlight intensity to a deviation of ambient light is adjusted.

4.  A backlight intensity adjustment method according to claim 1 wherein said positioning system is a global positioning system.

5.  A backlight intensity adjustment method according to claim 1 wherein said positioning system is a global communication system for mobile devices based positioning system.

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**EUROPEAN SEARCH REPORT**

Application Number

EP 12 16 9007

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A,D | US 2010/007638 A1 (KNOWLES MICHAEL [CA]) 14 January 2010 (2010-01-14) <br> * paragraph [0002] * <br> * paragraph [0010] - paragraph [0013] * <br> * paragraph [0023] - paragraph [0024] * <br> * paragraph [0026] - paragraph [0027] * <br> * paragraph [0030] - paragraph [0036] * <br> * paragraph [0040] * <br> * paragraph [0048] - paragraph [0050] * <br> * figures 1-4 * <br> ----- | 1-5 | INV. <br> H04M1/22 <br> H04M1/725 |
| A | EP 1 701 331 A1 (RESEARCH IN MOTION LTD [CA]) 13 September 2006 (2006-09-13) <br> * paragraph [0001] * <br> * paragraph [0003] - paragraph [0005] * <br> * paragraph [0012] * <br> * paragraph [0025] * <br> * paragraph [0037] - paragraph [0038] * <br> * paragraph [0040] * <br> * paragraph [0046] - paragraph [0048] * <br> ----- | 1-5 | |
| A | JP 2002 344599 A (DENSO CORP) 29 November 2002 (2002-11-29) <br> * the whole document * <br> ----- | 1-5 | TECHNICAL FIELDS SEARCHED (IPC) <br><br> H04M <br> G09G <br> G02F |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 5 September 2012 | Banerjea, Robin |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another
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L : document cited for other reasons

&: member of the same patent family, corresponding
    document

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 16 9007

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-09-2012

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

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- US 20100007638 A **[0006]**