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Volume Control Based on a Determined Context

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Abstract:

This publication describes techniques directed to an electronic device equipped with audio speakers and a volume-control manager application. Instructions included in the volume-control manager application, when executed by a processor of the electronic device, cause the electronic device to perform multiple operations that manage output volume of the audio speakers. Such operations include sensing, through one or more sensors of the electronic device, conditions surrounding the electronic device to determine a context and provide output-volume control options to a user in accordance with the determined context.

Keywords:

volume control, electronic device volume, electronic device context, automated volume control

Background:

An electronic device today is often equipped with audio output speakers for outputting audio, such as audio that might be associated with media presented through the device or a notification associated with an application executing on the electronic device. Typically, a user can manually adjust a master volume-control setting of the device. The user can also, in some instances, configure output volume-control settings for respective functions or applications operating on the electronic device (*e.g.*, the user may configure an output volume-control setting of a notification function to a lower value than that of a media player output volume setting).

In general, if audio output through the speakers of the electronic device is dormant for a period of time, (*e.g.*, after the user shuts off the electronic device or the electronic device enters a

"sleep" mode), the user may be surprised or embarrassed by a loud volume setting when audio output resumes through the speakers. This situation can easily happen when the context surrounding the electronic device changes over the period of time.

As an example, on a Sunday the user may set a call-notification volume-control setting on his smartphone to a maximum value while he is working in his garden (*e.g.*, a context surrounding the electronic device). On Monday morning, after going to his workplace (*e.g.*, the context surrounding the electronic device changes over the period of time between Sunday and Monday), the user, having forgotten that he set the call-notification volume-control setting to the maximum value, may be embarrassed by the volume of a call notification that he receives while he is in a critical meeting with clients.

Typically, techniques for managing volume control when resuming audio output through the speakers of the electronic device rely on a last-entered volume-control setting or a default/factory volume-control setting of the electronic device. Such techniques fail to prevent an embarrassing or unwanted event, such as the event described above.

Description:

This publication describes techniques directed to an electronic device equipped with audio speakers and a volume-control manager application. Instructions included in the volume-control manager application, when executed by a processor of the electronic device, cause the electronic device to perform multiple operations that manage the output volume of the audio speakers. Such operations include sensing, through one or more sensors of the electronic device, conditions surrounding the electronic device, determining a context surrounding the electronic device, and providing output-volume control options in accordance with the determined context.

Fig. 1, below, illustrates examples of an electronic device and elements of the electronic device that support volume control based on a determined context.

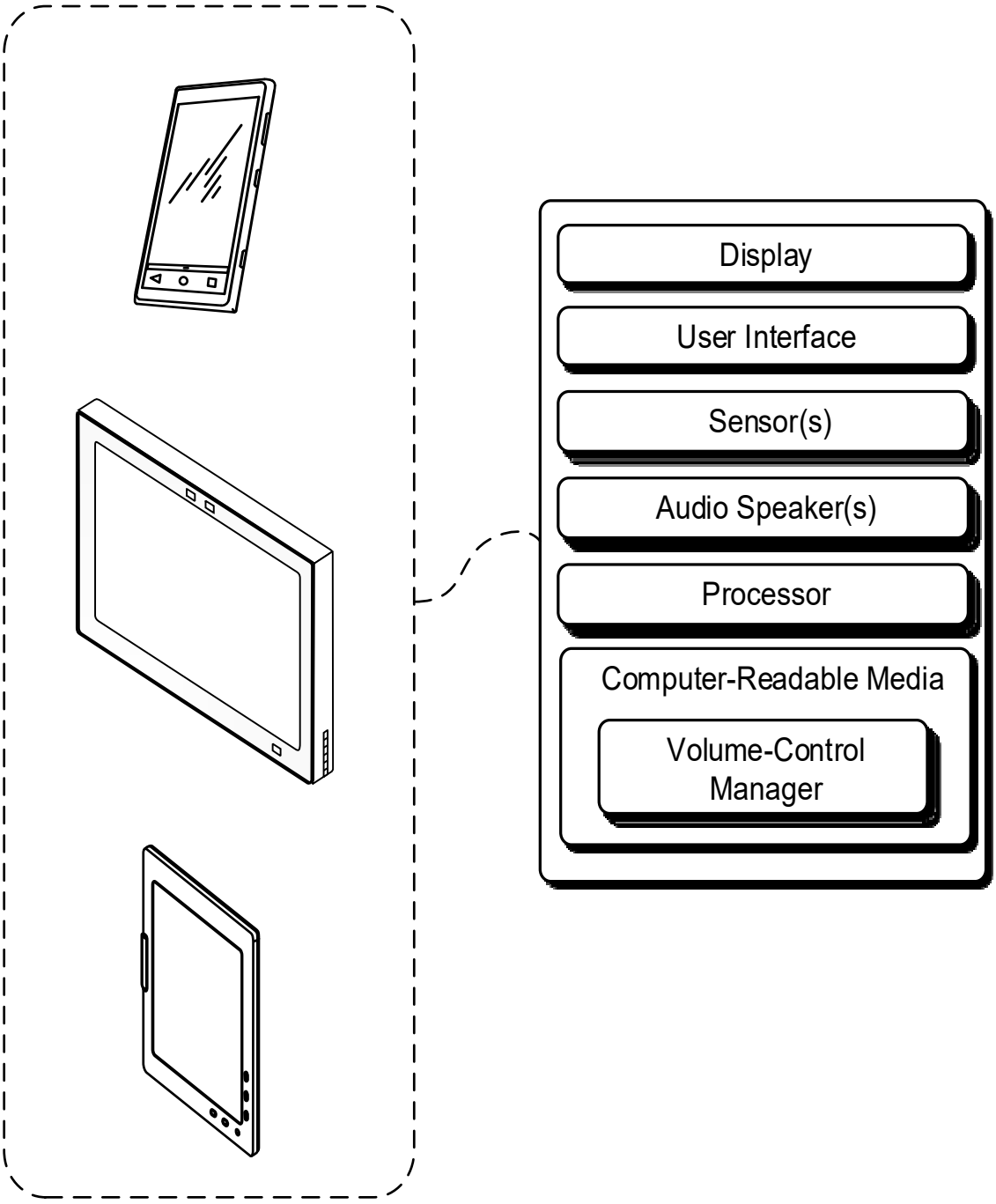

Fig. 1

As illustrated and as non-limiting examples, the electronic device may be a smartphone, a television display, or a tablet. The electronic device includes a display to present control options, a user interface to receive control inputs, sensors for sensing a context or environment surrounding the device, and audio speakers through which audio output is routed. The sensors, in general, may be used to sense conditions surrounding the electronic device. Example sensors include proximity sensors, imager sensors, thermal sensors, acoustic sensors, radar sensors, beacon-detection sensors, GPS signal-detection sensors, infrared sensors, and the like.

The electronic device also includes audio speakers through which audio output is routed, a processor, and a computer-readable medium (CRM). The processor may be a single core processor or a multiple core processor composed of a variety of materials, such as silicon, polysilicon, high-K dielectric, copper, and so on. The CRM may include any suitable memory or storage device such as random-access memory (RAM), static RAM (SRAM), dynamic RAM (DRAM), non-volatile RAM (NVRAM), read-only memory (ROM), or Flash memory. The CRM stores a volume-control manager application having executable instructions that, upon execution by the processor, cause the electronic device to perform multiple operations that manage output volume of the audio speakers. The operations include sensing, through one or more of the sensors, conditions near the electronic device, determining a surrounding context, and, based on the determined context, providing an output-volume control option to a user of the electronic device.

Fig. 2 illustrates an example instance in which a device with audible output detects a context and presents an output-volume control option of muting the device:

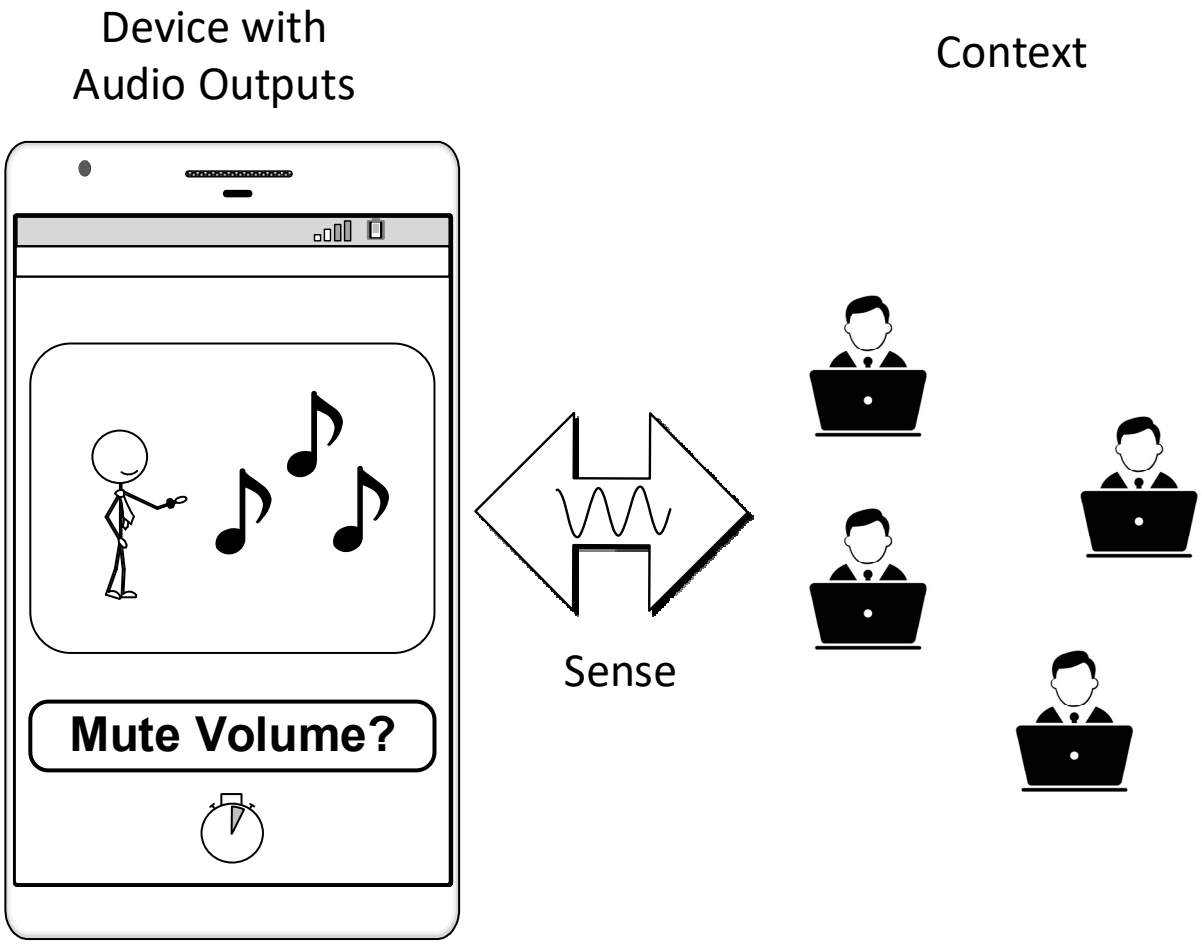

Fig. 2

In the example instance illustrated by Fig. 2, the user is initiating a media player application on his smartphone. As the media player is initiating, the processor of the smartphone executes the volume-control manager application to sense (through sensors) external conditions near the smartphone. In this instance, the sensing may include using a GPS signal sensor that senses a location and a microphone that senses multiple human voices and distinguishes the multiple human voices from a media such as a movie. Based on the sensed conditions, the smartphone determines that a context surrounding the smartphone is that of the user's work environment.

Based on the determined context, the volume-control manager application causes the smartphone to present a selectable option (*e.g.,* "Mute Volume?" option) and a quick-timer on the

display of the smartphone. If the user desires to mute the volume, prior to an expiration of a time period associated with the quick timer, he may select the "Mute Volume?" option through the user interface of the smartphone (*e.g.*, in this instance the display is a touchscreen and serves as the user interface of the smartphone).

Fig. 3 illustrates an example in which a device with audible output detects a context and presents an output-volume control option of stopping a ramped volume:

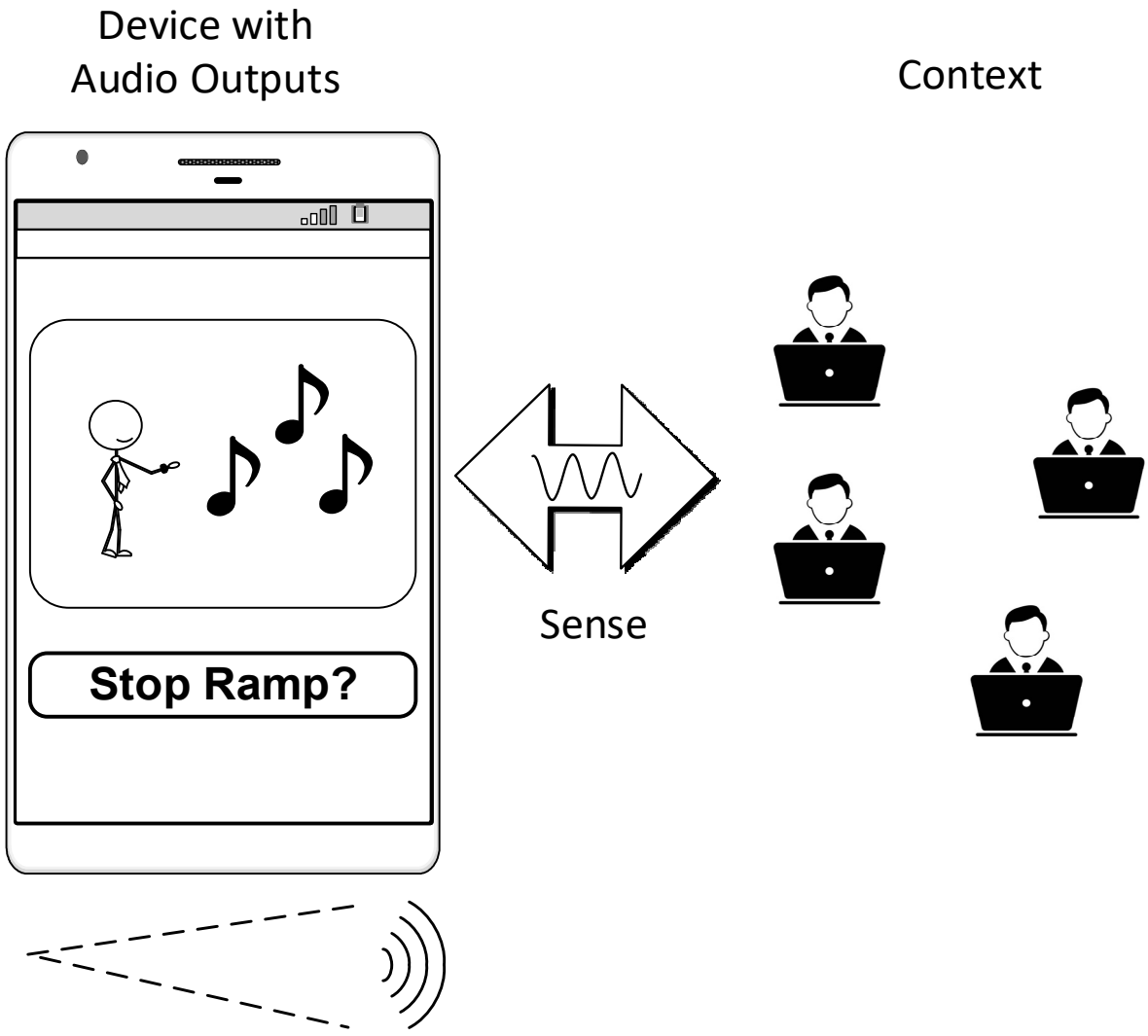

Fig. 3

In the example illustrated by Fig. 3, and based on the determined context, the volume-control manager application causes the smartphone to detect the context surrounding the

smartphone (similarly to Fig. 2) and causes the smartphone to present a selectable option (*e.g.,* "Stop Ramp?" option). If the user desires to stop a pre-programmed ramp-up, he may select the "Stop Ramp?" option through the user interface of the smartphone.

There are many variations and permutations to the aforementioned techniques. As a first example variation, and as opposed to the techniques applying to a smartphone with a touchscreen interface, the techniques may apply to a television display with audio output capabilities. In such an example instance, the user interface may be the remote control of the television as opposed to a touchscreen interface. As a second example variation, the techniques may apply to other outputs that are not audio outputs, such as a visual output (*e.g.*, it may be desirable for a display of the electronic device to remain "dark" or "hidden" prior to presenting video content while the electronic device is surrounded by a certain, determined context). And, as a third example variation, the techniques may use machine-learning to supplement the sensors to determine a context surrounding the electronic device (*e.g.*, the volume-control manager application may include algorithms that take into account the user's response or selections associated with previously determined contexts and the like).

In addition to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (*e.g.*, information about a user's social actions, information about a user's activities, information about a user's profession, information about a user's current location), and if the user is sent content or communications from a server. Furthermore, certain data may be treated in one or more ways before it is used, so that personally identifiable information is removed. For example, a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a

particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

In summary, the aforementioned techniques prevent embarrassing or unwanted events that may be associated with volume-control setting management practices today. Furthermore, the aforementioned techniques are applicable to a wide range of electronic devices detecting a variety of contexts.