**Title:** METHOD AND SYSTEM FOR EMULATION OF MULTIPLE AUTOMATIC EXTERNAL DEFIBRILLATORS

**Abstract:** A system and method for receiving, on a first device, a selection for a device profile, the device profile including at least one operating setting relating to a second device and configuring at least one setting on the second device to emulate the at least one operating setting of the selected device profile of the second device.

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**Method 200**

**Fig. 4**

START

The ALS device receives and stores the AED profile in the profile database

The ALS device operates in a configuration mode

Is further user input needed?

YES

The ALS device prompts the user for AED profile selection

NO

The ALS device receives the user selection

The ALS device operates in an AED mode, thereby emulating an AED corresponding to the AED profile selection

END
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Method and System for Emulation of Multiple Automatic External Defibrillators

Field of Invention

The present application generally relates to systems and methods for emulation of multiple automatic external defibrillators ("AEDs"). Specifically, the system and methods may allow for a user of an advanced life support defibrillator to selectably emulate a make and/or model of a specific AED.

Background

An automated external defibrillator ("AED") is a portable electronic device used to automatically diagnose life threatening cardiac arrhythmias (e.g., ventricular fibrillation ("VF"), ventricular tachycardia ("VT"), cardiac arrests, etc.), as well as, to restore normal heart rhythm to patients in cardiac arrest. Due to the fact that a cardiac arrest is a sudden condition that may be fatal if not treated within a few minutes, an AED is a life-saving device. An AED is able to treat these arrhythmias through the application of electrical therapy that may stop the arrhythmias and allow the heart to re-establish an effective and ordinary rhythm. Specifically, the AED may be applied outside the body in order, wherein the AED automatically analyzes a patient's heart rhythm and advises a rescuer as to whether or not a electrical shock is needed to restore a normal heart beat. Accordingly, if the patient's heart resumes beating normally, the heart has been defibrillated.

Many hospitals and medical institutions utilize a two-tiered response for responding to resuscitation events, such as cardiac arrests. The initial response to the cardiac event may be performed by a user, such as first responder, having an AED. This may be followed by a second response performed by a code team member, such as an emergency medical technician ("EMT") or a paramedic, using a more sophisticated monitoring and defibrillating device designed for users trained in Advanced Life Support ("ALS"). While both the AED and the monitor/defibrillator may include a number of audio and visual instructions (i.e., voice prompt, audio cues, etc.), these instructions may vary in sound, appearance, language, etc. from device to device based on the manufacturer and models of AEDs and monitoring/defibrillator devices.
Summary Of The Invention

A method for receiving, on a first device, a selection for a device profile, the device profile including at least one operating setting relating to a second device and configuring at least one setting on the second device to emulate the at least one operating setting of the selected device profile of the second device.

A device having a processor receiving a selection of a device profile, the device profile including at least one operating setting relating to a further device and for configuring at least one setting on the device, wherein the device emulates the at least one operating setting of the selected device profile of the further device and a memory for storing a plurality of device profiles in an updatable database, each device profile related to a different further device to be emulated on the device.

A device having receiving means for receiving a selection of a device profile, the device profile including at least one operating setting relating to a further device and configuring means for configuring at least one setting of the device, wherein the device emulates the at least one operating setting of the selected device profile of the further device.

Brief Description Of The Drawings

Fig. 1 shows an exemplary system for selectably emulating a specific make and model of an AED on a monitoring/defibrillating device according to the exemplary embodiments of the present invention.

Fig. 2 shows an exemplary illustration of the profile database for storing a plurality of AED profiles according to the exemplary embodiments of the present invention.

Fig. 3 shows an exemplary illustration of the AED profile, titled "Profile 10A" describing the various characteristics specific to the AED according to the exemplary embodiments of the present invention.
FIG. 4 shows an exemplary method for selectively emulating a specific make and model of an AED on the ALS device according to the exemplar}́ embodiments of the present invention.

**Detailed Description**

The present invention may be further understood with reference to the following description of exemplary embodiments and the related appended drawings, wherein like elements are provided with the same reference numerals. The exemplary embodiments of the present invention are related to systems and methods used for selectively emulating a specific make and model of an automated external defibrillator ("AED") on a monitor/defibrillator device. Specifically, the system and methods may allow for a user (e.g., an emergency medical technician ("EMT"), a doctor, a nurse, etc.) of an Advanced Life Support ("ALS") monitor/defibrillator device to select a specific make and/or model of an AED for emulation on the more sophisticated monitor/defibrillator device.

The ALS monitor/defibrillator device may be designed as a manual device, wherein the monitoring of a patient and administering of an electrical shock may be the result of direct instructions from an attending health professional (e.g., ALS-trained user). In addition, the ALS monitor/defibrillator may be designed as a semi-automatic device, wherein the device monitors the patient and instructs the health professional when the administration of the electric shock is needed. In contrast to the more sophisticated manual and semi-automatic defibrillators used by health professionals, the AEDs are usually limited in their ability to deliver a high joule shock for VF and/or VT. In addition, unlike the sophisticated defibrillators, an AED requires very little training for use.

Fig. 1 shows an exemplary system 100 for selectively emulating a specific make and model of an AED 110 on an ALS monitoring/defibrillating device ("ALS device 150") according to the exemplary embodiments of the present invention. According to the exemplar}́ embodiments of the present invention, the AED 110 may be used to determine the presence of a pulse, diagnosis a patient's heart rhythm, and determine whether an electrical shock needs to be administered. Specifically, the AED 110 may include diagnostic components 112 (e.g., a pair of leads, pads, etc.) attachable to the patent for monitoring. Once the diagnostic components 112
are attached to the patient, the AED 110 may assess the heart rhythm of the patient. The AED 110 may then automatically administer the electrical shock when it is determined to be necessary. While monitoring the patient, the user of the AED 110 may receive instructions from the AED 110 through voice prompts, audio/visual cues, etc. Accordingly, the AED 110 may further include a display screen 114, a speaker 116, and a user interface component 118 (e.g., a keypad, a touch screen, etc.).

It should be noted that while the exemplary embodiments of the systems and method are described as an ALS device 150 emulating the behavior of the AED 110, the present invention may be applied to the emulation behavior of any device over a separate device. For example, new implementations (e.g., software version, etc.) of a device may be released, wherein the new implementation may include different behavior from the preceding implementation. These different behaviors may be viewed as an improvement over the preceding implementation, while a user of die device may prefer the change in the behavior emulation by a separate device. Accordingly, the exemplary embodiments of the present invention may allow the user to selectively switch from emulating the old implementation to emulating the new implementation by the same emulation device, thereby allowing the emulation device to behave in accordance within the different behaviors.

According to the exemplary embodiments of the present invention, the ALS device 150 may be a more sophisticated defibrillator/monitor device than that of the AED 110. Specifically, the exemplary ALS device 150 may be designed for use by health professionals, such as paramedics and code team members. For example, the ALS device 150 may allow the health professional to administer medication (e.g., adrenaline) via intravenous access, administer oxygen via endotracheal intubation. In addition, the ALS device 150 may be set to perform as an AED when the user requires this functionality, wherein the ALS device 150 may monitor a patient's heart rate and administer an electrical shock. Accordingly, the exemplary embodiments of the present invention allow for a user of the ALS device 150 to selectably emulate various AEDs. In other words, the user of the ALS device 150 may select to an "AED mode" wherein the ALS device 150 will behave in a manner identical to a specific make and/or model of an AED, such as the AED 110. Specifically, the ALS device 150 may also present information and
instructions, such as voice prompts, audio cues, graphical displays, etc., in the same way as the selected AED 110. Accordingly, a user familiar with the AED 110 may now be equally comfortable with an AED mode on the ALS device 150, regardless of any default settings on the ALS device 150.

As shown in Fig. 1, the exemplary ALS device 150 may include a processor 160 and a memory 165. Similar to the AED 110, the ALS device may also include diagnostic components 152, a display screen 154, a speaker 156, and a user input component (e.g., a keypad 158). The processor 160 may regulate the operation of the ALS device 150 by facilitating communications between the various components such as the memory 165, the display screen 154, the speaker 156, etc. For example, the processor 160 may include a microprocessor, an embedded controller, a further application-specific integrated circuit, a programmable logic array, etc. The processor 160 may perform data processing, execute instructions and direct a flow of data between devices coupled to the processor 160. As will be explained below, the exemplary processor 160 may receive instructions from a user to emulate a particular AED 110 selected by the user. The choice of the AED 110 for the ALS device 150 to emulate may be set to a default AED, typically the AED 110 that is most often used by within a particular institution (e.g., hospital). Therefore, the selection may be made during a configuration mode where a user preference is established as the default setting. Thus, when an AED mode is selected for use on the ALS device 150, the processor 160 may refer to the default settings to determine the user preference and may set the ALS device 150 to mimic the behavior of the AED 110. Alternatively, the configuration may be selected by the user on a per-usage basis. In other words, the user may select an AED 110 for emulation from a menu on the display screen 154 of the ALS device 150 at the time of use.

Furthermore, as will be described in greater detail, the memory 165 of the ALS device 150 may include a profile database 170 for storing or selectively loading a plurality of AED profiles. According to the exemplary embodiments of the present invention, each of the AED profiles within the profile database 170 may describe a particular make and/or model of an AED, such as the AED 110. Furthermore, each of the AED profiles may include behavioral information relating to the behavior of the AED 110 in which the profile describes. For example, an AED profile may include a description of the language used by the AED 110, the instructions,
controls, and voice prompts used by the AED 110, the audio cues and graphical displays used by the AED, etc. Thus, when the user selects a specific AED, such as the AED 110, for the ALS device 150 to emulate, the processor 160 may retrieve a corresponding AEd profile from the memory 165 and transmit the behavioral information to the various components, such as the display screen 154, the speaker 156, etc. Thus, the visual and audio outputs of the ALS device 150 may mimic the visual and audio outputs of the selected AED 110.

Fig. 2 shows an exemplary illustration of the profile database 170 for storing a plurality of AED profiles 171-175 according to the exemplary embodiments of the present invention. Thus, the exemplary profile database 170 may include behavior information of multiple AED models from various manufacturers incorporated into a single device, such as the ALS device 150. For example, the AED profile 171 may relate to a specific manufacturer and model of an AED, such as a manufacturer 10 and model A. Accordingly, the AED profile 171 may be titled "Profile 1OA". The AED profiles 172 and 173 may relate to the same manufacturer as AED profile 171, but different models of AEDs, namely models B and C, respectively. Accordingly, the AED profile 172 may be titled "Profile 1OB" and the AED profile 173 may be titles as "Profile 1OC". The AED profiles 174 and 175 may relate to a different manufacturer, namely manufacturer 20, and models D and E, respectively. Accordingly, the AED profile 173 may be titles "Profile 2OD" and the AED profile 175 may be titled "Profile 2OE".

According to an exemplary embodiment of the present invention, the ALS device 150 may be limited to emulating the AED behaviors matching device models from a single manufacturer. In addition, or alternatively, the ALS device 150 may emulate the AED behavior matching device models from a group of manufacturers, depending on various licensing and/or contractual agreements. However, regardless of any licensing agreements, it should be noted that the exemplary ALS device 150 may be capable of emulating the behavior of any AED device produced by any manufacturer.

Furthermore, according to the exemplary embodiment of the present invention, the profile database 170 may be continuously updated with new AED profiles and/or obsolete AED profiles may be removed or deleted from the memory 165. For example, a hospital may
discontinue use of the AED 110 and implement the use of a new make and model AED. Accordingly, the AED profile for AED 110 may be removed from the profile database 170 of the memory, while the AED profile for the new AED may be added to the profile database 170.

Fig. 3 shows an exemplar illustration of the AED profile 171, titled "Profile 10A", describing the various characteristics specific to the AED 110 according to the exemplary embodiments of the present invention. Specifically, the AED profiles 171 may include a profile header, wherein the profile header may include the manufacturer of the AED 110 and the product name, product model and/or serial number of the AED 110 (e.g., a make and model of AED). According to the exemplary AED 110, the header may include the title "Profile 10a". In addition, the AED profile 171 may further include profile content, wherein the profile content may include information, such as a list of AED characteristics and various AED data files (e.g., digitized graphical and audio files), display text, selectable languages files, instructions, controls, etc.

It is noted that the profile 171 of Fig. 3 shows some exemplary characteristics of the AED 110. However, there may be any other number and type of characteristics of the AED 110 that may be included in the profile 171 for use in the modeling of the AED 110. That is, the characteristics shown in profile 171 of Fig. 3 may be considered as related to the external traits of the AED 110. Other characteristics may be related to the operational behavior of the AED 110, such as when a particular GUI screen is shown to a user when the GUI progresses from a displayed screen to another screen, the controls available on the particular AED, the response of the AED to the operation of the controls, the configuration choices available to the AED model, etc. Thus, the characteristics that may be used for modeling purposes are not limited to external characteristics, but may be any type of characteristic of the AED that may be suitable for modeling the AED so that the ALS device may more closely model the operation of the AED.

Fig. 4 represents an exemplary method 200 for selectably emulating a specific make and model of an AED (e.g., the AED 110) on the ALS device 150 according to the exemplary embodiments of the present invention. The exemplary method 200 will be described with reference to the exemplary system 100 of Fig. 1, including the profiles illustrated in Fig. 2 and 3.
As described above, the exemplary ALS device 150 may be a monitoring and defibrillating device within an institution such as a hospital. According to the exemplary embodiments, the ALS device 150 may include multiple operating modes, such as a configuration mode and an AED mode. Due to the fact that the institution may have several AEDs installed throughout the facility, the exemplary method 200 may allow the AED mode of the ALS device 150 to match the behavior of one or more of the installed AEDs. Specifically, the exemplary method 200 may save on training efforts for device users, as well as ensure that resuscitation efforts may not suffer due to a user of the ALS device 150 being unfamiliar with the different operations between various AEDs.

In step 210, the ALS device 150 may receive and store AED profile data on the profile database 170. Specifically, the user may input a number of AED profiles, such as AED profiles 171-175, onto the profile database 170 of the memory 165 of the ALS device 150. Alternatively, the AED profiles 171-175 may be automatically loaded onto the memory 165. For example, the memory 165 may be a removable memory, wherein any changes to the profile database 170 (e.g., profile additions, removals, alterations, etc.) may be performed through removing the memory 165 and replacing it with an updated memory. In another example, the ALS device 150 may include a network connection, wherein the profile database 170 on the memory 165 may be updated via a downloadable firmware update. Accordingly, the profile database 170 of the memory 165 may be routinely updated, adjusting AED behavioral settings of the ALS device 150 in order to account for changes in the AED emulation. These changes may include changes to the make and/or model of the AED 110 installed in the institution, or version changes to hardware/software of the existing AED 110. In addition, it should be noted that the manufacturer of the AED may provide the profile as part of an AED purchased package.

In step 220, the ALS device 150 may operate in a configuration mode. During the configuration mode, a user of the ALS device 150 may manage various AED profiles 171-175 within the memory 165 and may select one or more AED profiles 171-175 for the ALS device 150 to emulate. As described above, the selection the AED(s) that the ALS device 150 will emulate may typically be the AED(s) that is/are found within that particular institution. Thus, during the configuration mode, user preferences for the ALS device 150 may be set, wherein the
user preferences may direct the ALS device 150 to emulate specific behaviors of the AED(s). For example, the configuration mode may set the user preferences prior to implementing the ALS device 150 into the institution (e.g., prior to being available for regular use). In addition, or in the alternative, the configuration mode may set the user preference prior to each use of the ALS device 150 (e.g., in between regular uses of the ALS device 150).

In step 230, a determination may be made as to whether further user input is needed in order to select the AED 110 for emulation by the ALS device 150. As described above, the selection of the AED 110 may be performed either prior to regular use of the ALS device 150 or at the time of each use. Thus, in the event that the AED 110 is selected at the time of use, the determination in step 230 may allow a user to select an appropriate AED profile, such as one of the AED profiles 171-175. Accordingly, the method 200 may advance to step 240 for AED selection. However, in the event that the AED 110 is selected during the configuration mode in step 220, the method 200 may advance to step 260.

In step 240, the ALS device 150 may prompt a user to select an AED for emulation. Specifically, the ALS device 150 may display a list, or menu, of stored AED profiles 171-175 on the display screen 114. Accordingly, each of the AED profiles 171-175 stored in the profile database 170 may be displayed for user selection. The displayed list/menu may include the profile titles (e.g., Profiles 1OA, 1OB, 2OC, etc.), in addition to further descriptive data, such as a make/model name, a serial number, a product code, etc. Furthermore, in step 250, the ALS device 150 may receive a user selection via a user interface 158 (e.g., keypad, touch screen, etc.).

In step 260, the ALS device 150 may operate in an AED mode, wherein the ALS device emulates the selected AED 110. Specifically, the processor 160 may adjust the various settings and behavior of the ALS device 150 for emulating the selected AED 110. In other words, the processor 160 of the ALS device 150 may refer to one of the AED profiles 171-175 in order to emulate the behavior of a corresponding AED. As described above, these settings may include the language of the instructions (both audio and video instruction), audio cues, graphical displays, etc. Accordingly, the ALS device 150 within an institution, such as a hospital, may be able to match the behavior of any number of AED devices deployed through the institution.
Furthermore, any changes to the operation of one of these AED devices may result in replacing or updating the corresponding AED profile within the profile database 170. Thus, the ALS device 150 may remain up-to-date on the settings for each selectable AED profile.

As noted above, the exemplar embodiments of the present invention may apply to any device wherein new or updated implementations of the device are released. While these new implementation exhibit different behaviors and settings as the preceding implementations, a user of the device may wish to have the option to use the new implementation, the old implementations, or simply another device altogether. As described above, this may be particularly evident in devices such as a defibrillator for ALS-trained users within a particular institution. Accordingly, these devices may contain an operating mode that completely embodies the behavior of another device, such as the AED 110, within the same institution. Thus, an AED mode of the defibrillator may match the settings and behavior of the AED 110.

It will be apparent to those skilled in the art that various modifications may be made in the present invention, without departing from the spirit or the scope of the invention. Thus, it is intended that the present invention cover modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.
What is claimed is:

1. A method, comprising:
   receiving, on a first device, a selection for a device profile, the device profile including at least one operating setting relating to a second device; and
   configuring at least one setting on the second device to emulate the at least one operating setting of the selected device profile of the second device.

2. The method according to claim 1, further comprising:
   storing a plurality of device profiles in an updatable database on the first device, each device profile related to a different device to be emulated by the first device.

3. The method according to claim 1, wherein the second device is an automatic external defibrillator.

4. The method according to claim 1, wherein the first device is a monitor/defibrillator including diagnostic components for advanced life support.

5. The method according to claim 1, wherein the at least one operating setting includes at least one of a graphical display, an audio cue, a voice prompt, a language selection, an instruction, digital text and an operational behavior.

6. The method according to claim 1, wherein the device profile includes at least one of a manufacturer of the second device, a model name of the second device, a serial number of the second device, and a description of the second device.

7. The method according to claim 1, wherein the selection is received by the first device during one of a configuration mode and an operating mode.
8. A device, comprising:
   a processor receiving a selection of a device profile, the device profile including at least one operating setting relating to a further device and for configuring at least one setting on the device, wherein the device emulates the at least one operating setting of the selected device profile of the further device; and
   a memory for storing a plurality of device profiles in an updatable database. Each device profile related to a different further device is emulated on the device.

9. The device according to claim 8, wherein the further device is an automatic external defibrillator.

10. The device according to claim 8, wherein the device is a monitor/defibrillator including diagnostic components for advanced life support.

11. The device according to claim 8, wherein the at least one operating settings includes at least one of a graphical display, an audio cue, a voice prompt, a language selection, an instruction, digital text and an operational behavior.

12. The device according to claim 8, wherein the device profile includes at least one of a manufacturer of the further device, a model name of the further device, a serial number of the further device, and a description of the further device.

13. The device according to claim 8, wherein the device receives the selection of the device profile during one of a configuration mode and an operating mode.

14. A device, comprising:
   receiving means for receiving a selection of a device profile, the device profile including at least one operating setting relating to a further device; and
   configuring means for configuring at least one setting of the device, wherein the device emulates the at least one operating setting of the selected device profile of the further device.
15. The device according to claim 14, further comprising:

   storage means for storing a plurality of device profiles, the storage means being updatable, each device profile related to a different further device to be emulated on the second device,

   wherein the further device is a defibrillator.
Fig. 4

Method 200

START

The ALS device receives and stores the AED profile in the profile database

The ALS device operates in a configuration mode

Is further user input needed?

YES

The ALS device prompts the user for AED profile selection

NO

The ALS device receives the user selection

The ALS device operates in an AED mode, thereby emulating an AED corresponding to the AED profile selection

END