Automatic and Manual Adjustment of Typeface on Computing Devices for Low Vision (Antiglasses Mode)

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Abstract: - Methods to provide automatic and manual adjustment of font on personal digital assistants (mobiles, tablets etc.) are illustrated. With the required details filled about the user's vision properties, the manual system works whereas for the automatic adjustment, various modules are used (distance module, motion module, display module) using a database (vision record) to store the details of the particular user which helps in screen resolution, adjustment of font size and screen luminance for providing better vision for viewing any PDA when there is no availability of vision correcting devices (glasses, lenses etc.).

Key-words: Automatic adjustment, anti glasses, distance module, motion module, vision correction

1 Introduction

Most of the people make use of eye-glasses or contact lens to correct their defects in vision. Common defects include myopia (near-sightedness), presbyopia (far-sightedness), and astigmatism. Presbyopia, more specifically, is a condition where the eye exhibits a progressively diminished ability to focus on near objects with age[6]. In optics, the nearest point at which an object may be brought into focus by the eyes is called the eye's near point. Without correction, the near point is at 3 inches (7 cm) at age 10, to 6 inches (16 cm) at age 40, to 39 inches (1 meter) at age 60. As a result, a 60-year-old must use corrective lenses to read books or newspapers at a comfortable distance [1].

Currently the bifocals and progressive lens used are static that is the user has to change their position of the eye to look through the lens with the focal power corresponding to the distance of the object. This usually involves in seeing through the top for viewing objects which are at a further distance and through the bottom for viewing objects which are nearby. Adjustable focus eyeglasses are available to provide inexpensive eyeglasses for people from low-income background for presbyopia. This is only variable without having to change where one is looking [1].

The current application expresses the technical details of visual displays and how font and other display settings [8] (brightness etc) can be altered and monitored manually and automatically in the PDA's.

2 Problem Formulation

Many people use their PDA's(mobiles, tablets etc.) at various times during the day, the users who wear eyeglasses, lens or other vision correcting devices and may not wearing it throughout the day when using the mobile device. Due to the various defects in the vision, many cannot see and use their PDA's (mobile and tablets) without the vision correcting devices(eye-glasses, lens etc).For Example: Once the user wakes up in the morning, he/she may not be wearing their vision correction device, i n that case, the user may face a problem using/reading from the device[7].

3 Problem Solution

To abolish this problem, the PDA (mobile devices) automatically/manually alters the font size, screen resolution and luminance that'll be suitable for the user to view comfortably. We can use various modules to achieve this, some being, distance module, motion module, display module and vision properties can be stored for future uses.

The distance module is required to calculate the distance between the user and the phone can be calculated using a distance module which is a fine grained detection method that uses the front camera and inertial accelerometer of the smart phone, which adjust a font size of all content(i.e. all applications) displayed on any mobile device display based on the determined distance, thus this can be used for people with low vision to see the device properly even without their required measures(glasses, lens etc.) [1].

In this model, systems and the methods are provided for both manual adjustment of font display and it can be done also without any human interaction i.e. automatic adjustment of visual display. For Example: a user who developed presbyopia may set up their mobile device so that a font size in it become smaller with increasing distance between the user and the screen whereas in myopia the font size increases as distance increases, similarly other adjustments are done for other visionary defects. This is calculated and done by using the distance module which can be done both automatically [2], sensor may comprise a camera, rangefinder, sound propagation sensor, or any other sensor associated with determining a distance and manually where the user uses the manual setup[4].

3.1 Adjustment module

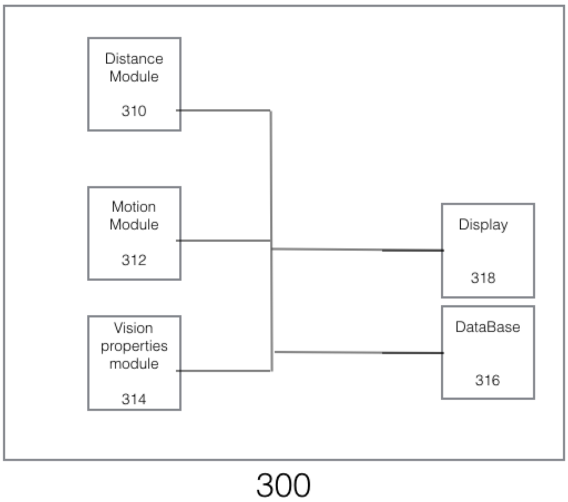

Figure1: Adjustment Module

The Figure 1 explains some of the embodiments that are used for the adjustment system functioning. The various modules for adjustment may be in complete or in a part on a mobile device (software and hardware). One or more modules can be implemented on one or more hardware devices/processors or even the Operating system or any other software system.

The Operating system may be used to provide overall adjustment of the various features in all the applications that are available on the device such as; instance, enhancements, modifications and adjustments can be made in terms of font size, brightness, saturation, sharpness and night vision[5].

3.2 Vision Property Module

The user, using the PDA (cellular phone, tablet etc.) may be having corrected vision or uncorrected vision (not using the vision correction devices). Some users might also have more than one corrected vision, [1] Example: Both myopia and presbyopia, also could be using lens for myopia and eyeglasses for reading for presbyopia. Similarly some use multifocal (bifocal and trifocal) glasses i.e. having more than one corrected vision.

This vision property module responds to the initial set of vision properties via GUI on the device. The initial properties is mainly used for the manual set-up which consists of the prescription details provided by the doctor which are stored in the database, which can be modified and updated for future.

The habits of the user may be also recorded to determine some properties. For Example: The time of the day, amount of motion, the ambient light in the user's environment may be determined [1].

For Example: When the environment is determined to be dark during the early morning, it will be assumed that the user isn't wearing the contact lens and changes will be made. In contrast, if the user is interacting with the mobile device in bright light and when the mobile device has detected being jostled recently, it might be determined that the user was exercising and is likely to be wearing contact lenses.

3.3 Distance Module

Distance module is to calculate approximate distances between the viewer's eyes and the screen of the device. This module helps to make the adjustments to the display based on the state of the user. The distance module can use various methods to determine the distances.

In some case, infrared sensor or a front facing camera can be used to capture a image to identify glasses (or other vision correction device) worn by the user and that helps to find the example distances between the display of the visual device(smart phone or tablet) and the viewer during an interaction.

The user initially takes a series of self-images at distances from extremely close to the user's face to a full arm's length away for mapping, during the set-up and installation process. The distances can be measured by the user using techniques apparent to those skilled in the art.

3.4 Motion Module

The movement/motion module is used to capture the movements done by the user during the interaction with the mobile device. Each movement is measured relative to the previous movement done using the internal accelerometer.[1] Rotational movements are usually ignored during the interaction between the user and the device for the calculation during the initial process, the mobile is placed near the user's face and moved further. This module only measures the forward and backward movements and only calculates once the device stops at any particular position and ignores any rotational movements.

3.5 Display Module

The display modification module is made use to modify the display of the screen and make the adjustments based on the other three modules and the vision state of the user.

The display modification module may operate as an overlay on top of the actual displayed font to exhibit the properties of a convex or concave lens per the prescription of the user.

The overlay may alter the displayed image according to correct for the eye correction. [1]

3.6 Manual Adjustment

The manual adjustment mode allows the user to manually adjust the modification to the visual display. Figure 2 depicts an example of a manual adjustment setup.

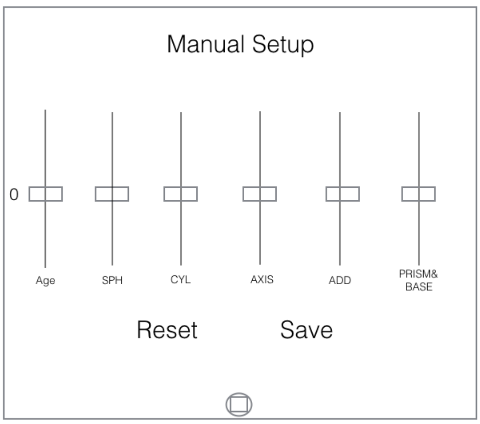

Figure 2: Manual Setup

This will be useful especially when the user's vision suddenly changes or alters. The manual mode limits the maximum and the minimum adjustment range the user can make without creating new state or a new correction device. Other sliders can be introduced according to the user's convince Example; colour blindness [3] Figure 3: This is a example of a visual acuity test chart, the user can use before manually setting up the features.

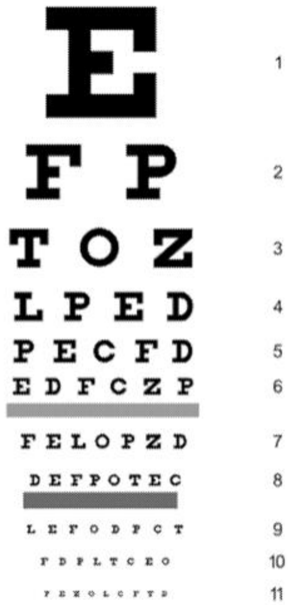

Figure 3: Acuity Test

3.7 Working of the Model

A user, such as user 200 holds a mobile device 201 at a distance away from his face. The mobile device, using an internal camera (possibly take pictures), determines a distance between the user 200 and the mobile device 201. The distance module 310 can be used to determine the distance between the user and the device (smart phone/tablet).

Figure 4: This is an example of a working model which describes the distance module.

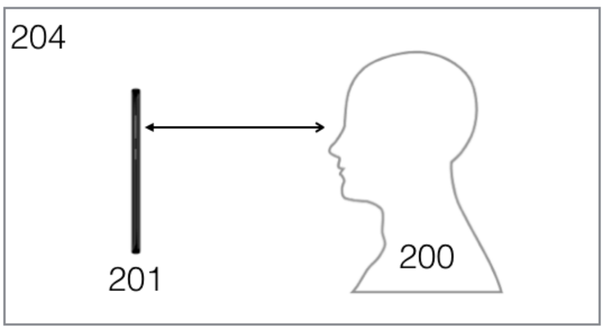

Figure 4: User Interaction

The following figure 5 explains the process of an example system. The flowchart (Figure 5) depicts the process of a anti glasses system, which starts with the details being manually registered by the manual set-up Fig 2. In an operation 606, example distances are determined either manually (taking self portrait images at various lengths) or automatically. In an operation 608, if the user is viewing the mobile device the process is further continued, followed by determination of the initial vision properties based on the habits, entries etc. If any motion is sensed during the interaction of the user and the device, the distance is calculated and the necessary adjustments are made for the user to view and use the device comfortably.

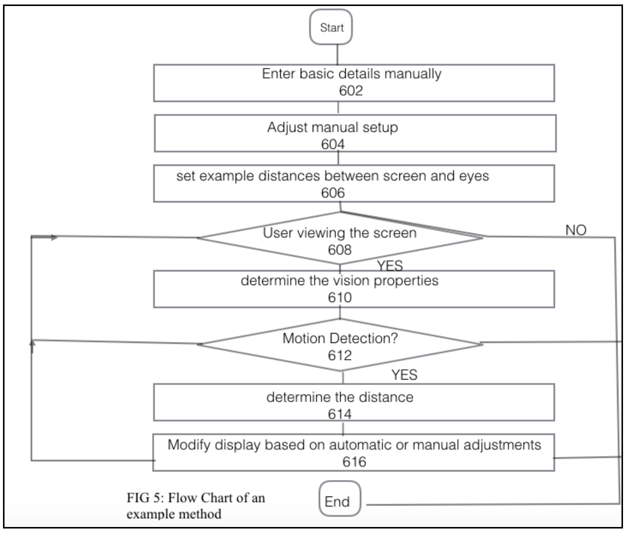

Figure 5: Flow chart of an example method

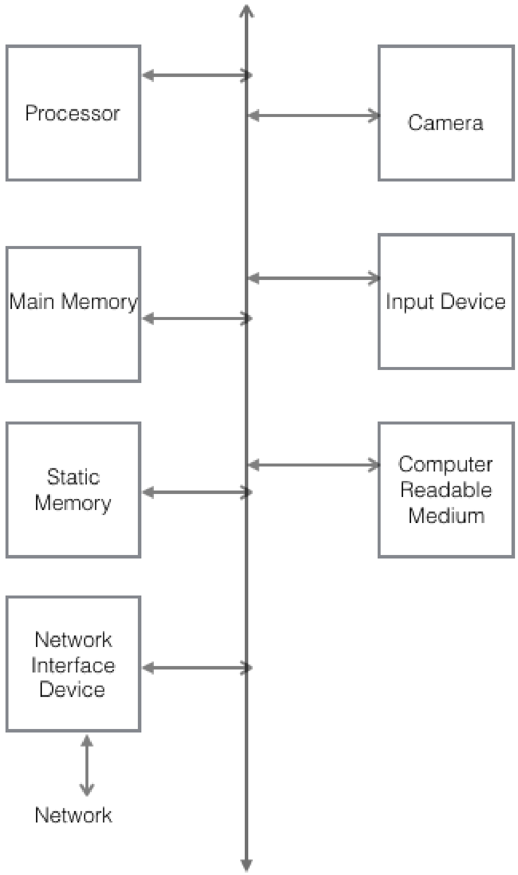

Figure 6: Diagrammatic representation of a machine consisting of the anti-glasses technique

4 Tools

The following Figure 6 represents a diagrammatic representation of a machine consisting of the anti-glasses technique.

The example computer system includes a processor (e.g., a central processing unit (CPU), a graphics processing unit (GPU) or both), a main memory and a static memory, which communicate with each other via a bus. The computer system may further include a camera or video display unit (LCD) or a cathode ray tube (CRT)). The computer system also includes an alphanumeric input device (e.g., a keyboard or a touch-sensitive display screen, a user interface (UI) navigation device (e.g., a mouse), a disk drive unit, a signal generation device (e.g., a speaker) and a network interface device.

4.1 Machine-Readable Medium

The disk drive unit includes a machine readable medium on which is stored one or more sets of instructions and data structures (e.g., software) embodying or utilized by any one or more of the methodologies or functions described herein. The instructions may also reside, completely or at least partially, within the main memory and/or within the processor during execution thereof by the computer system, the main memory and the processor also constituting machine-readable media.

5 Conclusion

This system helps the people with low vision to view and use their PDA's (cellular device, tablet etc.) comfortably without the vision correction devices (eye-glasses, contact lens). This system uses multiple modules, which can reside on one or more hardware devices or software devices to achieve an "anti-glasses system".

References:

[1]. Saumil Ashvin Gandhi, Scott, *"Automatic adjustment of font on a visual display",* Google Patents(2012-11-14)

[2]. Tung-Lin Wu, *"Adjusting print format in electronic device",* Hon Hai Precision Industry Co Ltd(2011)

[3]. Doron Lehmann, Eyal Nathan, Nimrod Barak, *"Adaptive font size mechanism"*, SAP SE(2012)

[4]. Hari Chakravarthula, Tomaso Paoletti, Avinash Uppuluri, *" Smart Display with Dynamic Font Management"*, Nanchang O-film Optical-Electronic Tech Co Ltd(2011)

[5]. Doron Lehmann, Eyal, Nimrod , "*Automatic brightness control for displays"*, Bell Cynthia S(2012)

[6]. William P. Alberth , *"Method and Device for Visual Compensation"* ,Google Technology Holdings LLC(2009)

[7]. Joseph Patino,Randall Scott Fraser, *"Device having a glasses mode"*, Google Technology Holdings LLC(2013)

[8]. Raghavendra Hosabettu, Kiran Kumar Channarayapatna Sathyanarayana, Parthasarathy Shunmugam Armugasamy, *"System and method for improving viewing experience on a digital device",* Siemens Product Lifecycle Management Software Inc.(2014)