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Adaptive Screen Layouts Based on Viewer Proximity from Home Devices

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Abstract:

Smart devices in the form of personal assistants are becoming more common and more dynamic. In addition to audibly exchanging information with a user via a mechanism such as a smart speaker, a personal assistant may now include a display to present useful ambient information to a user, such as time, weather, calendar information, or upcoming events. Techniques are described for adapting a screen layout of such a display based on proximity of a viewer relative to the display, allowing an effective and efficient presentation of the useful, ambient information.

Keywords: Personal Assistant, Screen Layout, Internet-of-Things, Viewer Proximity

Background:

Today, with advancements in communication technologies and with computing/sensing electronics embedded in a myriad of devices, the ability for devices to collect and exchange data with one another is escalating. Devices such as smart phones, voice-recognizing personal assistants, computers, automobiles, home entertainment systems/appliances, and the like, are able to communicate with one another either directly, in a machine-to-machine environment, or indirectly over a network. Such communications and exchange of data across the myriad of devices is commonly referred to as the Internet-of-Things (IoT). The communications and exchange of data can have purposes that include, for example, monitoring a person's health, collecting usage data for vendor analytics, remote initiation/shutdown of an operating system, automating a home environment, and so forth.

A view of an example IoT environment is represented in Fig. 1 below:

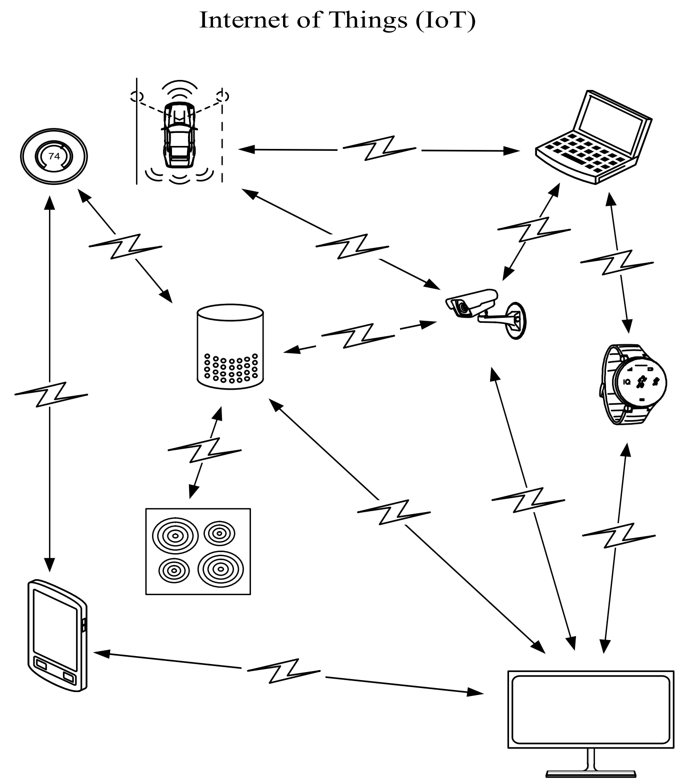

Fig. 1

In the IoT environment of Fig. 1, data may be collected by sensors of a device and shared with another device. Processing of data may be performed local to the device collecting the data or remote from the device collecting the data. Combinations of hardware (*e.g.*, sensors, microprocessors, memory), software (*e.g.,* algorithms, GUI's), and services (*e.g.*, communication networks) may be used to sense, collect, and exchange data. Large amounts of data are expected to be exchanged, as part of the IoT, across a horizon that is developing and changing frequently.

A particular aspect of the IoT environment may include a personal assistant with a display for displaying useful ambient information. Typically, the display is fixed in terms of layout constraints, such as text size or image sizes. However, in an instance where a viewer proximity is a far distance from the display, he may not be able to read or interpret content on the display due to the sizes of the presented content, rendering the display ineffective. Conversely, in an instance where the viewer proximity is immediate the display, there may be a limitation on an amount of content that is displayed, rendering the display inefficient. Improvements are needed to manage screen layouts in order to improve a display's effectiveness and efficiency.

Description:

A personal assistant having a display is often used to present ambient information to a person. While presenting the ambient information, it is desirable for the display to present the ambient information based on a viewer's vision capabilities. As this capability is related to the viewer's proximity to the display, adapting the screen layout based on the viewer proximity can improve the effectiveness and efficiency with which the display presents information.

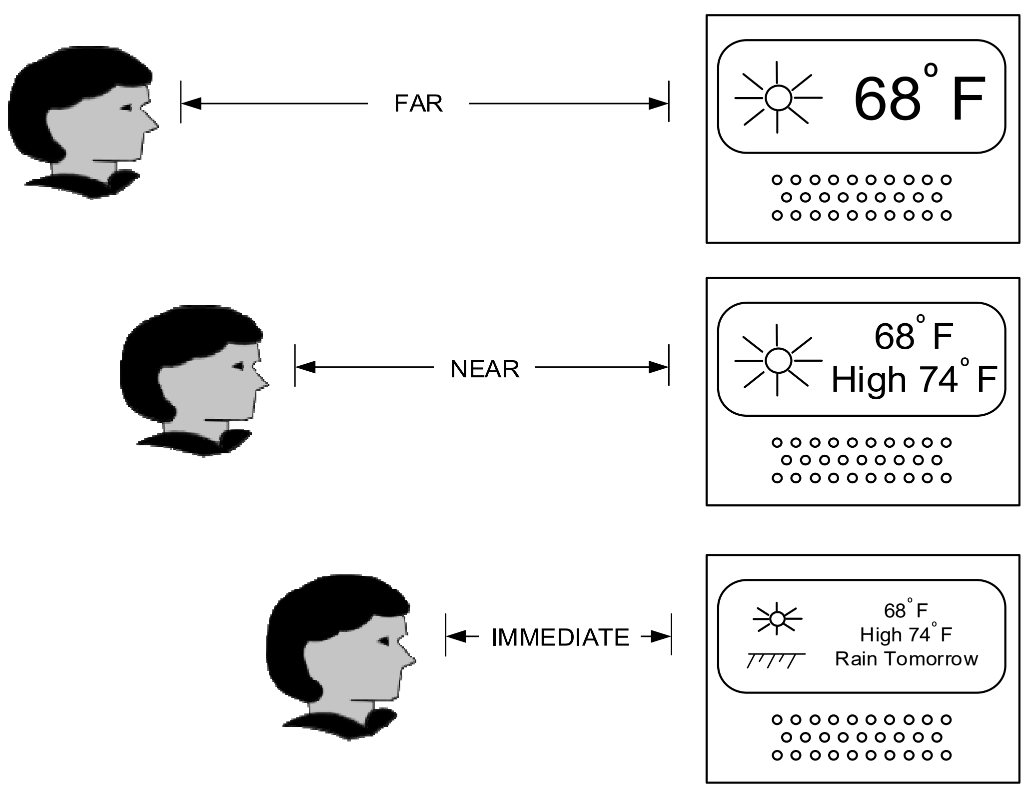

Fig. 2

In the example in Fig. 2, a viewer is viewing a personal assistant that is presenting ambient information through a display in three different instances. The display is presenting ambient information in the form of a weather report that is obtained, as part of the IoT, from a cloud-based service. The personal assistant further includes at least one mechanism that may be used to determine the viewer's proximity relative to the display.

In the first instance of the illustrated example, a determination is made that a viewer's proximity, relative to the personal assistant, is "far". In this instance, the personal assistant presents, via the display, minimal weather information (*e.g.*, a "sunny" graphic and a current outdoor temperature of "68°F") in a large text size that is readable by the viewer in a "glanceable" fashion.

In the second instance of the illustrated example, a determination is made that a viewer's proximity, relative to the personal assistant, is "near". In this instance, the personal assistant adapts the screen layout based on changed conditions relating to the viewer's proximity, and presents additional information in a reduced text size (*e.g.*, not only the "sunny" graphic and current outdoor conditions of "68°F", but also a prediction of "Hi 74°F" for the day).

In the third instance of the illustrated example, a determination is made that a viewer's proximity, relative to the personal assistant, is "immediate". In this instance, the personal assistant adapts the screen layout to the changed conditions relating to the viewer's proximity, and presents even more information. Note that, in this instance, the screen layout has adapted to include additional graphics (*e.g.*, the "sunny" graphic and a "rain" graphic are now presented) and increase displayed textual information via a further reduction in text sizes (*e.g.*, the current outdoor conditions of "68°F", the prediction of "Hi 74°F" for the day, and the forecast for "Rain Tomorrow" are now presented via the display).

The display can also be adapted to present interactive controls. In such an instance, a determination may be made that the viewer's proximity (within bounds of the "immediate" proximity as described above) is such that the viewer is able to touch the display and within a control range of the display. Upon this determination, the personal assistant may adapt the screen layout from a static layout (displaying text and graphics) to a dynamic, interactive layout and present, in addition to text and graphics, one or more buttons, menus, scroll bars, or the like. An example of a display presenting the described dynamic, interactive layout is illustrated in Fig. 3 below:

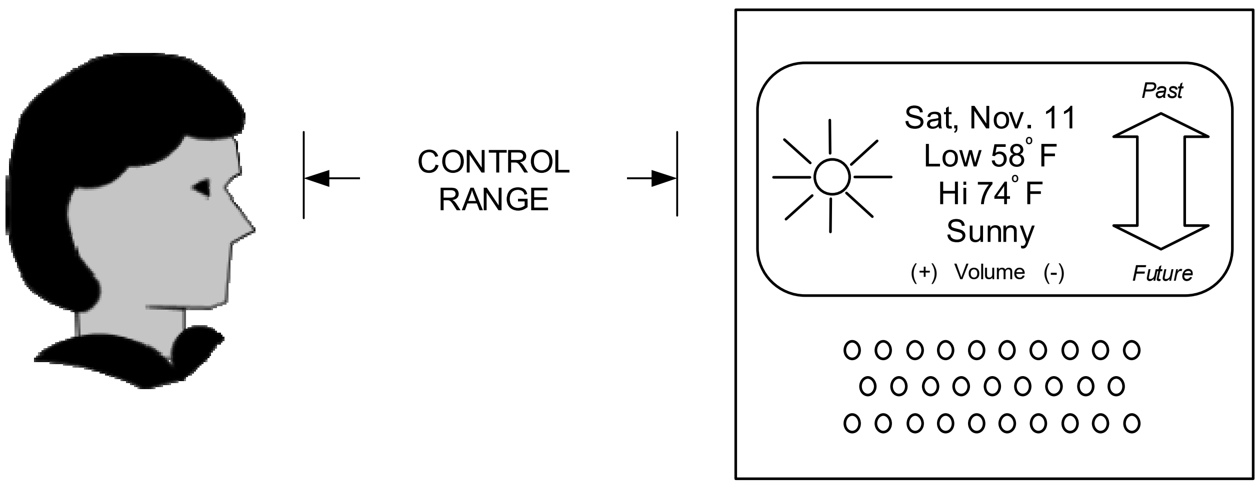

Fig. 3

As illustrated in Fig. 3, the display of the personal assistant presents a scroll bar (for a viewer to scroll through past weather history or future weather forecasts) as well as volume buttons (for increasing or decreasing volume of an audible weather report or forecast). Depending on content, provided by an entity such as a cloud-based service, interactive controls may vary. Furthermore, while a viewer is within the control range, additional fine-tune scaling of images and text may occur, with images or text dynamically shrinking or growing with changes to the viewer's proximity.

Features of a personal assistant may aid computing resources that are either local to the personal assistant or remote from the personal assistant (such as a cloud-based service) in determining a proximity of a viewer relative to a display. An example method, making use of a camera or other example image-capturing features that may be integrated into the personal assistant, is illustrated in Fig. 4 below:

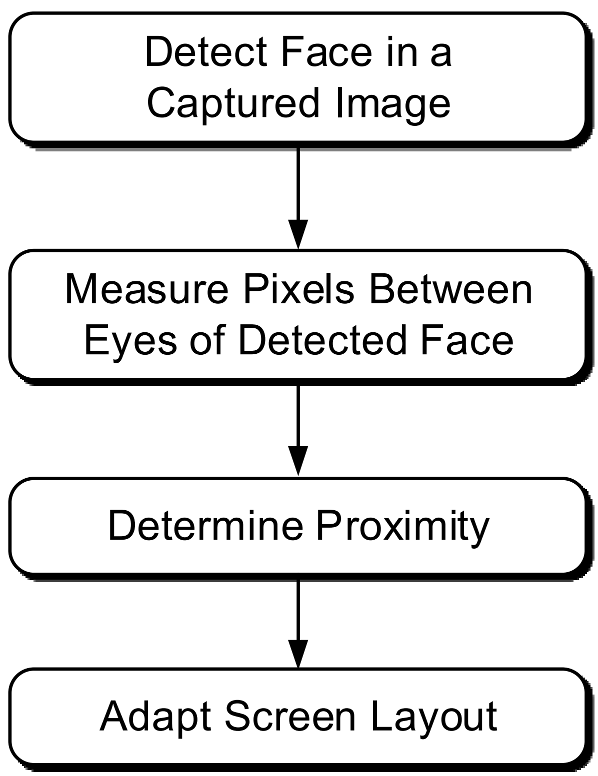

Fig. 4

As depicted in the example method, a face is detected in an image captured by the camera or other image-capturing feature of the personal assistant. Pixels between eyes of the detected face are then measured (counted), after which an algorithm is used to determine a proximity of the detected face relative to the personal assistant. In accordance with the determined proximity, the personal assistant adapts the screen layout in terms of text sizes, illustrations, presented controls, or the like.

Other example features of a personal assistant that may be used as part of determining proximity include proximity sensors, audio detecting features, radar features, or laser scanning features. Such features may be used individually, or in combinations, to render an accurate determination of proximity such that the screen layout may be adapted as needed. Furthermore, in addition to proximity, additional determinations may be made (for example, in a room of multiple potential viewers, one viewer may be identified who is looking at the display of the personal assistant, and adaptations to the screen layout would be made accordingly).

The personal assistant may be configured via an Application Programming Interface (API) in order to perform screen layout adaptation methods in accordance with a viewer's personal preferences. For example, a person having relatively good eyesight may configure the personal assistant such that the display never adapts a "far" range layout, and presents only "near" and "immediate" layouts. Conversely, as another example, a person having relatively poor eyesight may configure the personal assistant such the display never adapts an "immediate" layout. Additionally, configurability may be include accommodating a visually-impaired person, for whom baseline font sizes and layouts might be adjusted.