United States Patent Application Publication	20250263088
Kind Code	A1
Publication Date	August 21, 2025
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MOBILE TERMINAL, CONTROL METHOD THEREOF, SYSTEM, AND STORAGE MEDIUM

Abstract

A non-transitory computer-readable storage medium comprising a program executed on a mobile terminal used for safe driving support related to driving of a vehicle and is associated with an individual driver. The mobile terminal acquires acceleration detected by a sensor of the mobile terminal disposed in a vehicle or a sensor provided in the vehicle as acceleration of the vehicle while driving, determines a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle. The mobile terminal causes a display to show a display according to the determined rank.

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Family ID: **1000008480102**

Appl. No.: **19/049320**

Filed: **February 10, 2025**

Foreign Application Priority Data

JP	2024-024765	Feb. 21, 2024

Publication Classification

Int. Cl.: **B60W50/14** (20200101); **B60K35/28** (20240101); **B60K35/81** (20240101); **B60W40/09** (20120101); **H04W4/02** (20180101); **H04W4/029** (20180101)

U.S. Cl.:

CPC **B60W50/14** (20130101); **B60K35/28** (20240101); **B60K35/81** (20240101); **B60W40/09** (20130101); **H04W4/027** (20130101); **H04W4/029** (20180201); B60K2360/1876

(20240101); B60K2360/188 (20240101); B60K2360/566 (20240101); B60K2360/589 (20240101); B60W2050/146 (20130101); B60W2520/105 (20130101); B60W2530/18 (20130101); B60W2556/10 (20200201); B60W2556/50 (20200201)

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application claims priority to and the benefit of Japanese Patent Application No. 2024-024765, filed Feb. 21, 2024, the entire disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a mobile terminal, a control method thereof, a system, and a storage medium.

Description of the Related Art

[0003] Conventionally, a safe driving evaluation system that improves the driver's consciousness of refraining from a sudden braking operation has been known (Japanese Patent No. 5057167). A safe driving evaluation system according to Japanese Patent No. 5057167 discloses a technique for counting the number of times of braking operations by a driver of a vehicle, and evaluating the driver's driving in accordance with the ratio of sudden braking in his or her braking operations and validity of the sudden braking.

[0004] In the technique described in Japanese Patent No. 5057167, a navigation system incorporated in the vehicle acquires information on the brake operations, and evaluates the driving on the basis of the braking operations. In order to evaluate the driving of individual drivers using the navigation system incorporated in the vehicle, the navigation system needs to identify who is driving. That is, the navigation system needs to perform processing of identifying the driver, such as requesting the driver to log in, every time the driver gets into the vehicle. It may be troublesome for the driver to perform an operation or an action for identifying the driver each time that he or she gets into the vehicle, and therefore driving may be performed without identifying the individual driver.

SUMMARY OF THE INVENTION

[0005] The present invention has been made in view of the above problem, and provides a technique that enables easy evaluation of driving of a vehicle by a driver.

[0006] In order to solve the aforementioned issues, one aspect of the present disclosure provides a non-transitory computer-readable storage medium comprising a program executed on a mobile terminal, wherein: the program is a program for safe driving support related to driving of a vehicle; the mobile terminal is associated with an individual driver; and the mobile terminal comprises: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal disposed in a vehicle or a sensor provided in the vehicle as acceleration of the vehicle while driving, a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and a display control unit configured to cause a display to show a display according to the determined rank.

[0007] Another aspect of the present disclosure provides a mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the mobile terminal comprising: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal

disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and a display control unit configured to cause a display to show a display according to the determined rank.
[0008] Still another aspect of the present disclosure provides a control method of a mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the method comprising: acquiring acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; determining a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and causing a display to show a display according to the determined rank.
[0009] Yet another aspect of the present disclosure provides a system used for safe driving support related to driving of a vehicle, the system comprising a mobile terminal and a server, wherein: the mobile terminal is associated with an individual driver; the server comprises: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the server to function as: an acquisition unit configured to acquire, from the mobile terminal, acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle, a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and a transmission unit configured to transmit information for display according to the determined rank to the mobile terminal; and the mobile terminal causes a display to display the information for display received from the server.
[0010] According to the present invention, it is possible to implement a technique that enables easy evaluation of driving of a vehicle by a driver.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0011] FIG. **1** is a block diagram illustrating a functional configuration example of a mobile terminal according to the present embodiment of the present invention;
[0012] FIG. **2** is a diagram illustrating a display example of driving evaluation using the mobile terminal according to the present embodiment;
[0013] FIG. **3** is a diagram for describing another display example of a driving evaluation result according to the present embodiment;
[0014] FIG. **4** is a flowchart illustrating a series of operations of driving evaluation processing according to the present embodiment;
[0015] FIG. **5** is a flowchart illustrating a series of operations of relief processing according to the present embodiment;
[0016] FIG. **6** is a diagram illustrating an effect of a display example of driving evaluation according to the present embodiment;
[0017] FIG. **7** is a diagram for describing another display example of driving evaluation using the mobile terminal according to the present embodiment; and
[0018] FIG. **8** is a diagram for describing another display example of the driving evaluation result according to the present embodiment.
DESCRIPTION OF THE EMBODIMENTS
[0019] Hereinafter, embodiments will be described in detail with reference to the attached drawings. Note, the following embodiments are not intended to limit the scope of the claimed invention, and limitation is not made to an invention that requires a combination of all features described in the embodiments. Two or more of the multiple features described in the embodiments

may be combined as appropriate. Furthermore, the same reference numerals are given to the same or similar configurations, and redundant description thereof is omitted.

Configuration of Mobile Terminal

[0020] Next, a configuration example of a mobile terminal **100** will be described with reference to FIG. **1**. The configuration example illustrated in FIG. **1** illustrates a configuration example of a smartphone as an example of the mobile terminal **100** of the present embodiment. Note that the functional blocks to be described may be integrated or separated from each other, and a function to be described may be implemented by another block. In addition, a functional block described as hardware may be implemented by software, and vice versa.

[0021] In the mobile terminal **100** according to the present embodiment, for example, an application (also referred to as safe driving support application) provided for safe driving support is installed. The mobile terminal **100** is associated with an individual driver in advance by an operation such as the driver logging in to the mobile terminal **100**. Therefore, the safe driving support application can identify an individual driver. Note that the safe driving support application may accept the login of a driver and associate the mobile terminal **100** with the individual driver. In the present embodiment, since the driving of the driver is evaluated using the mobile terminal **100** associated in advance with the driver, the driver does not need to perform an operation or an action for identification such as logging into a navigation system or the like in the vehicle each time the driver gets in the vehicle. The mobile terminal **100** is disposed at a position in the vehicle where the driver can visually recognize the screen. When the mobile terminal **100** is disposed in the vehicle while driving in a state where the safe driving support application is operated, the safe driving support application provides the driver with various types of information for safe driving support.

[0022] A communication unit **101** is, for example, a communication device including a communication circuit and the like, and transmits and receives data to and from an external server or another mobile terminal via mobile communication such as LTE. The communication unit **101** may acquire various types of data indicating the state of the vehicle, such as acceleration, speed, steering angle, and position information, measured by the vehicle from the vehicle via a predetermined interface. Furthermore, the communication unit **101** may transmit information generated for display by the mobile terminal **100** described later for display on the vehicle side. In this case, the communication unit **101** may acquire, from the vehicle, operation information for the information displayed on the vehicle. The predetermined interface includes, for example, a short-range wireless communication interface such as Wi-Fi or Bluetooth (registered trademark) and a wired communication interface such as USB. Of course, the present invention is not limited to these examples, and the communication unit **101** can transmit or receive various types of information necessary for driving evaluation processing to be described later to and from the vehicle.

[0023] An operation unit **103** includes buttons and a touch panel included in the mobile terminal **100**. The touch panel can receive operations on GUIs for various operations displayed on the display unit **105**. A sensor unit **104** includes an acceleration sensor and a gyro sensor that measure acceleration and rotation of the mobile terminal **100** in addition to a GPS for identifying the current position.

[0024] A display unit **105** includes a display panel such as an LCD or an organic EL panel, and displays display information on the display panel in accordance with an instruction from a display control unit **116** described later.

[0025] An example of a graphical user interface (GUI) for safe driving support displayed on the display unit **105** by the mobile terminal **100** in the vehicle while driving will be described with reference to FIG. **2**. Note that in the following description, a case where the mobile terminal **100** displays a GUI for safe driving support on the display unit **105** will be described as an example. However, the display control by the mobile terminal **100** is not limited to this example. For example, the mobile terminal **100** may generate data for displaying a GUI for safe driving support

and then transmit the generated data for displaying to the vehicle via the above-described interface. In this case, the vehicle may acquire the data for displaying and cause a display provided in the vehicle to display the GUI.

[0026] A GUI **201** is an example of a GUI for safe driving support displayed on the display unit **105** while the vehicle is traveling. The GUI **201** includes, for example, an indicator region **202**, a map region **205**, and a driving evaluation region **207**.

[0027] The indicator region **202** can display various indicators related to driving. For example, an indicator **203** may indicate the magnitude of acceleration in the traveling direction of the vehicle. Furthermore, an indicator **204** can indicate, for example, the magnitude of acceleration (also referred to as lateral G or the like) in the lateral direction (direction orthogonal to traveling direction) of the vehicle. The indicators are not limited to these examples, and more or less indicators may be displayed. Since the mobile terminal **100** is disposed in the vehicle, acceleration detected by a sensor included in the mobile terminal **100** can be used as the acceleration of the vehicle. Therefore, the mobile terminal **100** can display various indications without acquiring the state of the vehicle from the vehicle by communication. Of course, as described above, various types of data (e.g. acceleration, speed, and steering angle) indicating the state of the vehicle may be acquired by communicating with the vehicle and displayed as indicators.

[0028] The map region **205** can display a map used for navigation. A self-vehicle position **206** indicates a position and a traveling direction of the vehicle. As will be described later, the mobile terminal **100** can display its own position detected by a sensor included in the mobile terminal **100** on the map region **205** as the position of the vehicle. Of course, communication with the vehicle may be performed to acquire the position of the vehicle and display the position as the self-vehicle position.

[0029] The driving evaluation region **207** displays a relative variation **208** of a rank (also simply referred to as rank of driver) related to the risk level of driving by the driver of the vehicle. The rank related to the risk level will be described later. The driving evaluation region **207** is displayed while the vehicle is traveling. Therefore, the driving evaluation region **207** includes less information than a driving evaluation region **251** displayed when the vehicle stops. For example, the driving evaluation region **207** does not include detailed information regarding the driver's rank. The driving evaluation region **207** includes an arrow representing a relative variation of the driver's rank. When the driver's rank is lower than a predetermined rank (e.g., 80th out of 100 ranks), the background region of the driving evaluation region **207** is displayed in a color (e.g., warm color such as red or orange) indicating that the risk is high. When the driver's rank is equal to or higher than a predetermined rank, the background region of the driving evaluation region **207** is displayed in a different mode (e.g., different color or different pattern) from the case where the driver's rank is lower than the predetermined rank. When the driver's rank is equal to or higher than a predetermined rank, the background region of the driving evaluation region **207** is displayed in a color (e.g., color such as gray or blue) indicating that the risk is not high.

[0030] A GUI **250** is an example of a GUI for safe driving support displayed when the vehicle is stopped. The GUI **250** is displayed on the display unit **105**, and includes, for example, the indicator region **202**, the map region **205**, and the driving evaluation region **251**. The indicator region **202** and the map region **205** in the GUI **250** display the same display contents as in the GUI **201**. Therefore, the same reference numerals are given, and the description thereof will be omitted.

[0031] The driving evaluation region **251** may be displayed, for example, when the driver touches the driving evaluation region **207** or touches a predetermined button while the vehicle is stopped. When the vehicle is not stopped, the mobile terminal **100** does not display the driving evaluation region **251** even if the driver touches the driving evaluation region **207** or touches a predetermined button.

[0032] The driving evaluation region **251** includes a relative rank variation **252**, a driver's rank **253**, a graph **256**, and a danger zone **257**. Similar to **208** described above, the relative rank variation **252**

includes an arrow representing the relative variation of the driver's rank. When the driver's rank is lower than a predetermined rank, the background region of the driving evaluation region **251** is displayed in a color (e.g., warm color such as red or orange) indicating that the risk is high. When the driver's rank is equal to or higher than a predetermined rank, the background region of the driving evaluation region **251** is displayed in a different mode (e.g., different color or different pattern) from the case where the driver's rank is lower than the predetermined rank. When the driver's rank is equal to or higher than a predetermined rank, the background region of the driving evaluation region **251** is displayed in a color (e.g., color such as gray or blue) indicating that the risk is not high. The danger zone **257** indicates a zone ranked lower than a predetermined rank. The background region of the driving evaluation region **251** may be switched between a first mode (mode indicating a good state) in a case where the driver's rank is equal to or higher than a first threshold, a second mode (mode indicating a normal state) in which the driver's rank is lower than the first threshold and equal to or higher than a second threshold, and a third mode (mode indicating a bad state) in which the driver's rank is lower than the second threshold, according to the driver's rank. FIG. **7** illustrates another example of the driving evaluation region **251** illustrated in FIG. **2**. In FIG. **7**, an excellent zone **258** is further displayed in addition to the example illustrated in FIG. **2**. The excellent zone **258** indicates a zone in which the driver's rank is from the first to a predetermined rank (e.g., 20th). The excellent zone **258** is displayed in a display mode (e.g., different color or different pattern) different from the danger zone **257**. When the danger zone **257** is displayed in a color indicating high risk (e.g., warm color such as red or orange), the excellent zone **258** may be displayed in a color indicating high quality (e.g., blue).

[0033] The graph **256** indicates a transition of the driver's rank in a predetermined period. By checking the graph **256**, the driver can grasp that his or her own rank is close to escaping the danger zone **257**, that his or her own rank has escaped the danger zone **257**, that his or her own rank is rising, and the like.

[0034] In the above example, the mobile terminal **100** displays the driving evaluation region **207** and then displays the driving evaluation region **251**. However, the display order of these driving evaluation regions is not limited to this example. For example, it is possible to prevent both the driving evaluation region **207** and the driving evaluation region **251** from being displayed until the vehicle travels a predetermined distance (after safe driving support application is used). The driving evaluation region **251** may be displayed only once in response to the vehicle stopping after the vehicle travels a predetermined distance. In this way, it is possible to cause the driver to recognize that the driving evaluation app is operating. Next, the mobile terminal **100** may display the driving evaluation region **207** in response to the start of traveling of the vehicle, for example. Thereafter, as described above, the driving evaluation region **251** may be displayed according to the operation of the driver when the vehicle is stopped.

[0035] FIG. **3** illustrates an example of another display screen **301** that displays the rank related to the driver's risk level (driver's rank). In the example illustrated in FIG. **3**, the driver is in his or her teens or twenties. The display screen **301** includes a distribution **302** of a plurality of drivers, a rank **304** to which the driver belongs, a danger zone **303**, and a driver's rank **305**. The danger zone **303** indicates a zone ranked lower than a predetermined rank. The distribution **302** of the plurality of drivers represents the number of drivers of the same rank on the basis of the evaluation results of the driving of the plurality of drivers. The rank **304** to which the driver belongs is displayed in a color different from other ranks. FIG. **8** illustrates another example of the display screen **301** illustrated in FIG. **3**. In FIG. **8**, an excellent zone **306** is further displayed in addition to the example illustrated in FIG. **3**. The excellent zone **306** indicates a zone in which the driver's rank is from the first to a predetermined rank (e.g., 20th). The excellent zone **306** is displayed in a display mode (e.g., different color or different pattern) different from the danger zone **303**. When the danger zone **303** is displayed in a color indicating high risk (e.g., warm color such as red or orange), the excellent zone **306** may be displayed in a color indicating high quality (e.g., blue).

[0036] A display screen **350** illustrated in FIG. **3** is, for example, a display screen displayed on a screen of a mobile terminal of the driver's parent. The driver's parent may want to know whether or not his or her child's driving is safe, or may want enough information to trust the child's driving. The mobile terminal **100** transmits information for displaying the display screen **301** to the mobile terminal of the driver's parent, and the mobile terminal of the parent displays the display screen **350**. As a result, the driver's parent can grasp the driving situation of the child by checking the display screen **350**. The display screen **350** displays information similar to reference numerals **302** to **305** in the display screen **301**.
[0037] Referring back to FIG. **1**, the configuration of the mobile terminal **100** will be described.
[0038] A storage unit **106** includes, for example, a non-volatile memory such as a semiconductor memory, and stores a computer program (including application and OS) executed by a control unit **102**.
[0039] The control unit **102** includes a CPU **110** and a RAM **111**, and controls the operation of each functional block in the control unit **102** and each unit in the mobile terminal **100** by the CPU **110** executing a program stored in the storage unit **106**, for example.
[0040] An information acquisition unit **112** acquires the position of the mobile terminal **100**, the moving speed of the mobile terminal **100**, the acceleration of the mobile terminal **100**, and the like from the sensor unit **104**. When the mobile terminal **100** is disposed in the vehicle while driving, the information acquisition unit **112** can acquire the acceleration in each direction detected by the sensor unit **104** as the acceleration in each direction of the vehicle. In addition, the information acquisition unit **112** can acquire the moving speed detected by the sensor unit **104** as the moving speed of the vehicle. Furthermore, the information acquisition unit **112** can acquire the position detected by the sensor unit **104** as the position of the vehicle.
[0041] An event detection unit **113** detects the occurrence of sudden acceleration, sudden deceleration, and sudden turning while driving on the basis of the acceleration of the vehicle. The event detection unit **113** detects, for example, sudden acceleration and sudden deceleration in which 0.5G or more occurs, sudden turning in which 0.5G or more occurs in the lateral direction, and sudden acceleration and sudden deceleration smaller than those described above. Note that while this example illustrates a case where it is determined whether sudden acceleration, sudden deceleration, or sudden turning of 0.5G or more has occurred, the threshold may be different for each event content. For example, the threshold of sudden acceleration may be 0.35G, and the threshold of sudden deceleration and sudden turning may be 0.5G. Regardless of which threshold is set, it is sufficient that occurrence of sudden acceleration, sudden deceleration, or sudden turning that rarely occurs and sudden acceleration or sudden deceleration smaller than these values can be detected. In the following description, these sudden acceleration, sudden deceleration, or sudden turning are also collectively referred to as an event.
[0042] Note that, for example, 0.3G is 0.3×9.81×3600/1000=10.6 [km/h/s], which corresponds to deceleration by 10.6 km/h in one second. The deceleration corresponding to 0.3G is relatively likely to occur on a daily basis. On the other hand, for example, 0.5G corresponds to deceleration by 0.5×9.81×3600/1000=17.7 [km/h/s]. From 17.7×3=53 [km/h], 0.5G corresponds to such a sudden deceleration that a vehicle traveling at 53 [km] per hour stops in three seconds, and does not occur frequently in normal driving.
[0043] When an event that generates 0.5G or more is detected and the driver is evaluated, since the majority of drivers do not generate the event, a system in which there is no change for the majority of drivers (there is no difference in ranks of most drivers) is obtained. Therefore, in the present embodiment, by taking into account sudden acceleration and sudden deceleration that generate 0.3G or more and less than 0.5G and sudden acceleration, sudden deceleration, and sudden turning that generate 0.5G or more, appropriate ranking is performed even for drivers that do not generate 0.5G or more.
[0044] A frequency calculation unit **114** calculates each frequency from the number of occurrences

of each event. The frequency calculation unit **114** calculates the occurrence frequency from the number of occurrences of each event within 200 km of the vehicle. For example, when the vehicle travels 201 km, the frequency calculation unit **114** calculates the occurrence frequency of the event from the number of times of occurrence of the event between 1 km and 201 km/200 [km]×100. Note that between the start of traveling and the predetermined distance, the number of occurrences of the event may be divided by the accumulated travel distance [km] to be multiplied by 100. In this manner, the frequency calculation unit **114** can evaluate driving by the driver of the vehicle on the basis of the acceleration of the vehicle.

[0045] In addition, the frequency calculation unit **114** executes relief processing to be described later. In the relief processing, for example, when the driver generates an event of 0.5G or more, the rank becomes lower than the lower 20% due to the one event. Hence, if the driver continues driving without generating 0.5G thereafter, the rank is restored. Details of the relief processing will be described later.

[0046] A ranking unit **115** ranks the risk level of a driver on the basis of the occurrence frequencies of an event that generates 0.3G or more and less than 0.5G and two events that generate 0.5G or more. The ranking unit **115** determines the rank related to the driver's risk level on the basis of a comparison between the evaluation results of the driving by the driver (occurrence frequencies of three events) and the evaluation results of the driving of the plurality of drivers based on travel histories of the plurality of drivers in the past (occurrence frequencies of three events).

[0047] The ranking unit **115** calculates a rank related to the driver's risk level for each predetermined travel distance (e.g., 1 km) of the vehicle. In addition, the ranking unit **115** calculates the rank related to the driver's risk level at the timing when the vehicle stops. In this way, for example, when the driver suddenly brakes and the vehicle stops, it is possible to display the latest rank reflecting the result of braking immediately before stopping.

[0048] The display control unit **116** causes the display unit **105**, for example, to display a display according to the rank determined by the ranking unit **115**. The display control unit **116** controls display of the driving evaluation region **207** and the driving evaluation region **251**, for example. The display control of these driving evaluation regions will be described later.

Series of Operations of Driving Evaluation Processing

[0049] Next, a series of operations of driving evaluation processing according to the present embodiment will be described with reference to FIG. **4**. Note that the series of operations of the driving evaluation processing is implemented by the CPU **110** of the control unit **102** developing a computer program stored in the storage unit **106** in the RAM **111** and executing the computer program. Furthermore, the series of operations of the driving evaluation processing is executed when the safe driving support application is executed in the mobile terminal **100** and the vehicle in which the mobile terminal **100** is disposed travels. As described above, the mobile terminal **100** is associated with an individual driver in advance by an operation such as the driver logging into the mobile terminal **100**. Therefore, the processing described below is performed for an individual driver.

[0050] In S**401**, the information acquisition unit **112** acquires the acceleration detected by the sensor unit **104** of the mobile terminal **100** as the acceleration of the vehicle. In S**402**, the event detection unit **113** determines whether an event in which the acceleration is equal to or greater than a first predetermined value has occurred. The first predetermined value is, for example, 0.5G, and the event in which the acceleration is equal to or greater than the first predetermined value is, for example, sudden acceleration, sudden deceleration, or sudden turning in which an acceleration of 0.5G occurs. That is, the event detection unit **113** determines whether sudden acceleration, sudden deceleration, or sudden turning that rarely occurs has occurred. When the event detection unit **113** determines that an event in which the magnitude of the acceleration is 0.5G has occurred, the processing proceeds to S**403**. Otherwise, the processing of S**403** is omitted and the processing proceeds to S**404**. In S**403**, the frequency calculation unit **114** counts up the number of occurrences

of each event (sudden acceleration, sudden deceleration, or sudden turning) in which acceleration of a magnitude of 0.5G occurs and stores the number in the storage unit **106**. Note that while the processing of this example illustrates a case where it is determined whether sudden acceleration, sudden deceleration, or sudden turning of 0.5G or more has occurred, as described above, the threshold may be different for each event content. For example, the threshold of sudden acceleration may be 0.35G, and the threshold of sudden deceleration and sudden turning may be 0.5G. Regardless of which threshold is set, it is sufficient that occurrence of sudden acceleration, sudden deceleration, or sudden turning that rarely occurs can be determined in S**402**. The same applies to the following description.

[0051] In S**404**, the event detection unit **113** determines whether an event in which the acceleration is equal to or greater than a second predetermined value has occurred. The second predetermined value is, for example, 0.3G, and the event in which the acceleration is equal to or greater than the second predetermined value is, for example, sudden acceleration or sudden deceleration in which an acceleration of 0.3G occurs. That is, the event detection unit **113** determines whether sudden acceleration or sudden deceleration, which is relatively likely to occur even in general driving of the driver, has occurred. The reason for evaluating the occurrence of such sudden acceleration and deceleration is to make it easier to determine the level of safety among drivers who do not generate the acceleration of 0.5G. When the event detection unit **113** determines that an event in which the magnitude of the acceleration is 0.3G has occurred, the processing proceeds to S**405**. Otherwise, the processing of S**405** is omitted and the processing proceeds to S**406**. Note that while the example of S**404** illustrates a case of sudden acceleration and sudden deceleration in which the acceleration of 0.3G or more is generated, it is also possible to use only the sudden deceleration. In S**405**, the frequency calculation unit **114** counts up the number of occurrences of an event (sudden acceleration or sudden deceleration) in which acceleration of a magnitude of 0.3G occurs and stores the number in the storage unit **106**.

[0052] In S**406**, the frequency calculation unit **114** determines whether the vehicle has traveled a distance of 1 km. The frequency calculation unit **114** makes this determination to calculate the occurrence frequency of the event every 1 km. When determining that the vehicle has traveled 1 km, the frequency calculation unit **114** calculates the occurrence frequency of the event in S**407**, and otherwise, returns the processing to S**401**. The event occurrence frequency in S**407** is, for example, the event occurrence frequency per predetermined distance (e.g., per 100 km) in the past. The frequency calculation unit **114** calculates, for example, occurrence frequencies of events such as sudden acceleration and sudden deceleration in which acceleration with a magnitude of 0.5G occurs, sudden turning in which acceleration with a magnitude of 0.5G occurs, and sudden acceleration and sudden deceleration in which acceleration with a magnitude of 0.3G occurs. In this way, the driving by the driver can be evaluated by the occurrence frequency of a number of events.

[0053] In S**408**, the ranking unit **115** compares the occurrence frequency of each event with the occurrence frequency of the event of each driver on the basis of the travel histories of a plurality of drivers in the past, and determines the rank (driver's rank) related to the risk level of the driver of the vehicle. By determining such a rank, the mobile terminal **100** can provide the driver or a parent of the driver with a guide for checking whether the driving by the driver while driving is safe as compared with many other drivers. The ranking unit **115** can determine the driver's rank from ranks 1 to 100 according to the occurrence frequency of the event. At this time, it is assumed that the vehicle is traveling. In this case, the display control unit **116** causes the display unit **105** to display only the relative variation of the driver's rank (corresponding to relative variation **208** of driving evaluation region **207** described above).

[0054] In S**409**, the frequency calculation unit **114** determines whether the vehicle has stopped (e.g., based on speed acquired by information acquisition unit **112**). By making this determination, the frequency calculation unit **114** can calculate the occurrence frequency of the event every time the vehicle stops. That is, when the vehicle stops due to sudden braking or the like by the driver,

even in a case where the vehicle has not traveled to the 1 km break, it is possible to determine the latest rank in consideration of the influence of the sudden braking and provide the latest rank to the driver. In S**410**, the frequency calculation unit **114** calculates the event occurrence frequency similarly to S**407**. Then, in S**411**, the ranking unit **115** and the display control unit **116** determine the rank similarly to S**408** and cause the display unit **105** to display the relative variation of the rank.

[0055] In S**412**, the control unit **102** determines whether an operation to display a detailed display (operation to display driving evaluation region **251**) has been received from the driver. When it is determined that the operation has been received, the control unit **102** advances the processing to S**413**, and otherwise advances the processing to S**414**.

[0056] In S**413**, in order to display the driving evaluation region **251**, the display control unit **116** causes the display unit **105** to display the driver's rank and the transition of the rank in a predetermined period.

[0057] In S**414**, the control unit **102** determines whether to end the processing. For example, when receiving an instruction to end the safe driving support application, the control unit **102** determines to end the processing and ends the series of operations, and otherwise returns the processing to S**401**.

Series of Operations of Relief Processing

[0058] Next, a series of operations of relief processing will be described with reference to FIG. **5**. The relief processing is processing of restoring the rank once lowered on condition that safe driving is continued. In addition, by providing the driver with the state in which the rank is restored, it is possible to change his or her behavior for driving more safely. Note that the series of operations of the relief processing is implemented by the CPU **110** of the control unit **102** developing a computer program stored in the storage unit **106** in the RAM **111** and executing the computer program. Furthermore, the series of operations of the relief processing is executed when the safe driving support application is executed in the mobile terminal **100** and the vehicle in which the mobile terminal **100** is disposed travels. Note that in the following description of the relief processing, the number of times of occurrence of an event is counted every time the vehicle travels 1 km, similarly to the description of FIG. **4**. In addition, the mobile terminal **100** is associated with an individual driver in advance, and processing described below is performed for an individual driver.

[0059] In S**501**, the event detection unit **113** determines whether an event (e.g., causing acceleration of 0.5G) has occurred while the vehicle travels up to a predetermined distance X km. The event detection unit **113** advances the processing to S**402** if an event has occurred, and ends the relief processing if no event has occurred. In S**502**, the frequency calculation unit **114** stores the number of occurrences N of events up to the distance X and a count for subtraction. At this point, the count for subtraction is initialized to 1.

[0060] In S**503**, the event detection unit **113** determines whether an event occurs again within the next 1 km (within X+1 km). If an event occurs, the processing proceeds to S**404**, and if no event occurs, the processing proceeds to S**405**.

[0061] In S**504**, if the number of times of occurrence of the event within the distance of X km is N, the frequency calculation unit **114** calculates the number of times of occurrence of the event by N=N*(1−0.2*C). That is, the frequency calculation unit **114** restores the driver's rank every time the vehicle travels 1 km after the occurrence of the event if the driver has not generated an event such as sudden acceleration or sudden deceleration of 0.5G.

[0062] In S**505**, if the number of times of occurrence of the event within the distance up to X km is N, and the number of times of occurrence of the event within the previous 1 km is M, the frequency calculation unit **114** calculates the number of times of occurrence of the event by N=N*(1−0.2*C)+M.

[0063] In S**506**, the frequency calculation unit **114** adds the subtraction count by C=C+1. That is, the frequency calculation unit **114** adds the subtraction count every time the vehicle travels 1 km.

When the subtraction count C reaches a value of 5 by adding the subtraction count, the number of occurrences N becomes 0 (N=N*(1−0.2*5)=N*0.0). That is, the driver's rank is improved (restored) as the subtraction count increases.

[0064] In S**507**, the frequency calculation unit **114** ends the processing if C exceeds 5, and repeats the processing from S**503** if C does not exceed 5.

[0065] Note that in the example illustrated in FIG. **5**, the rank is restored when the vehicle safely travels 5 km. However, the rank may be restored when the vehicle travels a longer distance.

[0066] With such relief processing, when a highly safe driver happens to cause sudden acceleration, sudden deceleration, or sudden turning with an acceleration of 0.5G, the driver's rank can be restored to an appropriate rank. In addition, by providing the driver with a state in which the rank is improved, the behavior change of the driver can be promoted.

[0067] Next, an example of the driving evaluation region **251** using the relief processing will be described with reference to FIG. **6**. A driving evaluation region **601** illustrated in FIG. **6** illustrates a display example immediately after the driver has caused an event such as sudden acceleration or sudden deceleration of 0.5G. The display control unit **116** displays the background region of the driving evaluation region **601** in a color indicating that the risk is high. A transition **256** of the driver's rank is displayed so as to increase, and is displayed so as to be positioned just at the upper limit of the danger zone **257**. As a result, it is indicated that the driver is close to escaping the danger zone **257**, and a behavior change is given such that the driver aims at driving without causing an event such as sudden acceleration or sudden deceleration of 0.5G.

[0068] A driving evaluation region **602** indicates that the driver's rank has escaped the danger zone **257** as a result of the continued safe driving. The display control unit **116** displays the background region of the driving evaluation region **602** in a color indicating that the risk is not high. The display of the transition of the driver's rank and the change of the background color can impress the driver that the driver has escaped the low evaluation rank.

[0069] A driving evaluation region **603** indicates a state in which the driver's rank smoothly improves. By indicating that the driver's rank smoothly improves and escapes the danger zone **257**, an intention to maintain the current safe driving is prompted.

[0070] The driving evaluation region **604** illustrates a state in which the driver's rank is lowered to the danger zone **257** again when the driver causes an event such as sudden acceleration or sudden deceleration of 0.5G. The display control unit **116** switches the background region of the driving evaluation region **604** to a color indicating that the risk is high. As a result, when the driver causes an event such as sudden acceleration or sudden deceleration of 0.5G to occur again, it is possible to more intuitively grasp the deterioration of the situation and to prompt a change in behavior aiming at safe driving again.

[0071] Note that the frequency calculation unit **114** may limit the number of times of application of the relief processing described above. For example, when the driver performs sudden acceleration, sudden deceleration, or sudden turning of 0.5G for the first time, the frequency calculation unit **114** can perform the first relief processing in order to restore the driver's rank. At this time, the frequency calculation unit **114** adjusts the parameters of the relief processing so that the rank is restored by, for example, 10 ranks.

[0072] Next, when the driver performs the second sudden acceleration, sudden deceleration, or sudden turning of 0.5G, the frequency calculation unit **114** can perform the second relief processing to restore the driver's rank. In this case, the frequency calculation unit **114** adjusts the parameters of the relief processing so that the rank is restored by, for example, five ranks.

[0073] Furthermore, when the driver performs the third sudden acceleration, sudden deceleration, or sudden turning of 0.5G, the frequency calculation unit **114** can perform the third relief processing to restore the driver's rank. In this case, the frequency calculation unit **114** adjusts the parameters of the relief processing so that the rank is restored by, for example, two ranks. Thereafter, for example, when the driver performs the fourth sudden acceleration, sudden

deceleration, or sudden turning of 0.5G, the frequency calculation unit **114** can be configured not to execute the subsequent relief processing. In a case where the relief processing is not performed, for example, the number of times of occurrence of an event is maintained while the vehicle travels a predetermined distance (e.g., 100 km or 200 km), and thus the driver's rank is not restored.

[0074] As described above, when the driver's rank is lowered due to the detection of an event in which acceleration (e.g., 0.5G or 0.35G) of a magnitude that rarely occurs has occurred, the frequency calculation unit **114** improves the rank for each travel distance of the vehicle. In this way, it is possible to prevent a lower rank from being given for a long period of time due to an event that has occurred once. Then, the possibility of stopping the use of the safe driving support application due to the set low rank can be reduced. In addition, when the frequency calculation unit **114** detects an event in which acceleration of a magnitude that rarely occurs has occurred more than a predetermined number of times, the frequency calculation unit **114** does not perform processing of improving the rank with respect to the decrease in the driver's rank. In this way, it is possible to fix a lower rank (rank of higher risk level) to a driver who repeats driving that lowers the rank. In addition, the frequency calculation unit **114** decreases the degree of improving the driver's rank as the number of times of detecting an event in which acceleration of a magnitude that rarely occurs has occurred increases. In this way, as the number of times of detection of the event increases, the degree of expectation for the relief processing by the driver can be reduced.

[0075] As described above, in the present embodiment, the program for safe driving support related to driving of the vehicle is executed in the mobile terminal associated in advance with the driver. According to the program, the mobile terminal acquires, as the acceleration of the vehicle, the acceleration detected by the sensor of the mobile terminal disposed in the vehicle while driving or the sensor provided in the vehicle, determines the driver's rank on the basis of the acceleration of the vehicle, and causes a display to show a display according to the determined rank. In this way, the driver does not need to perform an operation or an action for identification such as logging into a navigation system or the like in the vehicle each time the driver gets into the vehicle, and driving of the vehicle by the driver can be easily evaluated.

[0076] Note that in the above-described embodiment, the driving evaluation processing and the relief processing are executed in the mobile terminal. However, the present embodiment is not limited to the above example. For example, acceleration detected by a sensor of a mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle may be transmitted to a server via the mobile terminal, and the above-described driving evaluation processing and relief processing may be executed in the server. That is, the server may include the event detection unit **113**, the frequency calculation unit **114**, the ranking unit **115**, and the display control unit **116** described above. Then, the server may transmit the generated information for display to the mobile terminal, and the mobile terminal may display the GUIs **201**, **250**, and the like on the display unit **105**. The server may acquire information for identifying the driver or information for identifying the mobile terminal from the mobile terminal. Even in this case, the system including the mobile terminal and the server makes it possible to easily evaluate the driving of the vehicle by the driver.

Summary of Embodiment

[0077] (Item 1)

[0078] A program executed on a mobile terminal, wherein: [0079] the program is a program for safe driving support related to driving of a vehicle; [0080] the mobile terminal is associated with an individual driver; and [0081] the mobile terminal comprises: [0082] one or more processors; and [0083] a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: [0084] an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal disposed in a vehicle or a sensor provided in the vehicle as acceleration of the vehicle while driving, [0085] a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and [0086] a display control unit configured to cause a display

to show a display according to the determined rank.
[0087] According to this embodiment, it is possible to easily evaluate the driving of a vehicle by a driver.
[0088] (Item 2)
[0089] The program according to item 1, wherein the instructions further cause the mobile terminal to function as comprising an evaluation unit configured to evaluate driving by a driver of the vehicle on the basis of acceleration of the vehicle, and wherein [0090] the determination unit determines a rank related to the risk level of the driver on the basis of a comparison between a driving evaluation result by the driver and driving evaluation results of a plurality of drivers based on past travel histories of the plurality of drivers.
[0091] According to this embodiment, it is possible to provide an indication for confirming whether driving by the driver while driving is safe as compared with many other drivers.
[0092] (Item 3)
[0093] The program according to item 1, wherein [0094] the acquisition unit further acquires a position detected by a sensor of the mobile terminal or a sensor provided in the vehicle as a position of the vehicle, and [0095] the determination unit recalculates the rank of the risk level of the driver for each predetermined travel distance.
[0096] According to this embodiment, the driver's rank can be updated as needed in accordance with the traveling of the vehicle.
[0097] (Item 4)
[0098] The program according to item 1, wherein when the vehicle is moving, the display control unit causes the display to display a relative variation of a rank related to the risk level of the driver.
[0099] According to this embodiment, by providing only the variation of the rank, the driver is allowed to concentrate on driving while maintaining motivation for safe driving.
[0100] (Item 5)
[0101] The program according to item 1, wherein when the vehicle is stopped, the display control unit causes the display to display a numerical value indicating a rank related to the risk level of the driver.
[0102] According to this embodiment, it is possible to provide information with which the driver can more accurately grasp the details and the current state at the timing when the driver can gaze at the display.
[0103] (Item 6)
[0104] The program according to item 5, wherein when the vehicle is stopped, the display control unit further causes the display to display a transition in a predetermined period of a rank related to the risk level of the driver.
[0105] According to this embodiment, it is possible to provide information that gives a detailed and stronger motivation for safe driving at a timing when the driver can gaze at the display.
[0106] (Item 7)
[0107] The program according to item 1, wherein the display control unit switches whether or not to display a transition in a predetermined period of a rank related to the risk level of the driver depending on whether the vehicle is moving or stopped.
[0108] According to this embodiment, it is possible to achieve a balance between a display for concentrating on driving and a display that provides stronger motivation for safe driving.
[0109] (Item 8)
[0110] The program according to item 1, wherein when the rank related to the risk level of the driver is lower than a predetermined rank, the display control unit causes the display to show a display according to the determined rank by using a display color different from a display color when the rank is equal to or higher than the predetermined rank.
[0111] According to this embodiment, it is possible to intuitively grasp that the driver's rank is bad and that the driver has escaped the bad state.

[0112] (Item 9)
[0113] The program according to item 1, wherein when the rank related to the risk level of the driver is equal to or higher than a predetermined rank, the display control unit causes the display to show a display according to the determined rank by using a display color different from a display color when the rank is lower than the predetermined rank.
[0114] According to this embodiment, it is possible to intuitively grasp that the driver's rank is good and that the driver has entered a good state.
[0115] (Item 10)
[0116] The program according to item 1, wherein [0117] the acquisition unit further acquires a moving speed detected by a sensor of the mobile terminal or a sensor provided in the vehicle as a vehicle speed of the vehicle, and [0118] the determination unit recalculates the rank related to the risk level of the driver each time the vehicle stops.
[0119] According to this embodiment, it is possible to provide the driver with the latest rank in consideration of the latest situation such as the influence of sudden braking at the time of stopping.
[0120] (Item 11)
[0121] The program according to item 2, wherein the evaluation unit evaluates driving by the driver by measuring at least an occurrence frequency of an event in which acceleration equal to or greater than a first predetermined value occurs and an occurrence frequency of an event in which acceleration equal to or greater than a second predetermined value smaller than the first predetermined value occurs.
[0122] According to this embodiment, while evaluating driving on the basis of events that occur infrequently but are highly serious, it is possible to appropriately differentiate drivers who do not cause highly serious events on the basis of events that occur frequently but are less serious.
[0123] (Item 12)
[0124] The program according to item 2, in which in a case where a rank related to the risk level of the driver is lowered by detection of an event in which acceleration equal to or greater than a first predetermined value occurs, the evaluation unit increases the rank for each travel distance of the vehicle.
[0125] According to this embodiment, it is possible to prevent a lower rank from being given for a long time due to an event that has occurred once.
[0126] (Item 13)
[0127] The program according to item 11, in which when detecting an event in which acceleration equal to or greater than the first predetermined value occurs more than a predetermined number of times, the evaluation unit does not perform processing of improving the rank related to the risk level of the driver with respect to a decrease in the rank.
[0128] According to this embodiment, it is possible to fix a lower rank (rank of higher risk level) to a driver who repeats driving that lowers the rank.
[0129] (Item 14)
[0130] The program according to item 12, in which the evaluation unit decreases the degree of improvement of the driver's rank as the number of times of detection of the event in which the acceleration equal to or greater than the first predetermined value occurs increases.
[0131] According to this embodiment, as the number of times of detection of the event increases, the degree of expectation for the relief processing by the driver can be reduced.
[0132] (Item 15)
[0133] A mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the mobile terminal comprising: [0134] one or more processors; and [0135] a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: [0136] an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; [0137] a

determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and [0138] a display control unit configured to cause a display to show a display according to the determined rank.
[0139] According to this embodiment, a mobile terminal capable of easily evaluating driving of a vehicle by a driver is provided.
[0140] (Item 16)
[0141] A control method of a mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the method comprising: [0142] acquiring acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; [0143] determining a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and [0144] causing a display to show a display according to the determined rank.
[0145] According to this embodiment, a control method capable of easily evaluating driving of a vehicle by a driver is provided.
[0146] (Item 17)
[0147] A storage medium storing the program according to any one of items 1 to 13.
[0148] According to this embodiment, a storage medium capable of easily evaluating driving of a vehicle by a driver is provided.
[0149] (Item 18)
[0150] A system used for safe driving support related to driving of a vehicle, the system comprising a mobile terminal and a server, wherein: [0151] the mobile terminal is associated with an individual driver; [0152] the server comprises: [0153] one or more processors; and [0154] a memory storing instructions which, when the instructions are executed by the one or more processors, cause the server to function as: [0155] an acquisition unit configured to acquire, from the mobile terminal, acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle, [0156] a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and [0157] a transmission unit configured to transmit information for display according to the determined rank to the mobile terminal; and [0158] the mobile terminal causes a display to display the information for display received from the server.
[0159] According to this embodiment, a system capable of easily evaluating driving of a vehicle by a driver is provided.
[0160] The invention is not limited to the foregoing embodiments, and various variations/changes are possible within the spirit of the invention.

Claims

1. A non-transitory computer-readable storage medium comprising a program executed on a mobile terminal, wherein: the program is a program for safe driving support related to driving of a vehicle; the mobile terminal is associated with an individual driver; and the mobile terminal comprises: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal disposed in a vehicle or a sensor provided in the vehicle as acceleration of the vehicle while driving, a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and a display control unit configured to cause a display to show a display according to the determined rank.
2. The non-transitory computer-readable storage medium according to claim 1, wherein the instructions further cause the mobile terminal to function as an evaluation unit configured to evaluate driving by a driver of the vehicle on the basis of acceleration of the vehicle, and wherein

the determination unit determines a rank related to the risk level of the driver on the basis of a comparison between a driving evaluation result by the driver and driving evaluation results of a plurality of drivers based on past travel histories of the plurality of drivers.

3. The non-transitory computer-readable storage medium according to claim 1, wherein the acquisition unit further acquires a position detected by a sensor of the mobile terminal or a sensor provided in the vehicle as a position of the vehicle, and the determination unit recalculates the rank of the risk level of the driver for each predetermined travel distance.

4. The non-transitory computer-readable storage medium according to claim 1, wherein when the vehicle is moving, the display control unit causes the display to display a relative variation of a rank related to the risk level of the driver.

5. The non-transitory computer-readable storage medium according to claim 1, wherein when the vehicle is stopped, the display control unit causes the display to display a numerical value indicating a rank related to the risk level of the driver.

6. The non-transitory computer-readable storage medium according to claim 5, wherein when the vehicle is stopped, the display control unit further causes the display to display a transition in a predetermined period of a rank related to the risk level of the driver.

7. The non-transitory computer-readable storage medium according to claim 1, wherein the display control unit switches whether or not to display a transition in a predetermined period of a rank related to the risk level of the driver depending on whether the vehicle is moving or stopped.

8. The non-transitory computer-readable storage medium according to claim 1, wherein when the rank related to the risk level of the driver is lower than a predetermined rank, the display control unit causes the display to show a display according to the determined rank by using a display color different from a display color when the rank is equal to or higher than the predetermined rank.

9. The non-transitory computer-readable storage medium according to claim 1, wherein when the rank related to the risk level of the driver is equal to or higher than a predetermined rank, the display control unit causes the display to show a display according to the determined rank by using a display color different from a display color when the rank is lower than the predetermined rank.

10. The non-transitory computer-readable storage medium according to claim 1, wherein the acquisition unit further acquires a moving speed detected by a sensor of the mobile terminal or a sensor provided in the vehicle as a vehicle speed of the vehicle, and the determination unit recalculates the rank related to the risk level of the driver each time the vehicle stops.

11. The non-transitory computer-readable storage medium according to claim 2, wherein the evaluation unit evaluates driving by the driver by measuring at least an occurrence frequency of an event in which acceleration equal to or greater than a first predetermined value occurs and an occurrence frequency of an event in which acceleration equal to or greater than a second predetermined value smaller than the first predetermined value occurs.

12. A mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the mobile terminal comprising: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the mobile terminal to function as: an acquisition unit configured to acquire acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and a display control unit configured to cause a display to show a display according to the determined rank.

13. A control method of a mobile terminal used for safe driving support related to driving of a vehicle and associated with an individual driver, the method comprising: acquiring acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle; determining a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle; and causing a display to show a

display according to the determined rank.

14. A system used for safe driving support related to driving of a vehicle, the system comprising a mobile terminal and a server, wherein: the mobile terminal is associated with an individual driver; the server comprises: one or more processors; and a memory storing instructions which, when the instructions are executed by the one or more processors, cause the server to function as: an acquisition unit configured to acquire, from the mobile terminal, acceleration detected by a sensor of the mobile terminal disposed in a vehicle while driving or a sensor provided in the vehicle as acceleration of the vehicle, a determination unit configured to determine a rank related to a risk level of driving by a driver of the vehicle on the basis of acceleration of the vehicle, and a transmission unit configured to transmit information for display according to the determined rank to the mobile terminal; and the mobile terminal causes a display to display the information for display received from the server.