

at the left side remains visible when looking at the right side, so the user tends to lose their place while scrolling. (In the case of 320-pixel wide display, none of a typical 800-pixel-wide Web page that is visible when viewing the left side of the page is visible once the user has scrolled far enough to see the right edge of the page. Even if a device were made with a 480-pixel wide display, then only 160 pixels (at most) that are visible when viewing the left side of a typical 800-pixel wide page remain visible once the user has scrolled far enough to view the right side of that page: That is, the “overlap” is 160. With overlaps this small or smaller, it becomes hard for the user to picture the layout of the full page in their mind. This makes it hard to navigate a Web page while “looking through the straw” of the low-resolution displays in today’s mobile devices. However, in one aspect of the present invention, the observation is made that if a pocket-size mobile device’s display’s horizontal pixel dimensions are raised to the point where the “overlap” (i.e. the part of a typical 800-pixel wide Web page that remains visible as the user scrolls from the left side of the page to the point where they can see the right edge of the page) is at least 240 horizontal pixels (significantly higher than the overlap of today’s mobile devices as noted above)—and if the vertical pixel count is also sufficiently high (at least 320 pixels), but preferably no higher than the display’s horizontal pixel count—then a display pixel-count threshold is crossed such that the portions of typical Web pages visible at any time remain large enough to enjoy comfortable general Web access. While a 240-pixel overlap is the minimum required to cross this user-acceptability threshold if the vertical pixel count is as low as 320 pixels, an overlap of at least 400 horizontal pixels (half the width of a typical 800-pixel Web page) achieves better results in many applications. To get a 240-pixel overlap, a display would have to be at least 520 pixels wide. ( $520+520-800=240$ .) And to get a more ideal 400-pixel horizontal overlap, a display would have to be 600 pixels wide: That is, the middle 400 pixels of an 800-pixel Web page would remain continuously visible on a 600-pixel-wide display as a user scrolls from the left edge of the page to the point where the right edge of the page becomes visible. The horizontal and pixel counts embodied in the present invention shall be explained in more detail below.

[0081] Based on experimentation using accurate simulations of ranges of display counts, display densities, and overall device sizes, the observation is made that an ideal balance of characteristics for a pocket-size hand-held device used for general Web access (i.e. herein referred to as “mobile Web access”) is as follows: a horizontal effective pixel count of 600, a vertical effective pixel count of 400, an effective pixel density of 144 pixels-per-inch both horizontally and vertically, and an overall device size of 4.6×3.1 inches. It is also observed that the further from this set of characteristics a device gets, the less ideal it is as a pocket-size hand-held device to be used for general Web access, but that devices whose respective characteristics come within plus or minus 15% of each of those ideal display counts, display densities, and overall device size, are better suited for Web access than any known conventional hand-held mobile devices today. This is because when a device’s characteristics fall within plus or minus 15% of these carefully balanced ranges, the device size remains small enough to fit comfortably in most pockets and hands; yet enough pixels are visible to avoid the constraining “looking

through a straw” phenomenon; and the pixel density is low enough that Web content that would be comfortable to view on a typical notebook computer at about 18-21 inches (with a typical notebook computer display pixel density of about 96 ppi) can be comfortably viewed on the device from a typical hand-held-device viewing distance of about 12-14 inches, without requiring magnification and without some content appearing uncomfortably small. Also the display cost (often a major part of the device’s bill of materials) is optimized by not using substantially more pixels than is necessary to provide this optimal Web viewing experience on a hand-held pocket-size device.

[0082] Note that 600 horizontal pixels minus 15% is 510 horizontal pixels, which is slightly less than the 520 minimum horizontal pixel count referred to in the earlier guideline that was combined with a minimum vertical pixel count of 320. As noted above, it is observed that this slightly lower minimum of 510 horizontal pixel count is acceptable when balanced with a slightly higher minimum vertical pixel count of 340 pixels (which is 400 vertical pixels minus 15%) as well as a pixel density range of 144 ppi plus or minus 15%. The 520×320 pixel portion of a Web page (166,400 total pixels) referred to in the earlier guideline is a smaller portion of a page than a 510×340 pixel portion (173,400 total pixels), so the 520×320 pixel portion is referred to herein as the recommended minimum portion of a Web page that a portable electronic display device (particularly one used for Web access) should be able to display at native resolution.

[0083] FIG. 4-A illustrates the portion of a Web page (i.e. 600×400 pixels) viewable on a portable electronic display device according to an embodiment of the present invention at the display’s native resolution, in comparison to the viewable portion of Web page on some other types of devices. FIG. 4-B illustrates a 520×320 pixel portion of a Web page (item 405), which is the recommended minimum portion of a Web page that a portable electronic display device should be able to display at native resolution; and it illustrates a 600×400 pixel portion of a Web page (101), which is a recommended ideal portion of a Web page a portable electronic display device should be able to display, according to an embodiment of the present invention. Moreover, FIG. 4-A and FIG. 4-B illustrate some of the foregoing points. Suppose, for example, the dotted outline 404 were the frame of a typical 800-pixel wide 600-pixel tall Web browser window. The small square 402 shows the portion of that Web page that could be seen through a 160×160 pixel window (which is the pixel count dimensions used-on many Palm OS devices). The slightly larger rectangle 403 shows the portion of that Web page that could be seen through a 240×320 pixel window (which is the pixel count dimensions of many hand-held computers that run Microsoft’s PocketPC operating system, for example). Both of these windows 402 and 403 are just too small to enable decent general purpose Web access. As noted, an aspect of the present invention is the observation that the minimum portion of a Web page that a user needs to be able to see for reasonably enjoyable general purpose Web access on a pocket-size hand-held device is 520×320 pixels, as shown by rectangle 405 in FIG. 4-B. In many embodiments of the present invention, a preferred pixel count dimension—one where it is observed that most users can become quite comfortable accessing Web pages—is around 600×400 pixels, as shown by rectangle 101 in both FIG. 4-A and FIG.