Lock-out mechanisms for driver handheld computing devices. The lock-out mechanisms disable the ability of a handheld computing device to perform certain functions, such as texting, while one is driving. In one embodiment, a handheld computing device can provide a lock-out mechanism without requiring any modifications or additions to a vehicle by using a motion analyzer, a scenery analyzer and a lock-out mechanism. In other embodiments, the handheld computing device can provide a lock-out mechanism with modifications or additions to the vehicle, including the use of signals transmitted by the vehicle or by the vehicle key when engaged with the vehicle.

15 Claims, 8 Drawing Sheets
References Cited

U.S. PATENT DOCUMENTS


OTHER PUBLICATIONS


* cited by examiner
FIG. 2

HANDHELD COMPUTING DEVICE
200

DEVICE MOTION EXCEED
THRESHOLD?
210

YES

DISABLE DEVICE FUNCTION(S)
220

SCENERY ANALYZER
LOCATE DEVICE
HOLDER WITHIN
SAFE OPERATING
AREA?
230

YES

ENABLE DEVICE FUNCTION(S)
240

NO
FIG. 3

VEHICLE
100

HANDHELD COMPUTING DEVICE
200

PROVIDE SIGNAL TO
SAFE OPERATING AREA
300

ENABLE
DEVICE FUNCTION(S)
BASED ON SIGNAL
310
FIG. 4
FIG. 5

KEY
500

HANDHELD COMPUTING DEVICE
200

PROVIDE SIGNAL WHEN ENGAGED WITH VEHICLE
510

DISABLE DEVICE FUNCTION(S) BASED ON SIGNAL
520
FIG. 7
FIG. 8A

FIG. 8B
DRIVER HANDHELD COMPUTING DEVICE LOCK-OUT

FIELD OF THE INVENTION

This relates generally to safe operation of handheld computing devices, and more particularly, to providing a lock-out mechanism to prevent operation of one or more functions of handheld computing devices by drivers when operating vehicles.

BACKGROUND OF THE INVENTION

Texting while driving has become a major concern of parents, law enforcement, and the general public. An April 2006 study found that 80 percent of auto accidents are caused by distractions such as applying makeup, eating, and text messaging on handheld computing devices (texting). According to the Liberty Mutual Research Institute for Safety and Students Against Destructive Decisions, teens report that texting is their number one distraction while driving. Teens understand that texting while driving is dangerous, but this is often not enough motivation to end the practice.

New laws are being written to make texting illegal while driving. However, law enforcement officials report that their ability to catch offenders is limited because the texting device can be used out of sight (e.g., on the driver’s lap), thus making texting while driving even more dangerous. Texting while driving has become so widespread it is doubtful that law enforcement will have any significant effect on stopping the practice.

SUMMARY OF THE INVENTION

Lock-out mechanisms for driver handheld computing devices are disclosed. The lock-out mechanisms disable the ability of a handheld computing device to perform certain functions, such as texting, while one is driving.

In one embodiment, a handheld computing device can provide a lock-out mechanism without requiring any modifications or additions to a vehicle. In this embodiment, the handheld computing device can comprise a motion analyzer, a scenery analyzer and a lock-out mechanism. The motion analyzer can detect whether the handheld computing device is in motion beyond a predetermined threshold level. The scenery analyzer can determine whether a holder of handheld computing device is located within a safe operating area of a vehicle. And the lock-out mechanism can disable one or more functions of the handheld computing device based on output of the motion analyzer, and enable the one or more functions based on output of the scenery analyzer.

In other embodiments, the handheld computing device can provide a lock-out mechanism with modifications or additions to the vehicle. In one embodiment, a vehicle and a handheld computing device can provide a lock-out mechanism in which the vehicle, through transmission of a signal, can cause disabled functionality of the handheld computing device to be enabled. In another embodiment, a vehicle can unilaterally provide a lock-out mechanism by transmitting blocking signals to an unsafe operating area of the vehicle. In a further embodiment, a vehicle key and a handheld computing device can provide a lock-out mechanism in which the key transmits a signal when engaged with the vehicle. In yet another embodiment, a vehicle and a handheld computing device can provide a lock-out mechanism in which the vehicle transmits a signal notifying the handheld computing device to disable functionality.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exemplary vehicle with unsafe and safe operating areas according to one embodiment of the invention.

FIG. 2 illustrates an exemplary process in which a handheld computing device can provide a lock-out mechanism according to one embodiment of the invention.

FIG. 3 illustrates an exemplary process in which a vehicle and a handheld computing device can provide a lock-out mechanism according to one embodiment of the invention.

FIG. 4 illustrates an exemplary process in which a vehicle can provide a lock-out mechanism according to one embodiment of the invention.

FIG. 5 illustrates an exemplary process in which a vehicle key and a handheld computing device can provide a lock-out mechanism according to one embodiment of the invention.

FIG. 6 illustrates an exemplary process in which a vehicle and a handheld computing device can provide a lock-out mechanism according to one embodiment of the invention.

FIG. 7 illustrates an exemplary handheld computing device according to embodiments of the invention.

FIG. 8A illustrates an exemplary personal digital assistant (PDA) providing a lock-out mechanism according to an embodiment of the invention.

FIG. 8B illustrates an exemplary mobile telephone providing a lock-out mechanism according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description of preferred embodiments, reference is made to the accompanying drawings where it is shown by way of illustration specific embodiments in which the invention can be practiced. It is to be understood that other embodiments can be used and structural changes can be made without departing from the scope of the embodiments of this invention.

Embodiments of the invention relate to disabling the ability of a handheld computing device to perform certain functions, such as texting, while one is driving. An opportunity exists for handheld computing device makers to put into place a lock-out mechanism to disable the input and, possibly, the reception of text messages while the user is driving. The achievement of such a mechanism may be a significant selling point in the eyes of concerned parents, and it could lead to legislation that would require all handheld computing devices to disable texting while driving.

Although some embodiments of this invention may be described and illustrated herein in terms of a lock-out mechanism to disable text messaging, it should be understood that embodiments of this invention are not so limited, but are generally applicable to disabling any function of a handheld computing device that may interfere with the safe operation of a vehicle by a driver, such as receiving or placing cellular telephone calls without a hands-free device, for example.

Further, although some embodiments of this invention may be described and illustrated herein in the context of an automobile, it should be understood that embodiments of this invention are not so limited, but are generally applicable to any vehicle, such as trains or airplanes, for example.

FIG. 1 illustrates vehicle 100 with unsafe operating area 110 and safe operating area 120. In the embodiment illus-
treated in FIG. 1, vehicle 100 depicts an automobile, the four horizontal lines depict the backs of seats in vehicle 100, and the oval depicts a steering wheel. Unsafe operating area 110 depicts the driver compartment area comprising interior vehicle space devoted to the driver of vehicle 100. In this embodiment, the driver compartment area is considered unsafe for operating one or more functions of a handheld computing device during operation of vehicle 100. Safe operating area 120 depicts the passenger compartment area comprising interior vehicle space devoted to passengers of vehicle 100. In this embodiment, the passenger compartment area is considered safe for operating one or more functions of a handheld computing device during operation of vehicle 100. Embodiments of the invention are directed to disabling one or more functions of a handheld computing device held by a user while the user is operating vehicle 100 (e.g., driving the automobile), but enabling the functions of a handheld computing device held by a user riding along in vehicle 100 as a passenger.

It should be noted that the designation of a vehicle area as unsafe or safe for the purpose of operating one or more functions of a handheld computing device may differ according to vehicle type and safety considerations, and is not limited to the designations described and illustrated herein.

FIG. 2 illustrates a process in which handheld computing device 200 can provide a lock-out mechanism without requiring any modifications or additions to vehicle 100. In particular, in the embodiment illustrated in FIG. 2, handheld computing device 200 can comprise a motion analyzer, a Scenery analyzer and a lock-out mechanism. The motion analyzer can be configured to detect whether handheld computing device 200 is in motion beyond a predetermined threshold level (block 210). The Scenery analyzer can be configured to determine whether a holder of handheld computing device 200 is located within safe operating area 120 of vehicle 100 (block 230). The lock-out mechanism can be configured to disable (block 220) one or more functions of handheld computing device 200 based on output of the motion analyzer and enable (block 240) the one or more functions of handheld computing device 200 based on output of the Scenery analyzer.

For example, the lock-out mechanism can be configured to disable the one or more functions of handheld computing device 200 when the output of the motion analyzer indicates that handheld computing device 200 is in motion beyond a predetermined threshold level (e.g., speed). This can prevent handheld computing device 200 from being disabled when the user of the device is walking with the device rather than driving with it. And the lock-out mechanism can be configured to enable the one or more functions of handheld computing device 200 after output of the Scenery analyzer indicates that the holder of handheld computing device 200 is within safe operating area 120 of vehicle 100. This can enable passengers in moving vehicles to operate handheld computing device 200 without one or more of its functions being disabled.

In one embodiment, the lock-out mechanism can be configured to enable the one or more functions of handheld computing device 200 for a predetermined period of time. In another embodiment, the lock-out mechanism can be configured to enable the one or more functions of handheld computing device 200 for a predetermined number of operations associated with the one or more functions of handheld computing device 200 (e.g., the sending or receiving of a predetermined number or text messages).

The motion analyzer can utilize any suitable mechanism to detect whether handheld computing device 200 is in motion, such as GPS data and/or cellular telephone signals (e.g., based on changing base station signals and/or signal strength). If handheld computing device 200 has an accelerometer, accelerometer motion based on output of the accelerometer can be used to detect whether handheld computing device 200 is in motion. If handheld computing device 200 has a light sensor, changing light conditions based on output of the light sensor can be used to detect whether handheld computing device 200 is in motion.

The Scenery analyzer can be configured to determine whether a holder of handheld computing device 200 is located within safe operating area 120 of vehicle 100 based on picture data or video data if handheld computing device 200 has a camera. For example, the holder of the device can be required to pan the camera around the vehicle (e.g., 360 degrees), so that the camera can take either a series of pictures or a video. The picture/video data can be digitally analyzed by scenery analysis programming in handheld computing device 200 to determine if the holder of the device is deemed to be in safe operating area 120.

The scenery analysis programming can be based on any suitable algorithm. In one embodiment, for example, the algorithm may specify that if the picture/video data shows only one face and a vehicle operating mechanism (e.g., a steering wheel in an embodiment in which the vehicle is an automobile) in separate images, then it may be determined that the holder of the device is in a driver compartment area of the vehicle (e.g., such as the driver seat within unsafe operating area 110 of vehicle 100). The algorithm may also specify that if the picture/video data shows more than one face and a vehicle operating mechanism, with one of the faces and the vehicle operating mechanism in one image or video frame, then it may be determined that the holder of the device is not in the driver compartment area of the vehicle, but rather in a passenger compartment area of the vehicle (e.g., such as the front passenger seat within safe operating area 120 of vehicle 100). Further, the algorithm may specify that if the picture/video data does not show a vehicle operating mechanism, then it may be determined that the holder of the device is in a passenger compartment area of the vehicle (e.g., such as in the back seat within safe operating area 120 of vehicle 100, or in a passenger compartment area in some other form of transportation, such as a train). In order to prevent the holder of handheld computing device 200 from tilting the camera in different ways during a panning operation (e.g., to avoid capturing an image of the vehicle operating mechanism if the holder is in a driver compartment area of the vehicle), the scenery analysis programming can use accelerometer output to ensure that level and proper panning is implemented.

FIGS. 3-6 illustrate processes in which handheld computing device 200 can provide a lock-out mechanism with modifications or additions to vehicle 100. FIG. 3, for example, illustrates a process in which vehicle 100 and handheld computing device 200 can provide a lock-out mechanism in which vehicle 100 can cause disabled functionality of handheld computing device 200 (e.g., due to motion of handheld computing device 200) to be enabled. In this process, vehicle 100 can include a transmitter configured to provide signal to safe operating area 120 (block 300). Handheld computing device 200 can be configured to enable one or more of its functions (e.g., a text messaging function) based on the signal (block 310). The transmitter can be located in any suitable location in vehicle 100 as long as the transmission signal only reaches safe operating area 120 and not unsafe operating area 110. In this embodiment, the transmission signal may be used instead of scenery analysis to verify that the holder of handheld computing device 200 is in safe operating area 120 when in motion beyond a predetermined threshold level.
moving an object such as a cursor or pointer, scrolling or panning, adjusting control settings, opening a file or document, viewing a menu, making a selection, executing instructions, operating a peripheral device coupled to the host device, answering a telephone call, placing a telephone call, terminating a telephone call, receiving a text message, sending a text message, changing the volume or audio settings, storing information related to telephone communications such as addresses, frequently dialed numbers, received calls, missed calls, logging onto a computer or a computer network, permitting authorized individuals access to restricted areas of the computer or computer network, loading a user profile associated with a user’s preferred arrangement of the computer desktop, permitting access to web content, launching a particular program, encrypting or decoding a message, and/or the like. CPU 740 can also perform additional functions that may not be related to input device processing, and can be coupled to memory/storage 750 and display 720, which may include a liquid crystal display (LCD) for example, for providing a user interface (UI) to a user of the device.

Note that one or more of the functions described above can be performed by firmware stored in a memory (not shown) associated with I/O processor 730 and executed by I/O processor 730, or stored in memory/storage 750 and executed by CPU 740. The firmware can also be stored and/or transported within any computer-readable storage medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a “computer-readable storage medium” can be any medium that can contain or store a program for use by or in connection with the instruction execution system, apparatus, or device. The computer readable storage medium can include, but is not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus or device, a portable computer diskette (magnetic), a random access memory (RAM) (magnetic), a read-only memory (ROM) (magnetic), anerasable programmable read-only memory (EPROM) (magnetic), a portable optical disc such as a CD, CD-R, CD-RW, DVD, DVD-R, or DVD-RW, or flash memory such as compact flash cards, secure digital cards, USB memory devices, memory sticks, and the like.

The firmware can also be propagated within any transport medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In the context of this document, a “transport medium” can be any medium that can communicate, propagate or transport the program for use by or in connection with the instruction execution system, apparatus, or device. The transport readable medium can include, but is not limited to, an electronic, magnetic, optical, electromagnetic or infrared wired or wireless propagation medium.

Handheld computing device 200 can be any of a variety of types such as those illustrated in FIGS. 8A-8I, for example. FIG. 8A illustrates exemplary PDA 800 that can provide a lock-out mechanism according to an embodiment of the invention. FIG. 8D illustrates exemplary mobile telephone 810 that can provide a lock-out mechanism according to an embodiment of the invention. Additionally, handheld computing device 200 may be a combination of these types. For example, in one embodiment handheld computing device 200 may be a device that is a combination of PDA 800 and mobile
telephone 810. The PDA and mobile telephone of FIGS. 8A-8B can prevent the dangerous practice of operating a handheld computing device in certain ways while driving by providing a lock-out mechanism according to embodiments of the invention. Although embodiments of this invention have been fully described with reference to the accompanying drawings, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of embodiments of this invention as defined by the appended claims.

What is claimed is:

1. A handheld computing device comprising:
a motion analyzer configured to detect whether the handheld computing device is in motion beyond a predetermined threshold level;
a scene analyzer configured to determine whether the handheld computing device is located within a safe operating area of a vehicle based on at least one of picture data and video data; and
a lock-out mechanism configured to automatically and selectively disable one or more functions of the handheld computing device based on outputs from the motion analyzer and the scene analyzer.

2. The handheld computing device of claim 1, wherein the lock-out mechanism is configured to disable the one or more functions of the handheld computing device when the output of the motion analyzer indicates that the handheld computing device is in motion beyond the predetermined threshold level.

3. The handheld computing device of claim 2, wherein the lock-out mechanism is configured to enable the one or more functions of the handheld computing device after output of the scene analyzer indicates that the holder of the handheld computing device is located within the safe operating area of the vehicle.

4. The handheld computing device of claim 3, wherein the lock-out mechanism is configured to enable the one or more functions of the handheld computing device for a predetermined period of time.

5. The handheld computing device of claim 3, wherein the lock-out mechanism is configured to enable the one or more functions of the handheld computing device for a predetermined number of operations associated with the one or more functions of the handheld computing device.

6. The handheld computing device of claim 1, wherein the motion analyzer is configured to detect whether the handheld computing device is in motion based on GPS data.

7. The handheld computing device of claim 1, wherein the motion analyzer is configured to detect whether the handheld computing device is in motion based on cellular telephone signals.

8. The handheld computing device of claim 1, wherein the handheld computing device further comprises an accelerometer, and the motion analyzer is configured to detect whether the handheld computing device is in motion based on output of the accelerometer.

9. The handheld computing device of claim 1, wherein the handheld computing device further comprises a light sensor, and the motion analyzer is configured to detect whether the handheld computing device is in motion based on output of the light sensor.

10. The handheld computing device of claim 1, wherein the one or more functions of the handheld computing device includes a text messaging function.

11. A method comprising:
detecting using a handheld computing device whether the handheld computing device is in motion beyond a predetermined threshold level;
determining using the handheld computing device whether the handheld computing device is located within a safe operating area of a vehicle based on at least one of picture data and video data; and
automatically and selectively disabling using the handheld computing device one or more functions of the handheld computing device when both the handheld computing device is detected to be in motion beyond the predetermined threshold level and the handheld computing device is determined not to be located within the safe operating area of the vehicle.

12. The method of claim 11, wherein the one or more functions are configured to be enabled for a predetermined period of time.

13. The method of claim 11, wherein the one or more functions are configured to be enabled for a predetermined number of operations associated with the one or more functions of the handheld computing device.

14. The method of claim 11, wherein the one or more functions of the handheld computing device includes a text messaging function.

15. A mobile telephone comprising:
a motion analyzer configured to detect whether the mobile telephone is in motion beyond a predetermined threshold level;
a scene analyzer configured to determine whether the mobile telephone is located within a safe operating area of a vehicle based on at least one of picture data and video data; and
a lock-out mechanism configured to automatically and selectively disable one or more functions of the mobile telephone based on outputs from the motion analyzer and the scene analyzer.

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