Electronic Device With Environmental Monitoring

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Abstract

An environmental monitoring device that includes a sensor mechanism is described. During operation of the environmental monitoring device, the sensor mechanism provides sensor data based on measurements of environmental conditions in an external environment that includes the environmental monitoring device. Moreover, a control mechanism assesses if the environmental conditions indicate at least one of a set of threats. If yes, the control mechanism provides a corresponding alert. Furthermore, the environmental monitoring device includes a power source with a primary power source and a secondary power source. The secondary power source has at least a 10-year operating life and may power only or at least a subset of the functionality of the environmental monitoring device in the event the primary power source fails. For example, the sensor mechanism may include a smoke detector that is powered by the secondary power source in the event the primary power source fails.

Keywords

Electronic device; Environmental; monitoring.

1. Introduction

Trends in connectivity and in portable electronic devices are resulting in dramatic changes in people's lives. For example, the Internet now allows individuals access to vast amounts of information, as well as the ability to identify and interact with individuals, organizations and companies around the world. This has resulted in a significant increase in online financial transactions (which are sometimes referred to as 'ecommerce'). Similarly, the increasingly powerful computing and communication capabilities of portable electronic device (such as smartphones), as well as a large and growing set of applications, are accelerating these changes, providing individuals access to information at arbitrary locations and the ability to leverage this information to perform a wide variety of tasks.

Hence, there is a need for an environmental monitoring device that addresses the above-described problems.

2. An environmental monitoring device

Includes a sensor mechanism that provides sensor data based on measurements of environmental conditions in an external environment that includes the environmental monitoring device. Moreover, the environmental monitoring device includes a control mechanism that assess if the environmental conditions indicate an occurrence of at least one of a set of threats and, if yes, that provides a corresponding alert. Furthermore, the environmental monitoring device includes a power source that includes a primary power source and a secondary power source, where the primary power source includes a different type of battery than is included in the secondary power source, and the secondary power source has at least a 10-year operating life and powers a subset of the functionality of the environmental monitoring device in the event the primary power source fails FIG. 1 is a block diagram illustrating an environmental monitoring device .

Note that the environmental conditions may include: presence of smoke, and presence of carbon monoxide. Thus, the sensor mechanism may include a smoke detector that provides a smoke alert when smoke is present, and a carbon-monoxide detector that provides a carbon-monoxide alert when carbon monoxide is present.

The subset of the functionality may include providing an alert when smoke is present in the external environment.

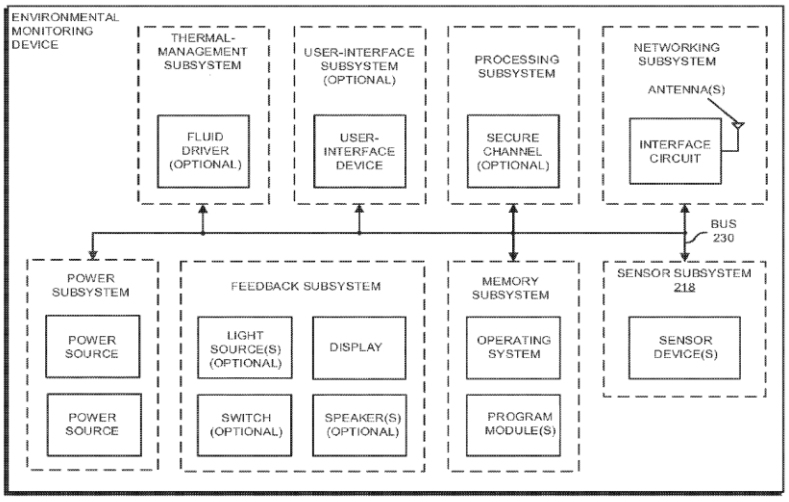

Fig. 1 block diagram illustrating an environmental monitoring device

The primary power source may include a rechargeable battery and the secondary power source may include a non-rechargeable battery. Consequently, the secondary power source may have a longer operating life than the primary power source. Note that failure of the primary power source may include a battery voltage less than a first threshold value. When this occurs, the power source may discharge the primary power source to the battery voltage equal to a second threshold value, which is less than the first threshold value, prior to recharging the primary power source so that an operating life of the primary power source is extended.

Additionally, the secondary power source may only power the subset of the functionality in the event the primary power source fails to extend an operating life of the secondary power source. Thus, a remainder of the functionality of the environmental monitoring device may be disabled or deactivated when the primary power source fails.

3. Block diagram illustrating a data structure with sensor data

The sensor data and/or the analyzed sensor data may be stored, at least temporarily, in a data structure in memory subsystem . This is shown in FIG. 2, which presents a data structure . In particular, data structure may include entries with: sensor data , timestamps , locations , optional analyzed sensor data , and/or environmental conditions . Note that locations (or location information) may specify locations were the sensor data was acquired or measured. For example, the location information may be measured using a sensor device in environmental monitoring device in FIG. 2 (such as a location monitor) and/or the location information may be received from another electronic device that is proximate to environmental monitoring device in FIG. 2 (such as an individual's cellular telephone). Thus, the location may be determined via GPS and/or a cellular-telephone network (such as triangulation or trilateration).

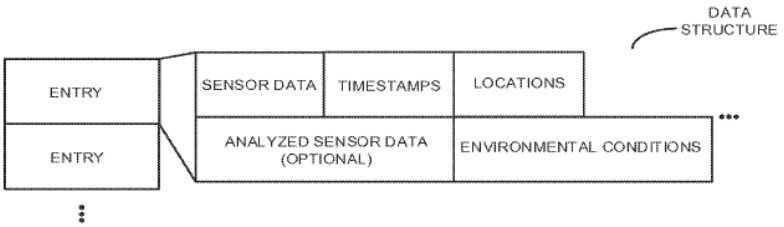

Fig. 2 block diagram illustrating a data structure with sensor data

4. Method for providing an alert based on an alert setting

Operation of the environmental monitoring device may be remotely configured. This is shown in FIG. 3, which presents a flow diagram illustrating a method for providing an alert based on an alert setting, which may be performed by a processor in the environmental monitoring device. For example, the processor may execute a program module that includes instructions for operations in method . During operation, the processor may receive (or access) sensor data (or analyzed sensor data) associated with a sensor device (operation) based on measurements of an environmental condition in an external environment that includes the environmental monitoring device.

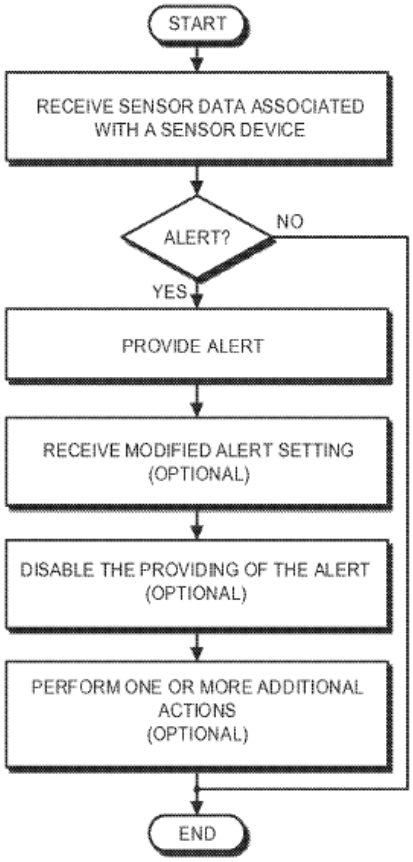

Fig. 3 flow diagram illustrating amethod for providing an alert based on an alert setting

Then, the processor, assesses (operation) if the environmental condition indicates a threat. If no, method ends. Otherwise, the processor provides the alert (operation) to an electronic device, which is separate from the environmental monitoring device (and may not communicate with and/or may not have electrical coupling to the environmental monitoring device), based on the alert setting (which may specify when or the requirements for an alert to be communicated and how the alert is communicated, such as: an audible alarm having a tone and a volume setting, a Short Message Service, email, a social network, a messaging service with a restricted number of characters per message, a telephone call, etc.). For example, the processor may provide an output or a control signal to a networking interface that, in response, wirelessly communicates the alert to the electronic device (such as a cellular telephone of a user or owner of the environmental monitoring device.) This capability may enable remote monitoring of the environment, such as while the user runs errands or is travelling. Note that the alert may include information quantifying a degree of the threat, such as a concentration of a chemical or a level of risk to individuals in the external environment. In some embodiments, the processor also provides the alert in the external environment. In particular, the processor may provide an output or a control signal to one or more speakers, which output an audible sound in the external environment.

Separately or additionally, the environmental monitoring device may receive, from the electronic device, the modified alert setting and optionally a (separate) control command (operation). For

example, the modified alert setting and the option control command may be wirelessly received from the user. In response, the processor disables the providing of the alert (operation) based on the modified alert setting and the optional control command. Note that the control command, such as a code, a safe word or a password, may help prevent accidental or unintended disabling of the alerts.

The processor may optionally perform one or more additional actions (operation). For example, the processor may assess the threat after receiving the modified alert setting and may reactivate the providing of the alert if the threat continues to increase. Alternatively or additionally, the processor may revert from the modified alert setting to the alert setting after a time interval (such as 5, 10, 15 or 30 minutes).

While the previous embodiments illustrated remote disabling of alerts (and, more generally, remote configuration of the alert setting and/or operation of the environmental monitoring device, including an operating mode of the environmental monitoring device), in other embodiments the user may disable the alert based on an action performed in the environment. For example, the sensor device in the environmental monitoring device may provide additional sensor data based on monitoring of a user command and an optional (separate) control command in the external environment (such as a sound, a verbal instruction or command, a gesture, a sequence of bodily motions, a facial expression, etc.). Note that the control command may include a safe word, a password or a security code that is spoken by the user or that is provided by the user via a user interface. In response to receiving the additional sensor data and the optional control command, the processor may disable the providing of the alert. Alternatively or additionally, the processor may disable the providing of the alert when the user activates or changes the position of a switch in a feedback subsystem in the environmental monitoring device. Note that the switch may be a physical switch, knob or dial, or a virtual switch (or a user-interface object or icon) that is presented on a display in the environmental monitoring device.

While the previous embodiments illustrated remote modification of the alert setting, in some embodiments the user modifies the alert setting by interacting with a user interface (such as a user-interface object or icon and, more generally, a selection mechanism) in the feedback subsystem that allows the user to select the type of alert or feedback (including disabling alerts). For example, a selection box or a slider bar may allow the user to select options or settings such as: basic, intermediate or advanced feedback (depending on the technical level of the user or the application of the environmental monitoring device). The user may also use a user interface in the environmental monitoring device and/or the display to select feedback and notification options or settings, such as: the danger alarms and alerts, threshold values for detecting environmental conditions (such an environment-specific threshold values, which may be calibrated based on a history of an environment), optimal settings for a particular environmental monitoring device or environment (such as calibration settings, power-consumption settings, etc.) or a generic environmental monitoring device or environment, etc. Alternatively, the thresholds may be determined based on sensor data and/or environmental conditions associated with multiple environmental monitoring devices, e.g., using a supervised learning technique (such as support vector machines, classification and regression trees, a neural network, regression analysis, Bayesian analysis, etc.). Note that the environmental monitoring device may also display and/or provide to the electronic device operating information, such as: sensor life, uptime, battery life remaining, network connectivity, danger alarms enabled or disabled, and/or status messages.

5. Environmental monitoring device and an electronic device during the method

FIG. 4 presents a drawing illustrating communication between an environmental monitoring device and an electronic device during method . During operation of environmental monitoring device , processor may receive sensor data associated with a sensor device based on measurements of an environmental condition in an external environment. Then, if processor assesses the environmental condition indicates a threat , processor may provide alert to electronic device based on the alert setting. In some embodiments, processor provides an output signal to one or more speakers , which output an audible sound in the external environment.

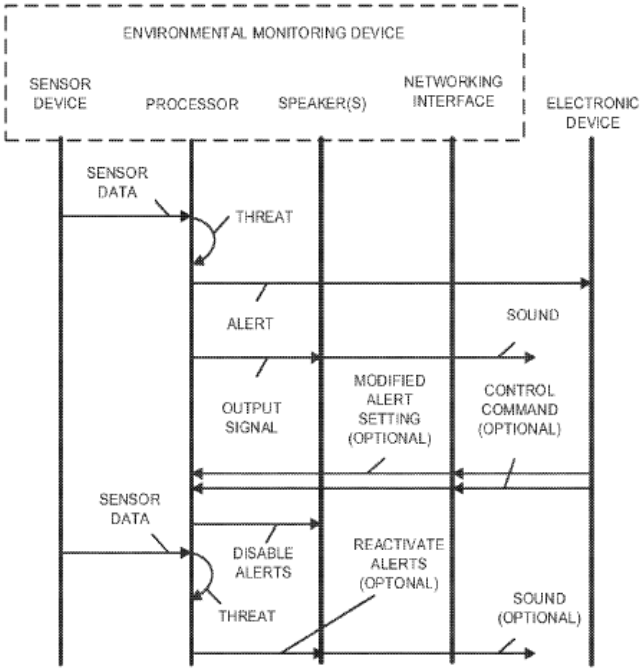

Fig. 4 is a drawing illustrating communication between an environmental monitoring device and an electronic device during the method

Separately or additionally, networking subsystem may optionally receive, from electronic device , modified alert setting and optionally control command in one or more packets or messages. In response, processor optionally disables alerts .

Processor may assess threat based on additional sensor data after receiving optional modified alert setting , and may optionally reactivate the alerts if threat continues to increase. Alternatively or additionally, processor may revert from modified alert setting to the alert setting after a time interval. In response to either, the one or more speakers may optionally provide sound .

6. Conclusion

The preceding summary is provided as an overview of some exemplary embodiments and to provide a basic understanding of aspects of the subject matter described herein. Accordingly, the above-described features are merely examples and should not be construed as narrowing the scope or spirit of the subject matter described herein in any way.

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