Dynamically Adjusting the Placement of Digital Content on a Watch Face to Avoid Obstruction by Watch Hands

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Dynamically Adjusting the Placement of Digital Content on a Watch Face to Avoid Obstruction by Watch Hands

Abstract:

Placement of digital content on a digital watch display with physical watch hands is dynamically adjusted to avoid obstruction of the watch face by the watch hands. The position of the physical hands is determined by the time of day, which is known to the internal electronics and/or software of the watch. Digital content can therefore be placed in a location that reduces or eliminates the obstruction and the location can be dynamically adjusted to remain unobstructed. For example, if the watch software knows that the hands are at the top of the screen (e.g., noon or midnight), digital content to be displayed in the top part of the display can be displayed in the lower part of the display. Likewise, at 6:30, the digital content can be displayed in the upper part of the display. As the hands move around the watch face, the digital content is moved to unobstructed areas.

Keywords: watch face, wearable, digital display, physical hands, hour-hand, minute-hand, second-hand, obstruction, dynamic placement, dynamic adjustment

Background:

Digital watches with a display that can present a wide variety of digital multi-media content are becoming more common. Some of these watches also have physical hands that indicate the time (e.g., hours, minutes, and/or seconds). This can present a problem because the display on a digital watch is typically small and, as the hands move around the watch face, different portions of the display are obstructed by the hands. These obstructions can make it difficult to quickly view and comprehend digital content, especially as small, high-resolution displays now allow for smaller text and graphics to be clearly displayed, even on watch-sized displays. This problem can reduce the quality and enjoyment of the digital watch experience for users who want the
functionality and convenience of a digital display along with the traditional style of physical watch hands.

Some existing solutions focus on reducing the severity of the obstruction by using hands that are transparent or very narrow. These solutions, however, make it more difficult for the user to see the hands to tell the time and limit watch developers’ design choices. Other solutions rely on a supposition that most digitally displayed content is known or can be anticipated, such as a current date, a future date, or a prior-set alarm. These techniques permanently place the content where it will not be obstructed. Because of the high volume and wide variety of digital content that is now possible to display, anticipating the type, size, and frequency of displayed content is no longer an adequate solution. For some watches with physical hands, in which numbers or marks representing the hours are digitally displayed around a center point, techniques that change the shape of the watch face are used. For example, the numbers or marks may be digitally displayed in either a circular or an elliptical arrangement. Alternating between these shapes may provide a small increase in the amount of fixed area available to display particular digital content, but the majority of the display is still obstructed at least part of the time, and the user’s view will be obstructed by the watch hands if content is displayed within the sweep of the hands.

Description:

To address the problem of digital watch displays being obstructed by the motion of physical watch hands, placement of digital content the display is dynamically adjusted to avoid the obstruction by the watch hands. The position of the physical hands is determined by the time of day, which is known to the internal electronics and/or software of the watch. Digital content can therefore be placed in a location that reduces or eliminates the obstruction and the location can be dynamically adjusted to remain unobstructed. For example, if the watch software knows that the
hands are at the top of the screen (e.g., noon or midnight), any digital content to be displayed can be displayed in the lower part of the display. Likewise, at 6:30, the digital content can be displayed in the upper part of the display. As the hands move around the watch face, the digital content is moved to unobstructed areas.

Figure 1 shows possible configurations of a digital watch face with physical hands. The example watch face shown in view 1A has markers that represent the numbers “12” and “6” along with a thick, rectangular hour- and minute-hand. The example shown in view 1B includes those features, along with additional markers for the numbers “3” and “9” and a narrow second-hand. View 1C depicts a watch face with narrower, tapered hands, no second-hand, and markers for only the numbers “12” and “6”. The watch face illustrated in view 1C is used in the remainder of the figures, but the concepts are applicable to a variety of configurations.

Figure 2 illustrates an example the different display areas that are available at various times of the day. The available areas are enclosed by dashed lines. In view 2A, it is about 6:30 and most of the upper part of the display is available. In view 2B, it is approximately midnight, and most of the lower part of the display is available. View 1C shows the available parts of the display at
about 6:15. In examples 2A, 2B, and 2C, the markers that represent the numbers “12” and “6” are included in the available display area, but in some implementations, these markers may be excluded from the available display area.

![Area Available For Displaying Digital Content](image)

**Figure 2**

The initial time setting on a digital watch may be determined using a variety of methods. For example, the time may be set at the factory, a user may set the time, or the watch may determine the time automatically using a network connection or the internet. The initial time setting may also be determined using various combinations of these techniques. Once the time of day is known, the position of the physical hands can be controlled by a software module running in the digital watch (the hands may also be controlled by firmware or hardware, alone or in combination with each other and/or the software). The software controls the position of the physical hands to represent the time. Because the watch software also knows the size and shape of the hands, it can calculate the pixels on the watch face that are unobstructed, and thus available, and the pixels that are obscured by the hands. The software provides the location of the available and obscured pixels
to the display so that digital content can be placed in locations that reduce or eliminate the obstruction. As the position of the hands changes with time, the location of the digital content can be dynamically adjusted to remain unobstructed.

Figure 3 illustrates an example of the technique. The time in view 3A is 8:00 AM and the watch is displaying digital content that includes a digital representation of the time, a link to an email program that shows the number of unread messages, and a reminder of a meeting later in the day. In view 3B, the time is 8:05 AM and the digital representation of the time has been moved down to avoid being obstructed by movement of the minute-hand and the reminder text been moved to near the bottom edge of the display. In view 3C, the time is 8:10 AM and the digital representation of the time has been moved from the right side of the display to the left side, as shown by a dashed line and arrow. In this example, the watch software also moved the e-mail link down to accommodate the digital representation of the time, and the reminder text has been left in its original location.

Figure 3
Figure 4 illustrates a more-complex example. The time in view 4A is 10:13 AM and the watch is displaying digital content that includes digital representations of the time and the date, a link to an e-mail program, a cloud-and-sun icon that represents a link to a weather application, a “play” button icon that represents a link to a music service, a battery life indicator, and a reminder of a meeting later in the day. In view 4B, the time is 12:01 PM. The digital representations of the time and date have been moved from the upper right corner of the display to the bottom of the display and the weather and music icons have been also been moved from the right side to the bottom of the display. The watch software has also moved the reminder text to the left side of the display and moved the e-mail link to accommodate the adjustment to the reminder text.

The examples shown in Figure 4 also illustrate an optional feature related to some persistent content (content that is always displayed), such as the battery life indicator. The watch software has placed the battery life indicator in a location in the bottom left corner of the display, out of the sweep of the hands so that it is never obstructed. While this may reduce the number of free pixels available at certain times of the day, it provides some display consistency for the user, especially with respect to relatively important features that are always displayed.
Figure 5 illustrates another optional feature for watches with a fast-moving hand, such as the second-hand. In this case, rather than moving the digital content around to avoid the fast-moving hand, the watch software uses smaller, transient adjustments that do not affect the entire layout. For example, the software can adjust the kerning (the space between letters of a word) to place the hand in a gap between characters or displayed objects. This technique allows the software to dynamically adjust to the position of the hands without frequent movement of the content that a user may find unsettling. In view 5A, the second hand is near the 26-second position and the kerning of the reminder text has been adjusted so that there is a small amount extra space between the “M” and the first “e” in the word “Meeting” and also between the first and second “0” in the digital representation of the time (6:00 PM). This extra space allows the reminder text to remain unobstructed without moving the entire reminder around the watch face. Similarly, in view 5B, the software has increased the space between the word “Mail” and the new messages indicator “(17)” to avoid obstruction by the second hand.
Figure 6 illustrates another optional feature that can be implemented in the examples shown above. In some cases, rather than moving the digital content around to avoid the physical hands, the hands may be moved out of the way for important content. For example, a user may sign up for hazard alerts (e.g., storm or flood warnings) or the user may have priority messages that cannot be missed (e.g., notifications to an on-call physician). In view 6A, the time is 10:13 AM and the display includes various digital content items. In view 6B, the time is still 10:13 AM, but the hands have been moved to the midday position so that a flood warning can be shown. This optional feature may be activated by any of a variety of methods, such as factory settings, user-initiated subscriptions, or governmental emergency networks.

Figure 6

In Figure 6, the digital content has been removed from the display to make room for the flood warning, except for the persistent battery life indicator. In some cases, both transient and persistent may be removed or only the digital content necessary to provide space for the high-importance content is removed. The digital watch can be returned to normal operation by various methods, such as a user selection, passage of a predefined time period, or after the alert has ended.