

Auto Telematics, Ltd Patent Owner's Oral Hearing Demonstratives

Case No. IPR2023-00857

U.S. Patent No. 10,198,879 B2

Case No. IPR2023-00911

U.S. Patent No. 9,311,271 B2

Before Hon. George R. Hoskins, Frances L. Ippolito and Sean P. O'Hanlon

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Purpose of the Claimed Invention

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**METHOD AND SYSTEM FOR LOGGING
VEHICLE BEHAVIOUR**

CROSS-REFERENCE TO RELATED
APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 15/061,910 filed Mar. 4, 2016, which is a continuation of U.S. patent application Ser. No. 13/994,455 filed Jul. 24, 2013 and now issued as U.S. Pat. No. 9,311,271, which is a 371 of international patent application PCT/GB2011/052491 filed Dec. 15, 2011, which claims foreign priority to GB patent application no. 1118777.0 filed Oct. 31, 2011, GB patent application no. 1109759.9 filed Jun. 10, 2011, GB patent application no. 1101259.8 filed Jan. 25, 2011, and GB patent application no. 1021292.6 filed Dec. 15, 2010, the contents of which are incorporated in their entirety as if fully presented herein.

FIELD OF THE INVENTION

The present invention relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present invention relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

BACKGROUND

Data logging devices are commonly installed on aircraft that log data about events associated with the behaviour of the aircraft and also the crew controlling the aircraft. Such data logging devices are commonly termed "black boxes" and are very useful for determining the cause of problems that have effected the aircraft, especially when no other record of a significant event such as a crash exists.

Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

It is the object of the present invention to alleviate the above-mentioned problems, at least in part.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the

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mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from the sensor set to derive said driving information; a memory for storing said derived driving information; and a wireless telecommunications module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to: register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory.

Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

Following on from this, it will be appreciated that the mobile device is ideally a portable mobile telecommunication device. Ideally, the mobile device is a hand-portable mobile device. Advantageously, the portability permits the mobile device to be conveniently fitted to and removed from the vehicle.

Furthermore, such a mobile telecommunication device presents additional advantages over known dedicated black-box systems as the data logging functionality of the mobile telecommunication device can be continually refined. This can be achieved without physically upgrading the hardware of the device, and also without significant user intervention. Specifically, the application may be arranged to determine whether a software update exists and if so, control the mobile device to download at least portions of an improved version of the application. Conveniently, downloading may be via the wireless telecommunication module. Said downloading may be automatic, or may be user-confirmed. For the avoidance of doubt, the application will typically be stored on a portion of the memory of the mobile device and executed therefrom, as is known in the art. Also, it will be appreciated that the application, or portion thereof may be downloaded via the wireless telecommunication module and/or via an intermediary device. For example the application may be side-loaded to the mobile device from an intermediary computing device.

The application may be sourced from an application store and/or content provider. For example, the content provider may comprise the Apple® Appstore®. The content provider may comprise a cloud computing provider.

It will be appreciated that the use of such a generic mobile device in this context may be counter-intuitive to a person skilled in the art—such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle. However, the inventor of the present invention has realised that such a mobile device that is adapted for installation to the vehicle

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FIELD OF THE INVENTION

The present invention relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present invention relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

'879 Patent at 1:20-30; '271 Patent at 1:15-25.

Purpose of the Claimed Invention

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FIGS. 5 to 24 illustrate a graphical user interface of the mobile device according to FIGS. 1 to 4b.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Specific embodiments are now described with reference to the appended figures.

A preferred embodiment of the present invention relates to a mobile telecommunications device for recording events associated with a vehicle, such as a car. In particular, the mobile telecommunications device is loaded with an application—a “mobile app”—which is arranged to record and document the events surrounding an incident involving the vehicle (a “driving incident”), such as a vehicle collision. The mobile application may be referred to as the “Witness” application in the ensuing description.

FIG. 1 illustrates a system 1 within which a vehicle, such as an automobile 3 configured with a mobile telecommunications device executing the Witness application, may communicate with one or more remotely located devices or systems. Such devices may relate to one or more servers, such as an insurance server 5, an emergency services server 7, a content provider server 9, and a personal computer 11. Communication between the automobile 3 and the one or more remotely located devices 5, 7, 9, 11 may be effected via a shared communication network 13. The shared communication network 13 may relate to a wide area network (WAN) such as the Internet, and may also comprise telecommunications networks. For example, the mobile telecommunications device of the present embodiments may be arranged to communicate with any one of the remotely located devices 5, 7, 9, 11 via a mobile telecommunications base station 15, which is coupled to the shared mobile telecommunications network 13.

A main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, such as the illustrated automobile 3, is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. As mentioned previously, this driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term “driving incident” as used within the present context may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring a driver’s driving performance, and determining a driving characteristic, or user profile for the subject driver. In other words, the sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic. Further details of this alternative embodiment are described below.

The mobile telecommunications device’s functionality is provided by the Witness application, which is installed in the device’s local non-volatile storage, and which is executed by the device’s native processor. The application may be downloaded to the mobile device via the shared communications network 13 and telephone base station 15, from the content provider server 9.

In use (once the application has been configured for execution on the mobile telecommunications device), when a driving incident has been detected by the mobile telecommunications device, data, comprising one or more of mobile

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device sensor data, derived driving information, and captured image data may be automatically forwarded to one or more of the remotely located devices 5, 7, 9, 11. For example, the mobile device may be configured such that when a driving incident is detected, such as a collision involving an automobile 3, driving information (including image data captured by the mobile device) derived from the sensor data is automatically forwarded to the insurance server 5, via the base station 15 and shared communications network 13. In this way, data relating to the driving incident (a collision in this example), is automatically forwarded to the automobile user’s insurance provider, for use in claim settlement, and/or to determine culpability.

Similarly, once a driving incident has been detected, data may also be automatically forwarded to the emergency services server 7. For example, such data may comprise the position information of the automobile 3, along with an automated S.O.S. message requesting assistance from the emergency services. Forwarded data may also comprise sensor data, and any relevant derived driving information, such as speed of impact, the g-forces the vehicle was subjected to during the collision, or any other information wherefrom the severity of the collision may be determined, and which may be used to assist the emergency services in coordinating the appropriate level of response.

Optionally, an electronic message may be sent to a personal contact preselected by the user. For example, an automated message, such as an e-mail, may be forwarded to the PC 11 of the user nominated personal contact, informing the personal contact that the user of the vehicle 3 has been involved in a driving incident. Similarly, and due to the mobile device’s telecommunications functionality, an electronic text message, such as an SMS (Short Message Service) may be forwarded to the telephone of the user selected personal contact, informing the contact of the driving incident. The mobile device may be equally be arranged to communicate with a personal contact via any known electronic messaging service and/or instant messaging service too. For example, via Apple’s® iMessage, or RIM’s® BlackBerry Messenger (BBM) service.

This functionality of forwarding a message to a nominated contact, may also be of particular benefit for managing large fleets of vehicles. For example, a car hire service. In this way, if any of the vehicles comprised in the fleet are involved in a driving incident, the car hire service may be automatically notified of the identity of the specific vehicle involved in the driving incident. In such embodiments, the nominated personal contact would be preselected by the vehicle fleet manager. The option of providing a second user selected personal contact is also envisaged. In this way, a message may be forwarded to both the car hire service for example, and to the driver’s selected personal contact.

In preferred embodiments the mobile telecommunications device relates to a mobile telephone having native processing functionality, and preferably relates to a smartphone. Preferably, the mobile telephone comprises a camera arranged to enable image capture, and preferably arranged to enable a sequence of images to be captured taken in temporal succession. In other words, in preferred embodiments the mobile telephone comprises a camera configured to enable video footage of a sequence of events to be captured.

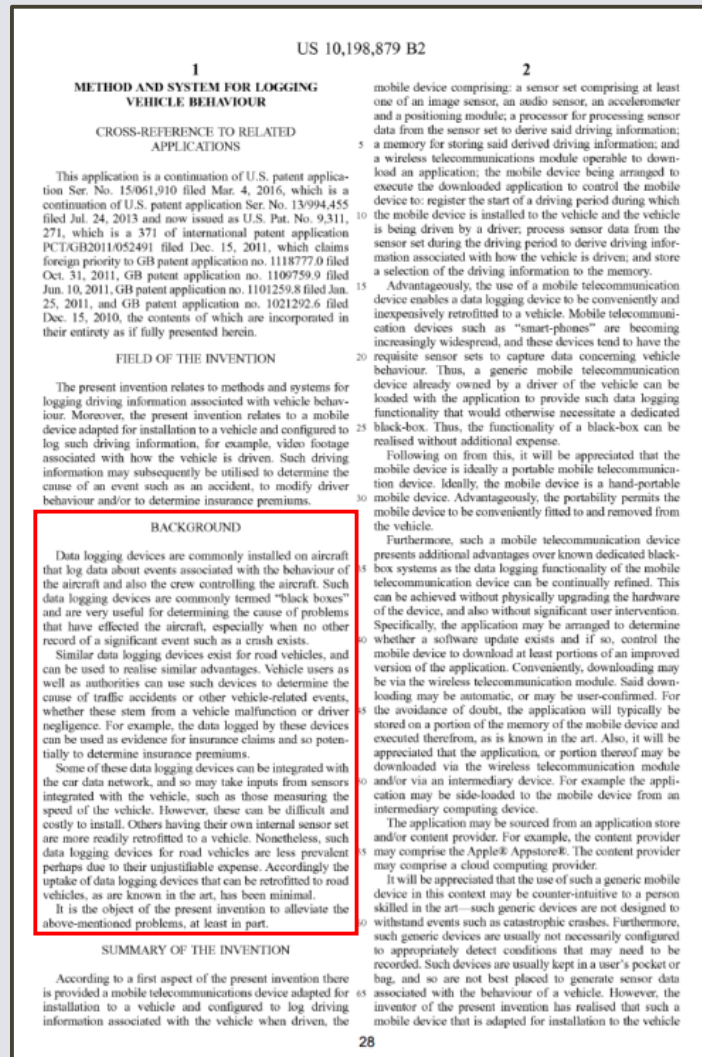
Alternatively, the mobile telecommunications device may relate to a PDA, a notepad such as an iPad®, or any other mobile device comprising local processing means and means for communicating with a telecommunications network.

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A main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, such as the illustrated automobile 3, is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. As mentioned previously, this driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term “driving incident” as used within the present context may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring a driver’s driving performance, and determining a driving characteristic, or user profile for the subject driver. In other words, the sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic. Further details of this alternative embodiment are described below.

’879 Patent at 13:36-56; ’271 Patent at 13:15-35.

Purpose of Claimed Invention - Background



BACKGROUND

Data logging devices are commonly installed on aircraft that log data about events associated with the behaviour of the aircraft and also the crew controlling the aircraft. Such data logging devices are commonly termed “black boxes” and are very useful for determining the cause of problems that have effected the aircraft, especially when no other record of a significant event such as a crash exists.

Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

It is the object of the present invention to alleviate the above-mentioned problems, at least in part.

'879 Patent at 1:32-60; '271 Patent at 1:27-55.

Purpose of the Claimed Invention

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METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOUR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 15/061,910 filed Mar. 4, 2016, which is a continuation of U.S. patent application Ser. No. 13/994,455 filed Jul. 24, 2013 and now issued as U.S. Pat. No. 9,311,271, which is a 371 of international patent application PCT/GB2011/052491 filed Dec. 15, 2011, which claims foreign priority to GB patent application no. 1118777.0 filed Oct. 31, 2011, GB patent application no. 1109759.9 filed Jun. 10, 2011, GB patent application no. 1101259.8 filed Jan. 25, 2011, and GB patent application no. 1021292.6 filed Dec. 15, 2010, the contents of which are incorporated in their entirety as if fully presented herein.

FIELD OF THE INVENTION

The present invention relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present invention relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

BACKGROUND

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Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

It is the object of the present invention to alleviate the above-mentioned problems, at least in part.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the

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mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from the sensor set to derive said driving information; a memory for storing said derived driving information; and a wireless telecommunication module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to: register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory.

Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

Following on from this, it will be appreciated that the mobile device is ideally a portable mobile telecommunication device. Ideally, the mobile device is a hand-portable mobile device. Advantageously, the portability permits the mobile device to be conveniently fitted to and removed from the vehicle.

Furthermore, such a mobile telecommunication device presents additional advantages over known dedicated black-box systems as the data logging functionality of the mobile telecommunication device can be continually refined. This can be achieved without physically upgrading the hardware of the device, and also without significant user intervention. Specifically, the application may be arranged to determine whether a software update exists and if so, control the mobile device to download at least portions of an improved version of the application. Conveniently, downloading may be via the wireless telecommunication module. Said downloading may be automatic, or may be user-confirmed. For the avoidance of doubt, the application will typically be stored on a portion of the memory of the mobile device and executed therefrom, as is known in the art. Also, it will be appreciated that the application, or portion thereof may be downloaded via the wireless telecommunication module and/or via an intermediary device. For example the application may be side-loaded to the mobile device from an intermediary computing device.

The application may be sourced from an application store and/or content provider. For example, the content provider may comprise the Apple® Appstore®. The content provider may comprise a cloud computing provider.

It will be appreciated that the use of such a generic mobile device in this context may be counter-intuitive to a person skilled in the art—such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle. However, the inventor of the present invention has realised that such a mobile device that is adapted for installation to the vehicle

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Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

'879 Patent at 2:15-26; '271 Patent at 2:10-21.

U.S. Patent No. 10,198,879 – Claim 1

the mobile...device...configured to...

determine...a start of a driving period...

***process the sensor data...during the
driving period to derive driving
information associated with how the
vehicle is driven...***

***...process the driving information to
generate a driving score...***

Claim 1 - '879 Patent at 31:43-32:2.

The invention claimed is:

1. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile telecommunications device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof;

a user interface;

a processor and;

a memory;

the mobile telecommunications device being configured to:

determine, based on at least one of the inputs received by the user interface and sensor data from the device's sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory;

wherein the driving information is derived without data from the vehicle sensors, and the mobile telecommunications device is controlled by a downloaded application to control the mobile device to process the

driving information to generate a driving score associated with a particular driver.

U.S. Patent No. 10,198,879 – Claim 21

...enable the mobile...device...to...

determine...a start of a driving period...

***process the sensor data...during the
driving period to derive driving
information associated with how the
vehicle is driven...***

generate a driving score...

Claim 21 - '879 Patent at 33:39-64.
(Similar subject matter to Claim 1.)

21. A non-transitory computer readable medium having instructions comprising a software application stored thereon, wherein the instructions are configured to be executed on a processor of a mobile telecommunications device to enable the mobile telecommunications device to log driving information associated with a driver of a vehicle, the mobile telecommunications device including a display; a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof; the processor; and a memory, wherein the instructions, upon execution by the processor, enable the mobile telecommunications device to:

present a user interface on the display;

determine, based on at least one of the inputs received by the user interface and/or sensor data from the sensor set, a start of a driving period during which the mobile telecommunications device is removably attached to a vehicle and the vehicle is being driven by the driver;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven;

store a selection of the driving information to the memory; and

generate a driving score associated with the driver, wherein the driving information is derived without data from vehicle sensors.

U.S. Patent No. 10,198,879 – Claim 46

46. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile telecommunications device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof;

a user interface;

a processor and;

a memory;

the mobile telecommunications device being configured to:

determine, based on at least one of the inputs received by the user interface and sensor data from the device's sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory;

the mobile...device...configured to...determine...a start of a driving period...; process the sensor data...during the driving period to derive driving information associated with how the vehicle is driven...

by determination of...vehicle...events...

wherein the driving information is derived without data from the vehicle sensors and the mobile telecommunications device is configured to process the sensor data by determination of at least one of:
vehicle acceleration events; and
vehicle braking events;
wherein the determining of such events occurs when data from the sensor set accords with predefined threshold values; and
wherein the mobile telecommunications device is controlled by a downloaded application to control the mobile device to process the driving information to generate a driving score associated with a particular driver.

...process the driving information to generate a driving score...

Claim 46 - '879 Patent at 35:65-36:32.

U.S. Patent No. 10,198,879 – Claim 51

51. A non-transitory computer readable medium having instructions comprising a software application stored thereon, wherein the instructions are configured to be executed on a processor of a mobile telecommunications device to enable the mobile telecommunications device to log driving information associated with a driver of a vehicle, the mobile telecommunications device including a display; a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof; the processor; and a memory, wherein the instructions, upon execution by the processor, enable the mobile telecommunications device to:

*...enable the mobile...device...to...
determine...a start of a driving period...; process
the sensor data...during the driving period to
derive driving information associated with how
the vehicle is driven...; generate a driving score...*

*...driving information...comprises the
determination of...vehicle...events...*

present a user interface on the display;
determine, based on at least inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile telecommunications device is removably attached to a vehicle and the vehicle is being driven by the driver;
process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven;
store a selection of the driving information to the memory; and
generate a driving score associated with the driver, wherein the driving information is derived without data from vehicle sensors and comprises the determination of at least one of:
vehicle acceleration events; and
vehicle braking events;
wherein the determination of such events occurs when data from the sensor set accords with predefined threshold parameters.

Claim 51 - '879 Patent at 36:56-37:21. (Similar to Claim 46.)

The '879 Patent utilizes event modeling for "determination of...vehicle...events" (e.g., driving incidents)

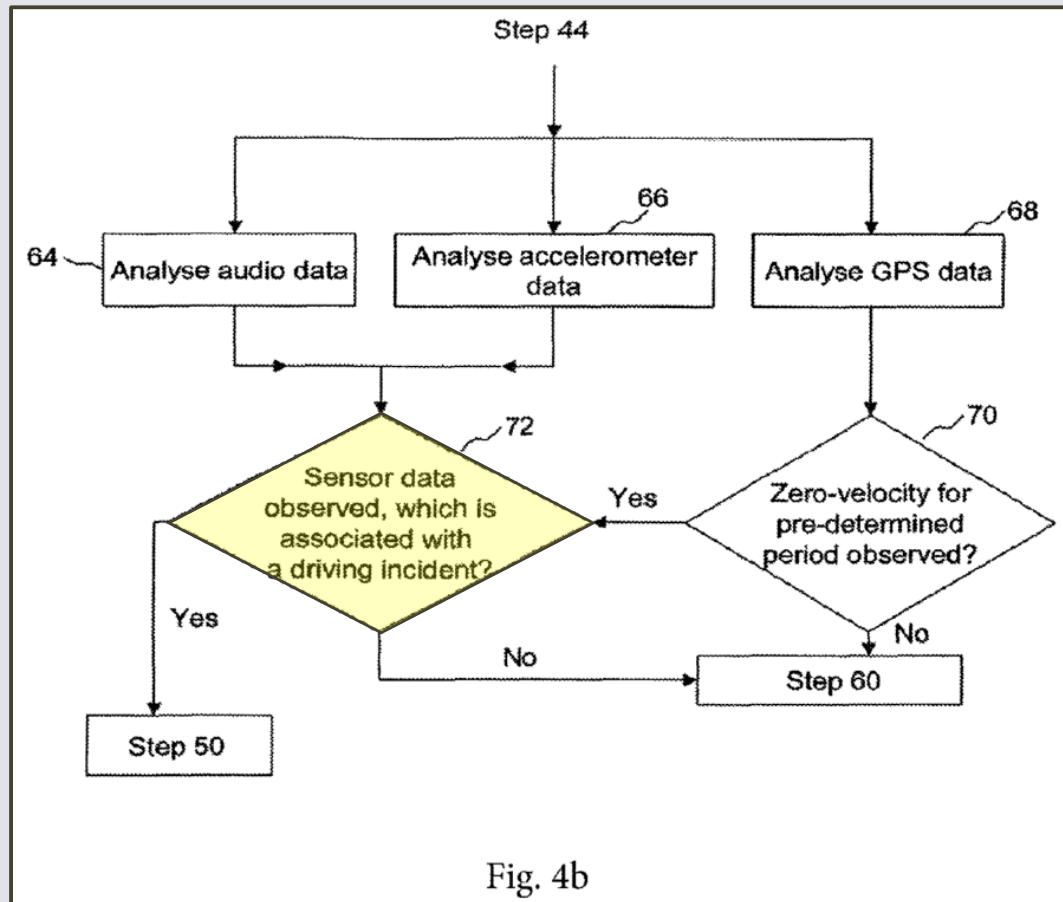


FIG. 4b provides more detail regarding how a driving incident may be automatically detected (i.e. steps 46 and 48 of FIG. 4a) in a preferred embodiment, where the mobile telecommunications device 17 is configured to sample audio data, accelerometer data, and GPS data only. Each one of these types of data is analysed in turn, at steps 64, 66 and 68. The analysis may comprise comparing measured sensor data and/or derived driving information with a data model. The model may comprise defined threshold values for different data types. Sampled sensor data and/or driving information may be compared with the data model to determine if a driving incident has occurred.

'879 Patent at 20:52-63, FIG. 4b.

The '879 Patent utilizes event modeling for "determination of...vehicle...events" (e.g., driving incidents)

To this end the mobile device may comprise an event detector for detecting the occurrence of an event.

Preferably, the event detector is arranged to detect the occurrence of a predetermined event by correlating data, such as sensor data, against an event indication model. The application may comprise the event indication model.

Preferably, the event indication model comprises a set of predetermined data values corresponding to a predetermined event. Accordingly, the event detector is arranged to compare the set of predetermined data values against corresponding sensor data to determine whether the predetermined event has occurred.

For example, the event indication model may indicate that a serious crash has occurred if values returned by an accelerometer sensor exceed predetermined data values of the event indication model, thereby representing a sustained vehicle deceleration beyond a threshold level. Following on from this, it will be appreciated that detection of an event may be dependent on matching a sequence of data values that have occurred over time. Moreover, the event indication model may comprise a sequence of predetermined data values, the sequence being associated by a function of time.

'879 Patent at 5:27-48.

'879 Patent
at 21:18-32.

'879 Patent
at 21:43-54.

Similarly, the analysis of sampled accelerometer data, at step 66, may comprise comparing the sampled data with predetermined accelerometer data models. The data models represent specific states of motion of the vehicle. For example, this might comprise defining threshold values for yaw, pitch and roll, which if exceeded, indicate a state of motion of the vehicle indicative of a driving incident. For example, a measured yaw value above a predetermined threshold value may be indicative of the vehicle having lost traction and is fishtailing and/or skidding. Similarly, a roll and/or pitch value above a predetermined threshold value may be indicative of the vehicle having overturned.

Accelerometer sensor data is also used for deriving driving information such as g-forces. Analysis of g-force data is also used to determine if a driving incident has occurred. For

The data models are preferably preconfigured and are comprised within the application executed on the mobile telecommunications device. Different data models are used depending on the type of vehicle the telecommunications device is being used with. Different vehicle types will experience different states of motion during regular operation, which must be considered in determining if a driving incident has occurred. For example, a motorcycle will display more roll and/or pitch than an automobile during regular operation. Accordingly, different data models and/or threshold values must be used to automate the identification of a driving incident for different vehicle types. The specific

U.S. Patent No. 10,198,879 – Claim 54

Claim 54 - '879 Patent at 37:34-38:13.
(Similar to Claim 1, replacing
“removably attached” with
“removably affixed.”)

54. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile telecommunications device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof;

a user interface;

a processor and;

a memory;

the mobile telecommunications device being configured to:

determine, based on at least one of the inputs received by the user interface and sensor data from the device's

*the mobile...device...configured to...
determine...a start of a driving period...*

*...process the driving information to
generate a driving score...*

*process the sensor data...during the driving
period to derive driving information
associated with how the vehicle is driven...*

sensor set, a start of a driving period during which the mobile device is removably affixed to the vehicle and the vehicle is in use;
process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and
store a selection of the driving information to the memory;
wherein the driving information is derived without data from the vehicle sensors, and the mobile telecommunications device is controlled by a downloaded application to control the mobile device to process the driving information to generate a driving score associated with a particular driver.

U.S. Patent No. 10,198,879 – Claim 55

the mobile...device...configured to...

determine...a start of a driving period...

process the sensor data...during the driving period to derive driving information associated with how the vehicle is driven,

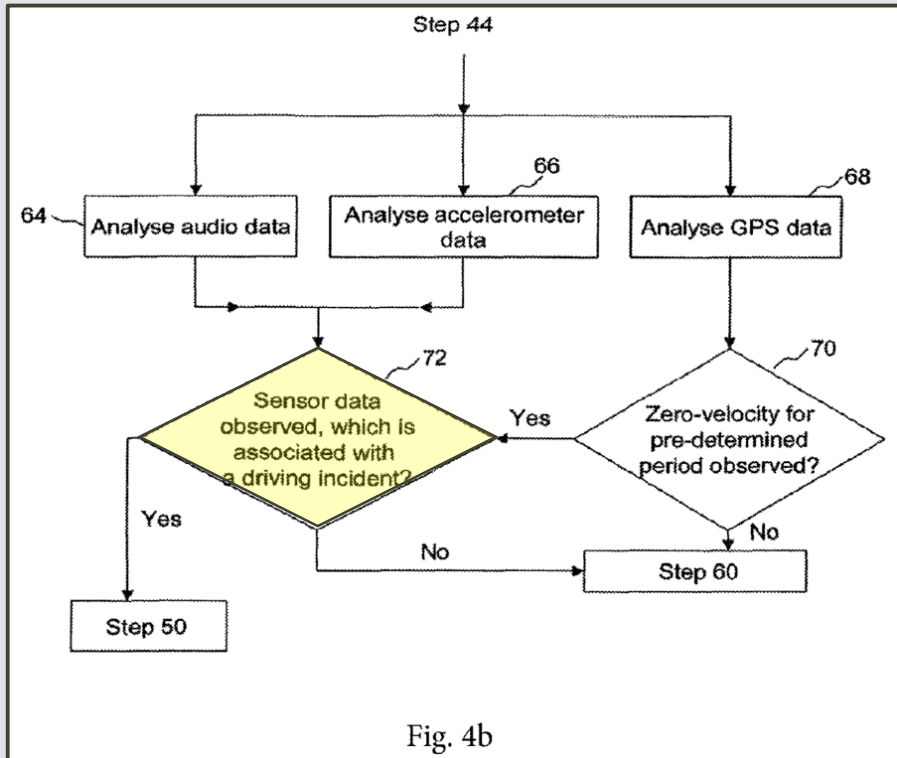
the processing involving...a neural network...to determine whether the driving information represents an acceptable or unacceptable driving pattern...

...process the driving information to generate a driving score...

Claim 55 - '879 Patent at 38:14-45. (Similar to Claim 1, adding "processing involving...a neural network.")

55. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile telecommunications device comprising:
a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof;
a user interface;
a processor and;
a memory;
the mobile telecommunications device being configured to:
determine, based on at least one of the inputs received by the user interface and sensor data from the device's sensor set, a start of a driving period during which the mobile device is removably affixed to the vehicle and the vehicle is in use;
process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven, the processing involving the use of a neural network on the mobile telecommunications device to determine whether the driving information represents an acceptable or unacceptable driving pattern; and,
store a selection of the driving information to the memory;
wherein the driving information is derived without data from the vehicle sensors, and the mobile telecommunications device is controlled by a downloaded application to control the mobile device to process the driving information to generate a driving score associated with a particular driver.

The '879 Patent's event modeling provides processing for pattern recognition by a neural network *on the mobile device*



'879 Patent at 6:66-7:3, FIG. 4b.

Preferably, the event indication model comprises a pattern of predetermined data values. Preferably, the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model. Preferably, there are a plurality of event indication models. Each event indication model may be associated with a separate predetermined event.

'879 Patent at 6:3-10.

Alternatively, if transmission bandwidths are small, the processing can be executed automatically on the processing device. In this case, the use of virtual neural networks can be used to determine whether the driving information represents acceptable or unacceptable driving patterns.

U.S. Patent No. 9,311,271 – Claim 1

the mobile device configured to:...

determine...a start of a driving period...

process the sensor data...during the driving period to derive driving information associated with how the vehicle is driven...

register the start of the driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values...reflecting a detected speed above a predetermined threshold.

1. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven;

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to register the start of the driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

Claim 1 - '271 Patent at 31:29-56.

The mobile device of the '271 patent has a technical way to determine the start of an actual driving period by an initialization input that is directly associated with driving

Claim 1 requires “register[ing] the start of the driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values...reflecting a detected speed above a predetermined threshold.” Ex-1001, 31:51-56 (claim element [1.10]). This “Initialization Limitation” should be interpreted as intended – to explicitly claim how the mobile device registers the start of the driving period –as supported by the specification. *Id.*, 3:12-38.

The start of a driving period must be registered, but precisely “‘when the driving period starts’ is ‘not critical,’” because reaching a threshold speed provides a practical approximation of the start of the driving period and, most importantly, is explicitly claimed. Pet. Reply, 8 (quoting Ex-1088, 99:7-10); Ex-1089, 263:15-18, 268:9-22, 269:13-25; Ex-1001, 31:54-56. To deny this fact is to deny the claim language itself. Even Curry understood that measuring a speed could indicate a driving status, albeit at a snapshot in time. *See, e.g.*, Ex-1005, 16:26-28 (determining “driving mode” when speed is “greater than 15 miles/hour” at the time of a call).

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The

...

initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold—for example, 20 kilometers per hour—then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile

'271 Patent
at 3:12-38.

U.S. Patent No. 9,311,271 – Claim 4

the mobile device configured to:...

determine...a start of a driving period...

process the sensor data...during the driving period to derive driving information associated with how the vehicle is driven...

process the sensor data...during a plurality of driving periods to derive driving information associated with how the vehicle is driven during the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

4. A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven,

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to process the sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven during the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

Claim 4 - '271 Patent at 32:1-29.

The mobile device of the '271 Patent derives driving information during a plurality of driving periods for comparison to a **benchmark** the mobile device sets based on a first set of driving periods. ('271 Patent, Claim 4)
The benchmark can influence event (e.g., driving incident) detection.

Preferably, the executed application may be arranged to control the mobile device to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with when and/or how the vehicle is driven for each of the driving periods. Preferably, sensor data processed during a first set of driving periods define a benchmark against which sensor data is compared during subsequent sets of driving periods. In particular, the executed application may be arranged to control the mobile to modify one or more event indication models in response to the benchmark. Advantageously, such a benchmark ensures that the event indication models may be tailored to the standard behaviour of a particular vehicle. As will be appreciated, different sensor types, mobile devices, mounting positions, vehicles, drivers and road conditions may generate different sets of sensor data for driving behaviour that is considered standard or safe. Accordingly, the benchmark allows the mobile device to account for variable driving conditions.

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.

Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of driving incident.

'271 Patent at 6:1-18, 22:46-58.

U.S. Patent No. 9,311,271 – Claim 6

6. A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

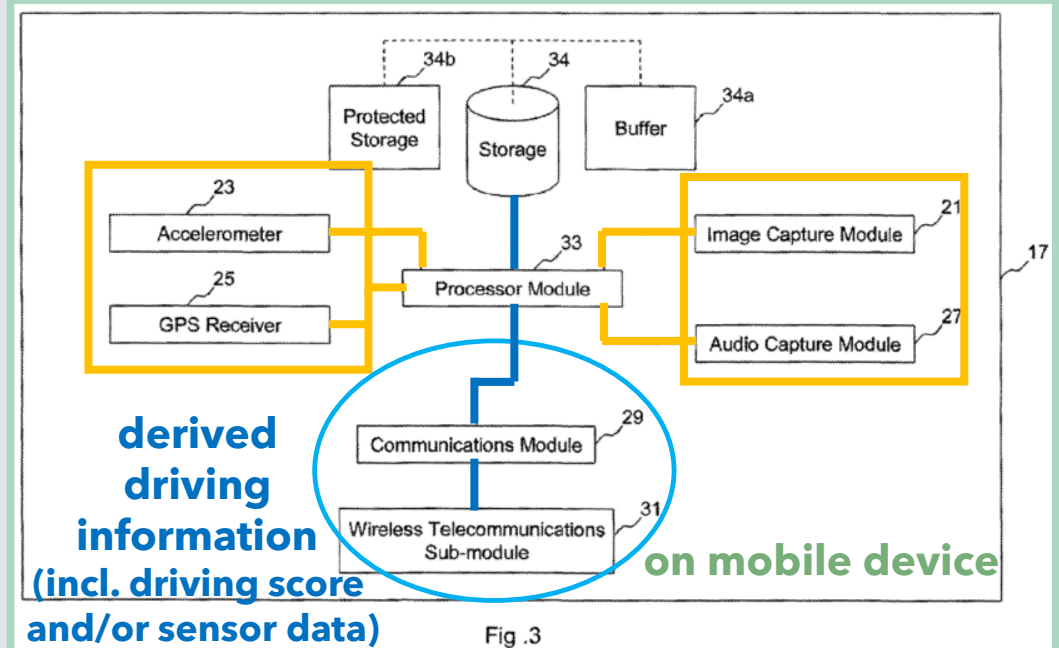
a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver, the data logging system being further arranged to

process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver.

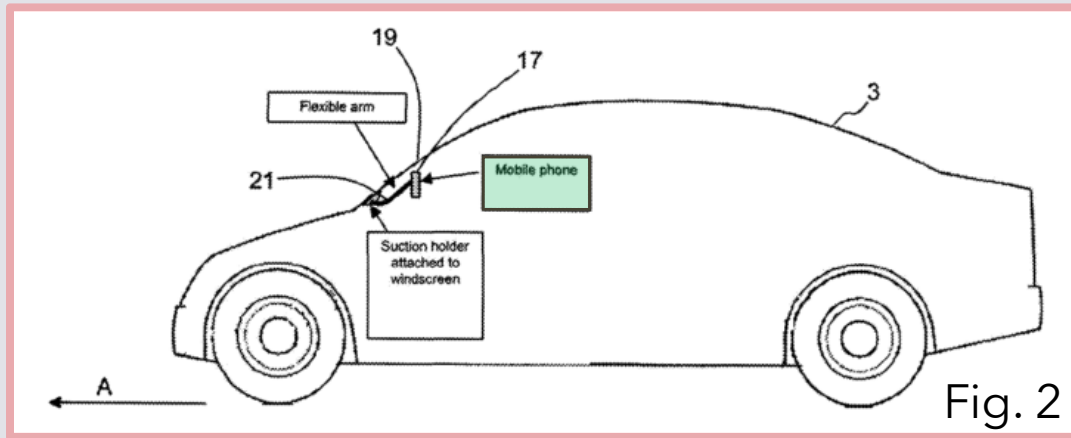


Claim 6 - '271 Patent at 32:40-33:4; FIG. 3.

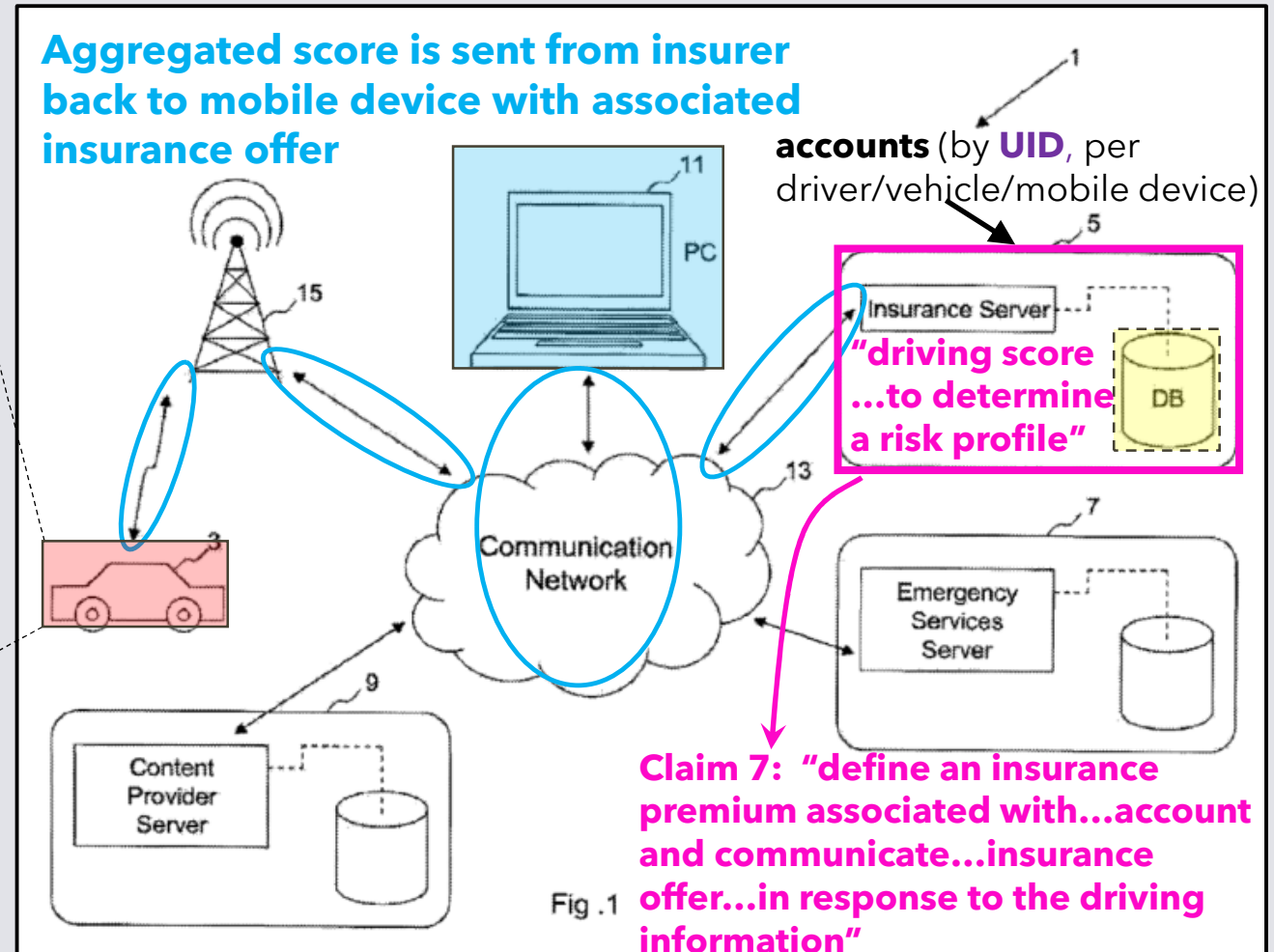
U.S. Patent No. 9,311,271 – Data-Logging System, Claims 6 & 7

Scoring multiple driving periods

'271 Patent at Claims 6, 7, 32:40-34:21; FIGs. 1, 2; 10:1-16, 11:52-12:14, 13:25-33, 21:38-22:22, 28:30-29:13.



**deriving driving information
(incl. driving score and/or sensor data
derived during a driving period)**



See, also, Claim 4, 32:21-26 ("process the sensor data...during a plurality of driving periods to derive driving information associated with how the vehicle is driven during the driving periods").

U.S. Patent No. 9,311,271 – Claim 7

7. A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data

from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver,

the data logging system being further arranged to process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver; and,

wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the remote mobile telecommunication device an insurance offer generated in response to the driving information received from the remote mobile telecommunications device.

'271 Patent at Claim 7, 33:5-34:21.

Processing by the Mobile Device of the '879 and '271 Patents

Process by mobile device "to determine if a driving incident has occurred" during a driving period (from "register start of a driving period" 42 to "driving period terminated" 56).

'879 Patent, FIG. 4a, 18:40-20:51.

'271 Patent, FIG. 4a, 18:8-20:15.

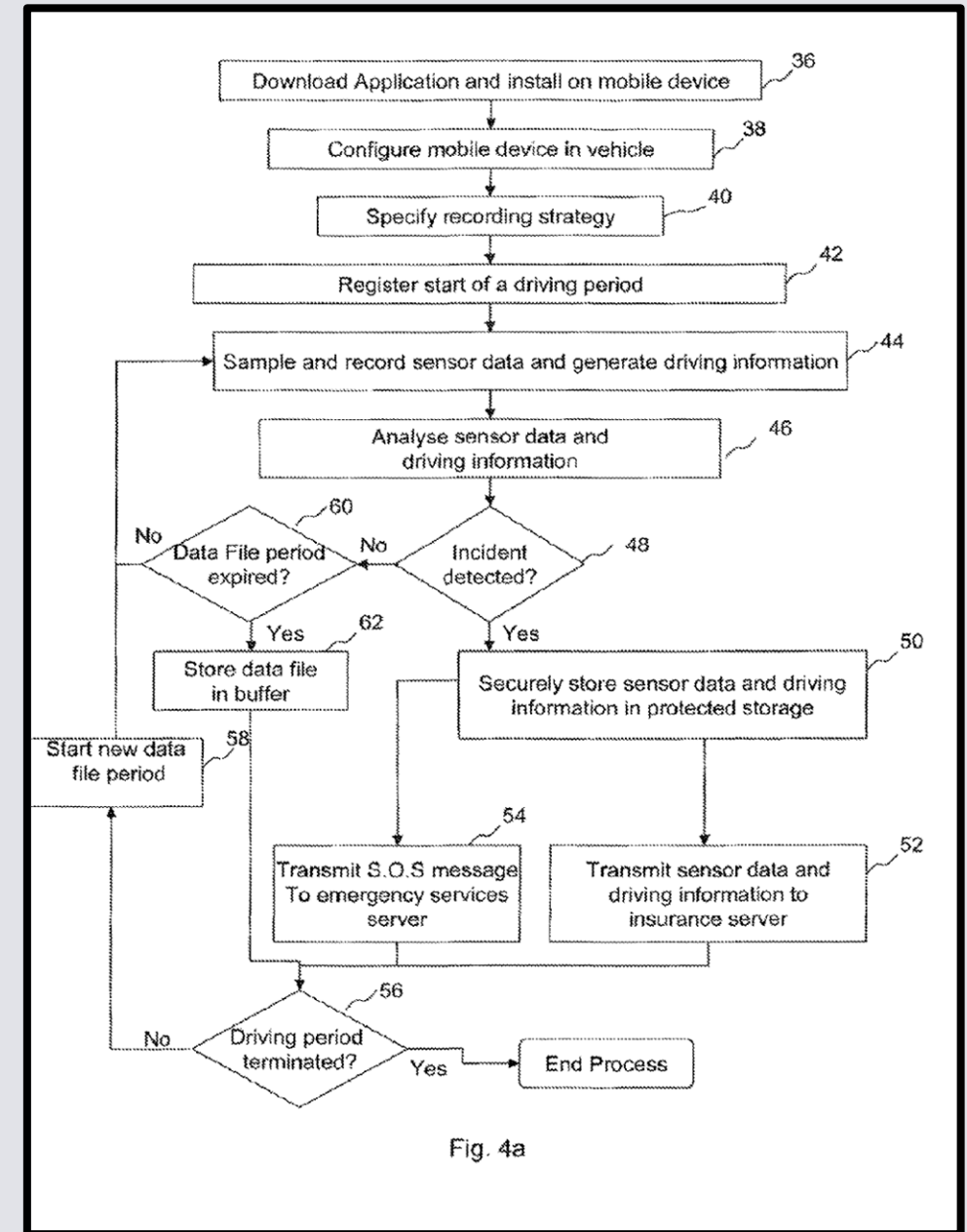


Fig. 4a

U.S. Patent Nos. 10,198,879 and 9,311,271 – “Determine...a Start of a Driving Period”

US 10,198,879 B2

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can overcome such drawbacks and fulfil a role similar to a black box. To this end, the mobile telecommunication device may comprise an adapter arranged to hold the device securely to the vehicle.

Advantageously, as well as protecting the device from damage, the adapter improves the suitability and reliability of the sensor data and so the driving information associated with when and/or how the vehicle is being driven. For example, if the sensor set comprises an accelerometer, the acceleration of the vehicle can be more accurately measured due to the mobile device being firmly attached to the vehicle. Similarly, if the sensor set comprises an image sensor, for example, for capturing video footage of the road ahead, better footage can be obtained as the mobile device can be held in the correct position and orientation relative to the vehicle. In particular, the mobile device may be positioned by the adapter so that its image sensor views the road ahead through a windshield of the vehicle.

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The initialisation input may comprise a user input—for example, the user manually executing the application on the mobile device. The initialisation input may also or instead be generated automatically in response to the mobile device being installed to the vehicle and/or the vehicle being driven. The initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold—for example, 20 kilometers per hour—then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile device is held securely to the vehicle in a predetermined position (for example, via the adapter) this can also be used to trigger the start of the driving period. To this end, the adapter and/or the mobile device may comprise a registration module configured to register the installation of the mobile device to the vehicle and/or the adapter. The registration module may comprise a proximity sensor to detect the proximity of the mobile device to the vehicle. The registration module may comprise a NFC (near field communication) device. The registration module may be arranged to determine a match between the location of the mobile device and the location of the vehicle. The match may be performed by receiving and comparing a first positioning input associated with the position of the vehicle and a second positioning input associated with the position of the mobile device. The registration module and/or adapter may be a smart holster.

Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a

4
driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a “hands-free” mode or accessory—as are well known in the art—may obviate the need for a user to manipulate the mobile device. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the enabled hands-free mode of operation may comprise enabling voice-activated commands. In light of this, it is preferred that the adapter is configured to hold the mobile device in a way that facilitates reception of voice commands from the user. In particular, the mobile device may be held in a position relative to the user to permit clear reception of the users voice. Typically, this position is about the dashboard in a vehicle such as car or van. Furthermore, the adapter is configured with an opening through which an audio sensor of the mobile device is able to receive the user's voice.

Also, even though a drivers control of a vehicle may be affected by manipulating the mobile device, under certain circumstances, this may not be objectionable—for example, when the vehicle is stationary. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the driving information—for example, the speed and location of the vehicle.

Furthermore, it will be appreciated that the driver may not be the only user within the vehicle, and so disabling functions of the mobile device may not be appropriate under all circumstances, as a passenger of the vehicle may want to use the mobile device whilst the driver is driving. Under these circumstances, the executed application is arranged to control the mobile device to register the presence of a non-driver (for example, via image recognition, or entry of an unlock code) and unlock, or retain the original functionality of the mobile device. Furthermore, the executed application may be arranged to run in the background. Accordingly, the mobile device may be used for other purposes, such as making or receiving a telephone call.

It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to sample and process sensor data at a relatively high rate (i.e. many times a second), continually storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by being selective about the driving information that is stored, storage utilisation can be made more efficient.

In particular, the executed application may control the mobile device to store a summary of the driving period. The summary may comprise compressed and/or summarised driving information. For example, the sensor data can be processed at a first sampling rate and then down-sampled to a fraction of the first sampling rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the

'879 Patent at 3:19-28.

'271 Patent at 3:12-21.

U.S. Patent Nos. 10,198,879 and 9,311,271 – Removably Attached/Affixed

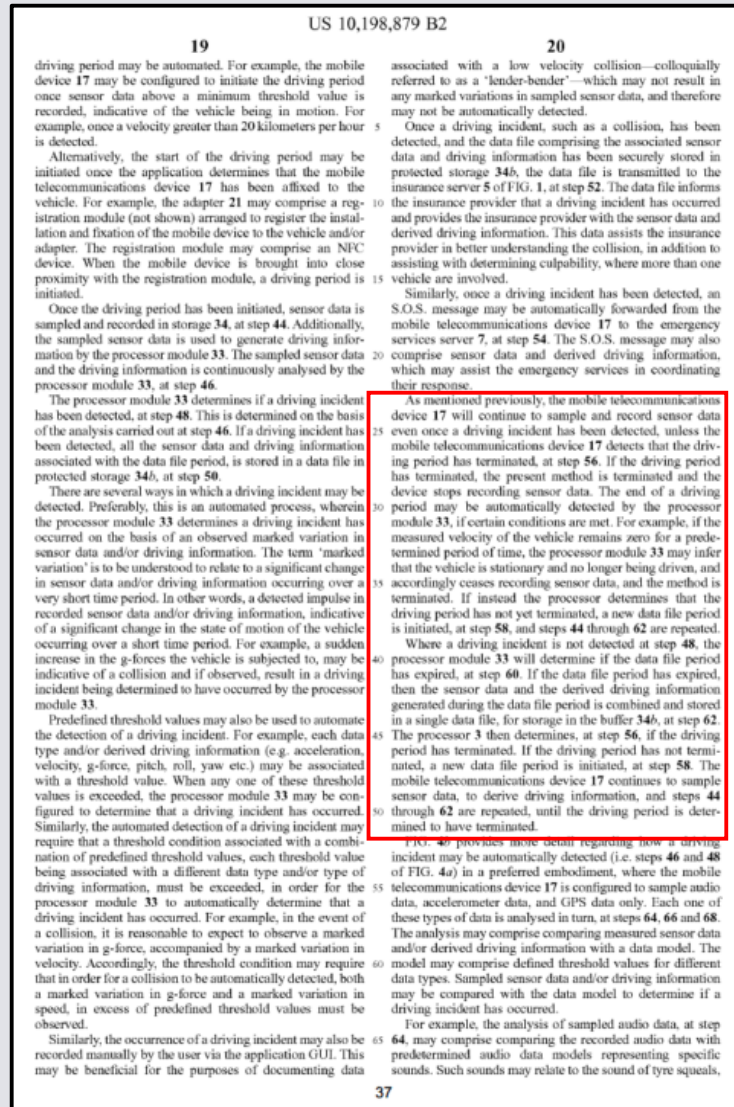


Preferably, the mobile device is arranged to interface with an external device wirelessly, for example via a Bluetooth® connection. Advantageously, this removes the need for the mobile device to be physically connected to the external device. As will be appreciated, following a driving period, a user may want to leave the vehicle and so take a personal mobile telecommunication device with them, and so a wireless interface with such an external device obviates the inconvenience of physically detaching and then subsequently re-attaching the mobile device.

'879 Patent at 10:5-14; see also 19:7-16.

'271 Patent at 9:58-67; see also 18:40-48.

U.S. Patent Nos. 10,198,879 and 9,311,271 – “Driving Period”

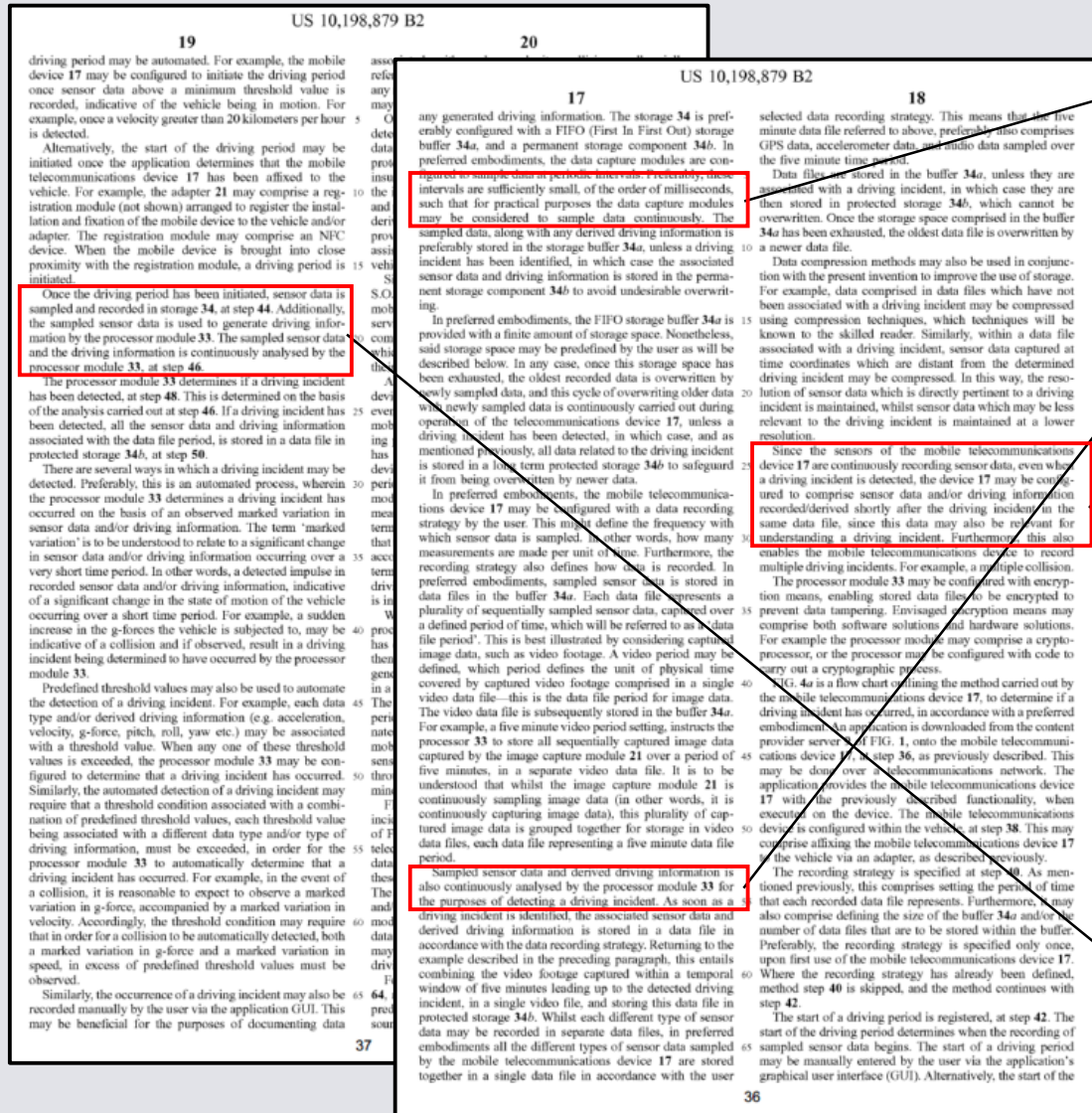


As mentioned previously, the mobile telecommunications device 17 will continue to sample and record sensor data even once a driving incident has been detected, unless the mobile telecommunications device 17 detects that the driving period has terminated, at step 56. If the driving period has terminated, the present method is terminated and the device stops recording sensor data. The end of a driving period may be automatically detected by the processor module 33, if certain conditions are met. For example, if the measured velocity of the vehicle remains zero for a predetermined period of time, the processor module 33 may infer that the vehicle is stationary and no longer being driven, and accordingly ceases recording sensor data, and the method is terminated. If instead the processor determines that the driving period has not yet terminated, a new data file period is initiated, at step 58, and steps 44 through 62 are repeated.

Where a driving incident is not detected at step 48, the processor module 33 will determine if the data file period has expired, at step 60. If the data file period has expired, then the sensor data and the derived driving information generated during the data file period is combined and stored in a single data file, for storage in the buffer 34b, at step 62. The processor 3 then determines, at step 56, if the driving period has terminated. If the driving period has not terminated, a new data file period is initiated, at step 58. The mobile telecommunications device 17 continues to sample sensor data, to derive driving information, and steps 44 through 62 are repeated, until the driving period is determined to have terminated.

'879 Patent at 20:23-51. '271 Patent at 19:54-20:15.

U.S. Patent Nos. 10,198,879 and 9,311,271 - "Continuous" Processing



figured to sample data at periodic intervals. Preferably, these intervals are sufficiently small, of the order of milliseconds, such that for practical purposes the data capture modules may be considered to sample data continuously. The

Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident. As soon as a

Since the sensors of the mobile telecommunications device 17 are continuously recording sensor data, even when a driving incident is detected, the device 17 may be configured to comprise sensor data and/or driving information recorded/derived shortly after the driving incident in the same data file, since this data may also be relevant for understanding a driving incident. Furthermore, this also

Once the driving period has been initiated, sensor data is sampled and recorded in storage 34, at step 44. Additionally, the sampled sensor data is used to generate driving information by the processor module 33. The sampled sensor data and the driving information is continuously analysed by the processor module 33, at step 46.

'879 Patent at 17:5-8, 17:53-55, 18:24-30, 19:17-22.

'271 Patent at 16:44-47, 17:22-24, 17:59-65, 18:49-54.

Patent Owner's Expert on "Driving Period" in U.S. Patent Nos. 10,198,879 and 9,311,271

- "The inventions of the '879 and '271 patents are...to supplement the vehicle with a readily accessible application on a portable device for real-time, continuous situational awareness of a vehicle's environment during **entire driving periods of the vehicle**...." Wilson Dec. (AT-2001) at ¶42.
- "[T]he term "driving period" should be construed according to its plain and ordinary meaning. Thus, in my opinion a POSITA would understand the term "driving period" to refer simply to **the period of time when the vehicle is being driven**." *Id.* at ¶49. See also *id.* at ¶54.
- "Critical to the functionality of the invention is that...the 'driving period' represent a **fair representation of the user's actual driving**." *Id.* at ¶50.
- "Once the start of a driving period is determined, the mobile...device processes sensor data...from the start of the driving period and **during the driving period (for the duration of the driving period)**, to derive driving information associated with how a vehicle is driven during (for the duration of) the driving period...." *Id.* at ¶52.
- "[T]he driving period must be the **entire period in which the vehicle is being driven** (absent short periods related to getting up to speed, backing out of [a] driveway, leaving a particular geo-fence, etc.). *Id.* at ¶54.

Patent Owner's Expert on "Driving Period" (continued)

- "[A] monitoring period that starts at any point and monitors only a portion of a driving period for some random period of time, untethered from the vehicle actually being driven, is **not** a 'driving period' as claimed." *Id.* at ¶55.
- "[T]o act like an automotive black box, the '879 and '271 patents noted that the mobile...device needed to be able to record sensor data during an **entire driving period**...." *Id.* at ¶63.
- "[C]all handling was not contemplated to indicate the start of a driving period or to otherwise determine a driving period and, in my opinion, would have frustrated the purpose of recording driving information while the vehicle is being driven for detecting a driving incident during the driving period." *Id.* at ¶68.

69. To implement the functions of an automotive black box in a mobile telecommunications device, the '879 and '271 patents further confirm that the mobile telecommunications device must detect such driving incident, e.g., "detect occurrence of a predetermined event of significance (such as a crash) and in response store driving information associated with that event to the memory" of the mobile telecommunications device. *Id.* at 5:12-16. This focuses the device's data logging on specific data, because "it is more important to have detailed information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally." USAA-1001 at 5:7-11. It is thus likewise important that the driving period include the full period in which the operator is driving, as the crash may well not occur during the limited monitored phone call period of Curry.

Wilson Declaration for '857 and '271 Patents at ¶69.

Prosecution History – Plante – “Determine...Start of a Driving Period”


US 20070135979A1

(19) **United States**
(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0135979 A1**
Plante (43) **Pub. Date: Jun. 14, 2007**

(54) **VEHICLE EVENT RECORDER SYSTEMS** (57) **ABSTRACT**

(75) **Inventor:** James Plante, Del Mar, CA (US)
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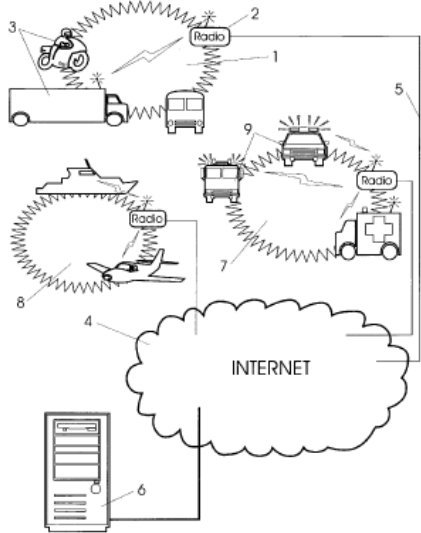
(73) **Assignee:** SmartDrive Systems Inc

(21) **Appl. No.:** 11/298,069
(22) **Filed:** Dec. 9, 2005

Publication Classification

(51) **Int. CL.** G01M 17/00 (2006.01)
(52) **U.S. CL.** 701/35

Vehicle recorder systems are arranged in configured with a video camera, light-weight memory systems, and radio communications facility suitable for use in conjunction with an automobile. An automobile equipped with these video recorder systems used normally throughout the service today, provides a video record of unusual events which may occur from time-to-time. Events such as accidents, near-miss incidents, driving of use, among others, trigger a system to preserve video images collected before and after the moment of the event. Replay of these images yield information regarding cause and true nature of the event. These systems are particularly arranged about, and in support of fleet use of vehicles. That is, groups of vehicles are arranged and coupled together whereby a plurality of such vehicles may communicate with a common system providing a fleet manager advanced fleet management tools.



Next, there is no disclosure in Plante of the mobile telecommunications device being configured to determine, based on the inputs from the user interface and the sensor data, a start of a driving period when the vehicle is in use. The Examiner refers to paragraph [0051] to support the position that this is disclosed in Plante. However, paragraph [0051] is completely silent on the determination of the start of a driving period. The reason for this is that the data recorder of Plante only records data and then transfers it to a server once it is in a download space. It is the server that carries out analysis of that data (see para. [0132], for example). There is absolutely no processing carried out as such on the data recorder of Plante, and therefore there can, by definition, be no determination of the start of a driving period by the data recorder.

From '487 Patent Prosecution History, USAA-1002 in IPR2023-00518, at 32.

Prosecution History – Plante



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 Plante (43) Pub. Date: **Jun. 14, 2007**

(54) **VEHICLE EVENT RECORDER SYSTEMS** (57) **ABSTRACT**

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(21) Appl. No.: **11/298,069**

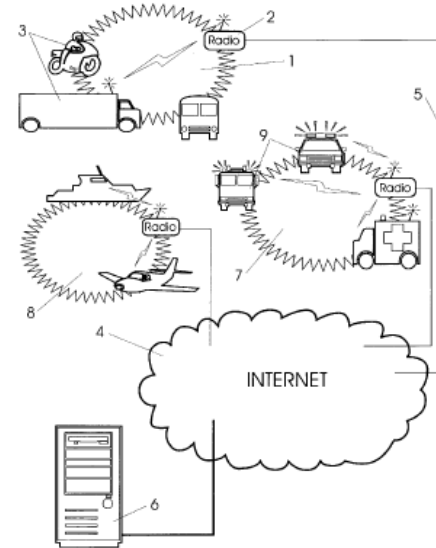
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(51) Int. Cl. **G01M 17/00** (2006.01)

(52) U.S. Cl. **701/35**

Vehicle recorder systems are arranged in configured with a video camera, light-weight memory systems, and radio communications facility suitable for use in conjunction with an automobile. An automobile equipped with these video recorder systems used normally throughout the service today, provides a video record of unusual events which may occur from time-to-time. Events such as accidents, near-miss incidents, driving of use, among others, trigger a system to preserve video images collected before and after the moment of the event. Replay of these images yield information regarding cause and true nature of the event. These systems are particularly arranged about, and in support of fleet use of vehicles. That is, groups of vehicles are arranged and coupled together whereby a plurality of such vehicles may communicate with a common system providing a fleet manager advanced fleet management tools.



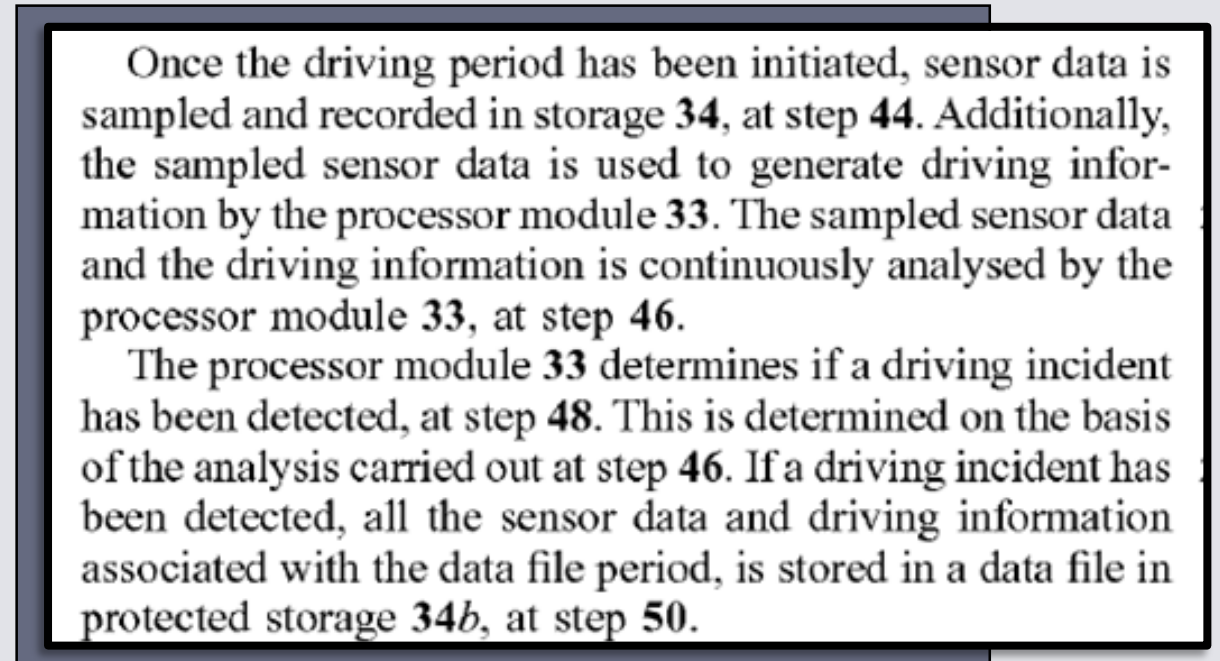
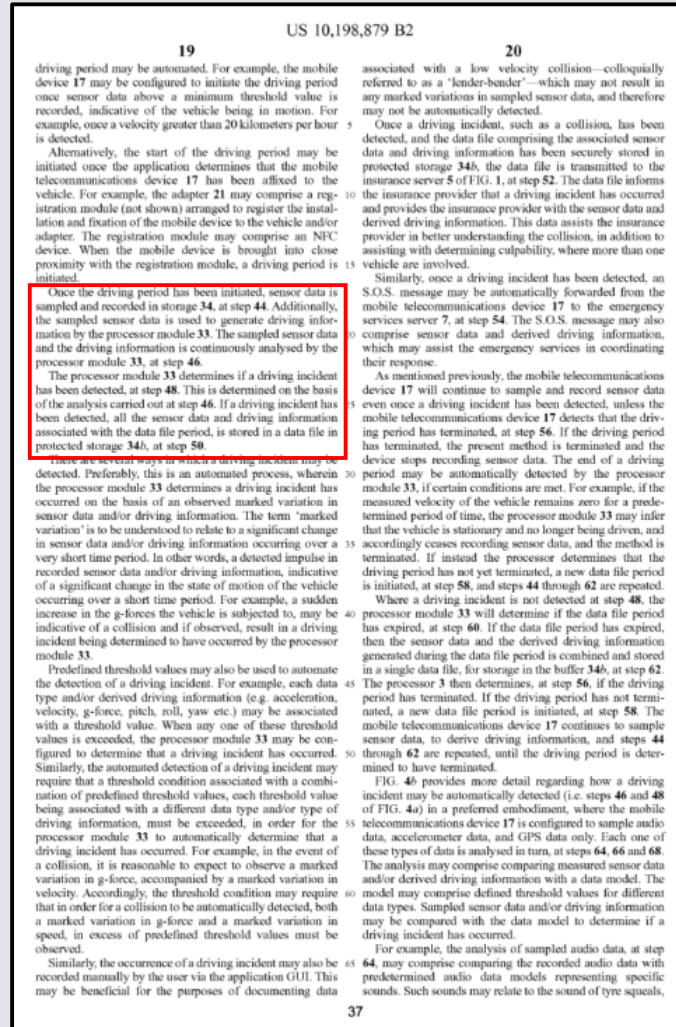
the data recorder of Plante is not a “*mobile telecommunications device*” as recited in the claims because it cannot be moved around freely without relying on the vehicle’s power source and data connections. Additionally, a feature of a *mobile telecommunications device* is that it has its own power source, for example a mobile phone with a battery.

system 48 as shown in Figures 4 and 5. Accordingly, whilst the data recorder records information from its camera(s), it also records information from the vehicle sensors, which can be “useful” in for providing additional data and information which relates to the status of the vehicle (see para. [0095]). In view of the amendments that have been made to clarify that driving information is derived without data from the vehicle sensors, this amendment seems to further distinguish the claimed invention from Plante.

The advantages of having a mobile device that is not reliant on the vehicle are clear. Not only does this mean that the data recording can be made personal by recording the driving of a user in different vehicles to be captured and analyzed, but also the retrofitting of older vehicles with mobile devices in accordance with Plante (which is expensive) can be avoided.

From ‘487 Patent Prosecution History, USAA-1002 in IPR2023-00518, at 31-33.

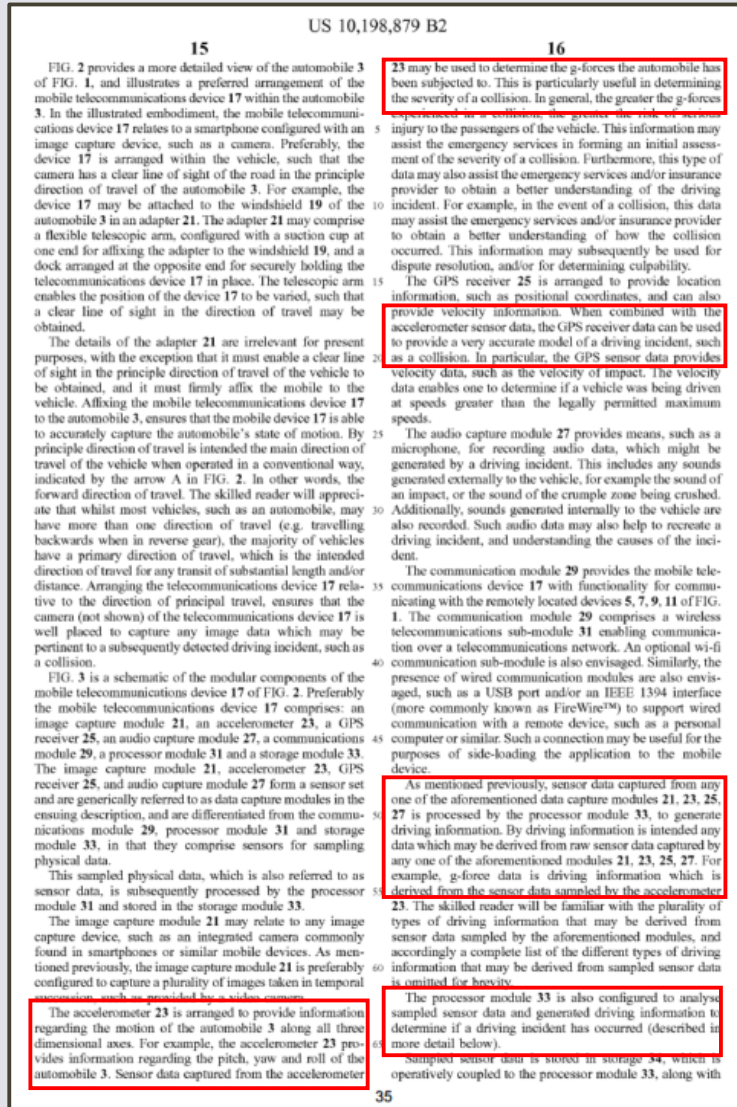
U.S. Patent Nos. 10,198,879 and 9,311,271 – “Determine...a Start of a Driving Period” and “Process Sensor Data... to Derive Driving Information”



'879 Patent at 19:17-28.

'271 Patent at 18:49-60.

U.S. Patent Nos. 10,198,879 and 9,311,271 – “Process Sensor Data...to Derive Driving Information”



'879 Patent at
15:63-16:3,
16:17-20,
16:48-65.

'271 Patent at
15:38-42,
15:59-61,
16:20-37.

The accelerometer 23 is arranged to provide information regarding the motion of the automobile 3 along all three dimensional axes. For example, the accelerometer 23 provides information regarding the pitch, yaw and roll of the automobile 3. Sensor data captured from the accelerometer

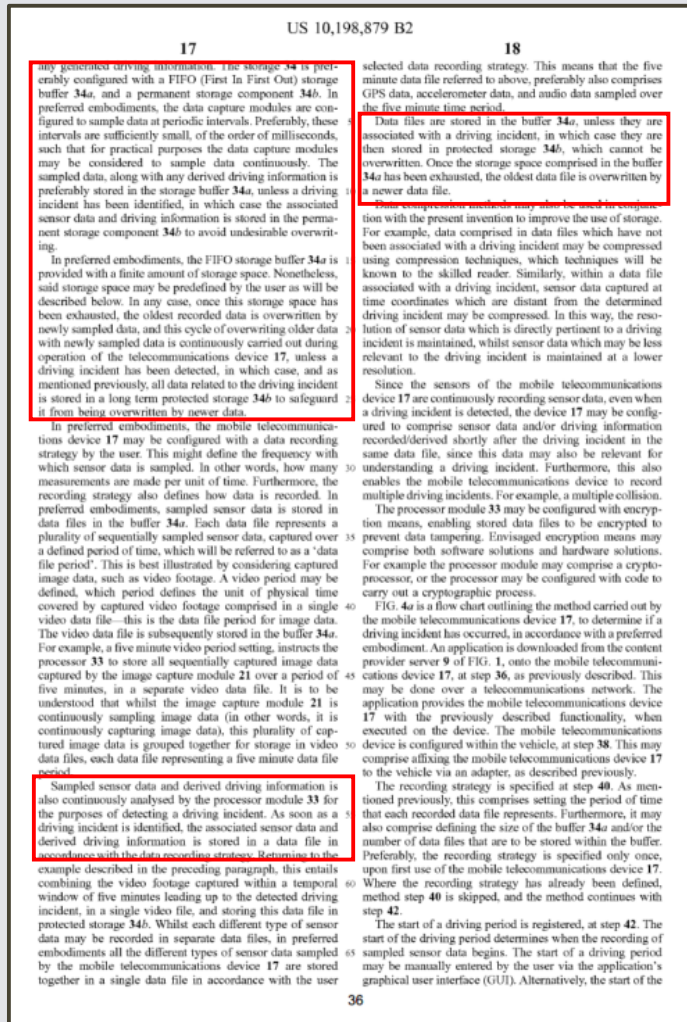
23 may be used to determine the g-forces the automobile has been subjected to. This is particularly useful in determining the severity of a collision. In general, the greater the g-forces

provide velocity information. When combined with the accelerometer sensor data, the GPS receiver data can be used to provide a very accurate model of a driving incident, such as a collision. In particular, the GPS sensor data provides

As mentioned previously, sensor data captured from any one of the aforementioned data capture modules 21, 23, 25, 27 is processed by the processor module 33, to generate driving information. By driving information is intended any data which may be derived from raw sensor data captured by any one of the aforementioned modules 21, 23, 25, 27. For example, g-force data is driving information which is derived from the sensor data sampled by the accelerometer

The processor module 33 is also configured to analyse sampled sensor data and generated driving information to determine if a driving incident has occurred (described in

U.S. Patent No. 10,198,879 (Claims 9/10/35/36)
Store a selection of the driving information to the memory...compris[ing] a long term...and a short term memory..."

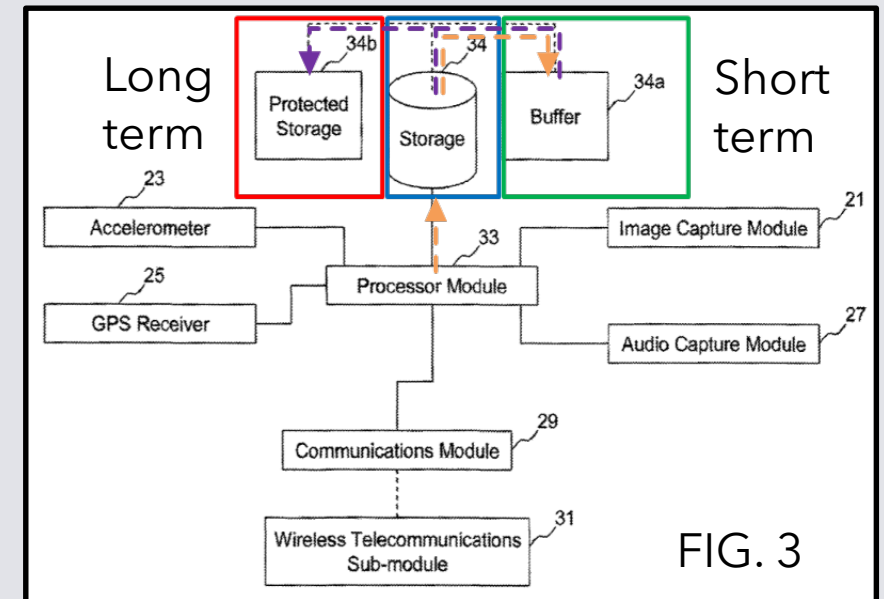


Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident. As soon as a driving incident is identified, the associated sensor data and derived driving information is stored in a data file in accordance with the data recording strategy. Returning to the

Data files are stored in the buffer 34a, unless they are associated with a driving incident, in which case they are then stored in protected storage 34b, which cannot be overwritten. Once the storage space comprised in the buffer 34a has been exhausted, the oldest data file is overwritten by a newer data file.

Sampled data + derived driving information

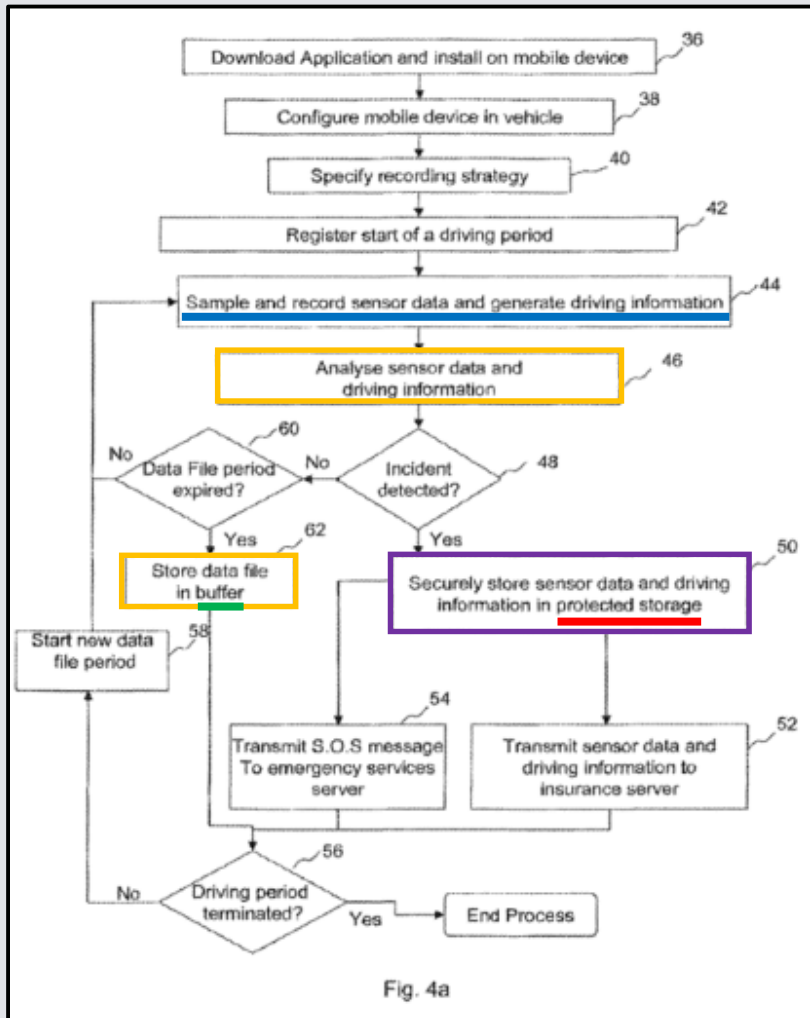
Sampled data + derived driving information with detected event



'879 Patent at 17:1-26, 53-58; 18:5-10; 19:17-28; 20:23-51; FIGs. 3, 4a.

U.S. Patent No. 10,198,879 (Claims 9/10/35/36)

Store a selection of the driving information to the memory...compris[ing] a long term...and a short term memory..."



Where a driving incident is not detected at step 48, the processor module 33 will determine if the data file period has expired, at step 60. If the data file period has expired, then the sensor data and the derived driving information generated during the data file period is combined and stored in a single data file, for storage in the buffer 34b, at step 62.

Once the driving period has been initiated, sensor data is sampled and recorded in storage 34, at step 44. Additionally, the sampled sensor data is used to generate driving information by the processor module 33. The sampled sensor data and the driving information is continuously analysed by the processor module 33, at step 46.

The processor module 33 determines if a driving incident has been detected, at step 48. This is determined on the basis of the analysis carried out at step 46. If a driving incident has been detected, all the sensor data and driving information associated with the data file period, is stored in a data file in protected storage 34b, at step 50.

'879 Patent at 19:17-28; 20:23-51; FIG. 4a.

U.S. Patent Nos. 10,198,879 (Claims 4/9/24/35) and 9,311,271 (Claim 3) – Sampling and storing data of detected event

- **Update rate** higher in short term memory, which is overwritten when a driving event is not detected
- **Sampling rate** higher when a driving event is detected to collect more data points; down-sampling when no event is detected to conserve storage space

'879 Patent at 4:63-5:11;
'271 Patent at 4:55-5:2.

It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to **sample** and process sensor data at a relatively high rate (i.e. many times a second), continually storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by being selective about the driving information that is stored, storage utilisation can be made more efficient.

'879 Patent at 4:50-59; '271 Patent at 4:42-51.

driving information. For example, the sensor data can be processed at a first **sampling** rate and then down-sampled to a fraction of the first **sampling** rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample

sensor data from a first **sampling** rate to a second **sampling** and store the sensor data as driving information at said second **sampling** rate. Advantageously, this retains a snapshot of when and/or how the vehicle is being driven, but with fewer data points, and so requiring less storage space.

Nonetheless, under certain circumstances, it is more useful to retain information at higher or the highest possible **sampling** rates. In particular, it is more important to have detailed information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally.

The action taken may comprise storing data captured at a higher (or the highest possible) **sampling** rate than when an event is not detected. Thus, as described above, this may involve preventing the down-**sampling** of sensor data. Fur-

'879 Patent at 7:4-7; '271 Patent at 6:60-63.

driving information and/or sensor data. Preferably, the short term memory is arranged to receive driving information and/or sensor data at a higher update **rate** than the long term memory. Preferably, the long term memory has a larger capacity than the short term memory.

Preferably, the executed application controls the mobile device to write driving information and/or sensor data to the short term memory at a predetermined update **rate** during the driving period. Ideally, the driving information and/or sensor data is written to the short term memory in a predetermined sequence, ideally a chronological sequence. Preferably, the

executed application controls the mobile device to overwrite driving information and/or sensor data previously written to the short term memory. Advantageously, this ensures that recording of sensor data and/or driving information, especially data that is recorded at a relatively high update **rate**, is not prevented during the driving period due to the short term memory becoming full.

'879 Patent at 7:57-8:7; '271 Patent at 7:46-63.

U.S. Patent Nos. 10,198,879 (Claims 11/12/13/29/30/31) and 9,311,271 – Call Handling and Hands-Free Mode Disclosure

3

US 10,198,879 B2

4

can overcome such drawbacks and fulfil a role similar to a black box. To this end, the mobile telecommunication device may comprise an adapter arranged to hold the device securely to the vehicle.

Advantageously, as well as protecting the device from damage, the adapter improves the suitability and reliability of the sensor data and so the driving information associated with when and/or how the vehicle is being driven. For example, if the sensor set comprises an accelerometer, the acceleration of the vehicle can be more accurately measured due to the mobile device being firmly attached to the vehicle. Similarly, if the sensor set comprises an image sensor, for example, for capturing video footage of the road ahead, better footage can be obtained as the mobile device can be held in the correct position and orientation relative to the vehicle. In particular, the mobile device may be positioned by the adapter so that its image sensor views the road ahead through a windshield of the vehicle.

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The initialisation input may comprise a user input—for example, the user manually executing the application on the mobile device. The initialisation input may also or instead be generated automatically in response to the mobile device being installed to the vehicle and/or the vehicle being driven. The initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold—for example, 20 kilometres per hour—then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile device is held securely to the vehicle in a predetermined position (for example, via the adapter) this can also be used to trigger the start of the driving period. To this end, the adapter and/or the mobile device may comprise a registration module configured to register the installation of the mobile device to the vehicle and/or the adapter. The registration module may comprise a proximity sensor to detect the proximity of the mobile device to the vehicle. The registration module may comprise a NFC (near field communication) device. The registration module may be arranged to determine a match between the location of the mobile device and the location of the vehicle. The match may be performed by receiving and comparing a first positioning input associated with the position of the vehicle and a second positioning input associated with the position of the mobile device. The registration module and/or adapter may be a smart holster.

Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a

driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a 'hands-free' mode or accessory—as are well known in the art—may obviate the need for a user to manipulate the mobile device. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the enabled hands-free mode of operation may comprise enabling voice-activated commands. In light of this, it is preferred that the adapter is configured to hold the mobile device in a way that facilitates reception of voice commands from the user. In particular, the mobile device may be held in a position relative to the user to permit clear reception of the user's voice. Typically, this position is about the dashboard in a vehicle such as car or van. Furthermore, the adapter is configured with an opening through which an audio sensor of the mobile device is able to receive the user's voice.

Also, even though a drivers control of a vehicle may be affected by manipulating the mobile device, under certain circumstances, this may not be objectionable—for example, when the vehicle is stationary. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the driving information—for example, the speed and location of the vehicle.

Furthermore, it will be appreciated that the driver may not be the only user within the vehicle, and so disabling functions of the mobile device may not be appropriate under all circumstances, as a passenger of the vehicle may want to use the mobile device whilst the driver is driving. Under these circumstances, the executed application is arranged to control the mobile device to register the presence of a non-driver (for example, via image recognition, or entry of an unlock code) and unlock, or retain the original functionality of the mobile device. Furthermore, the executed application may be arranged to run in the background. Accordingly, the mobile device may be used for other purposes, such as making or receiving a telephone call.

It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to sample and process sensor data at a relatively high rate (i.e. many times a second), continuously storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by being selective about the driving information that is stored, storage utilisation can be made more efficient.

In particular, the executed application may control the mobile device to store a summary of the driving period. The summary may comprise compressed and/or summarised driving information. For example, the sensor data can be processed at a first sampling rate and then down-sampled to a fraction of the first sampling rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample

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Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a

driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a 'hands-free' mode or accessory—as are well known in the art—may obviate the need for a user to manipulate the mobile device. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the

'879 Patent
at 3:63-4:16;
'271 Patent
at 3:55-4:8.

Curry – WO 2010/042545 (Ex. 1005) – Curry is Merely a Call Handler

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(54) Title: SYSTEM AND METHOD FOR PREVENTING CELL PHONE USE WHILE DRIVING

(57) Abstract: A system for monitoring and controlling the use of a mobile computing device is disclosed. The system includes a data server (104) containing a model of a road network specifying traffic routes at a selected location. A mobile wireless computing device (106) is configured to wirelessly communicate with the data server (104). An embedded accelerometer (116) and a GPS receiver (114) are included in the wireless device (106). A mobile device control module in communication with the wireless device (106) and the data server (104) provides a motion data cache (118) to record data from the GPS receiver (114) and accelerometer (116), an activity mode recognition module (120) configured to determine a type of activity based on the motion data cache (118), and a use permission module (112) in communication with the data server (104) to provide timing and location information at which the wireless device (106) can be used based on the activity mode.

FIG. 1

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(54) Title: SYSTEM AND METHOD FOR PREVENTING CELL PHONE USE WHILE DRIVING

Curry at Title.

Curry - WO 2010/042545 (Ex. 1005) - Curry is Merely a Call Handler

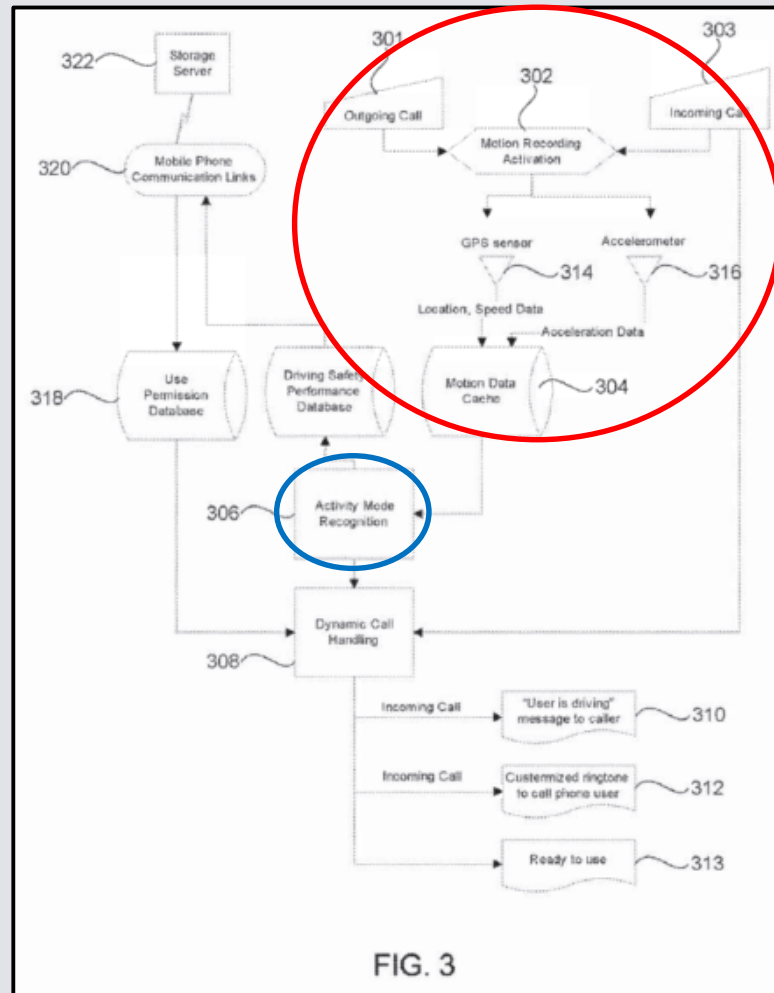
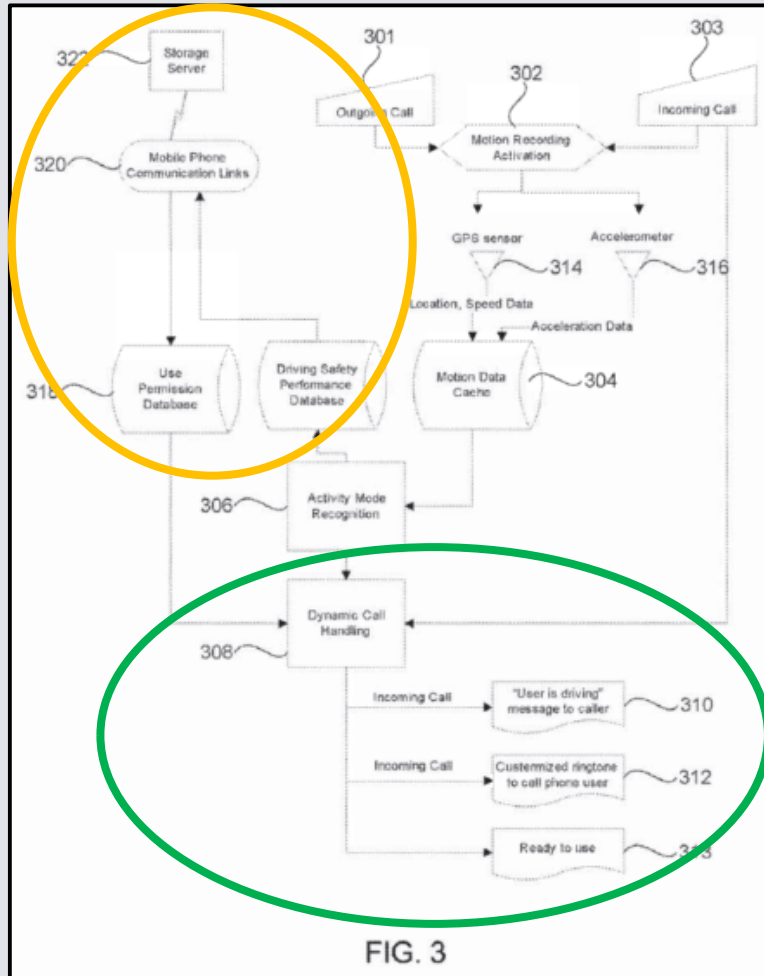


FIG. 3 illustrates a flow chart depicting a driving safety monitoring program on a mobile phone client. If the mobile phone is not in monitoring mode, the motion recording process can be activated 302 on the phone. This may be accomplished by the user of the phone, or through an automated process by the mobile phone client when a selected type of motion is detected. For example, the reporting process may be activated when an outgoing call 301 is made or an incoming call 303 is received.

The GPS receiver 314 can collect location and speed data of the mobile device. The accelerometer 316 can collect acceleration/deceleration data in different axes. Each motion measurement from the GPS sensor and accelerometer can be associated with a timestamp, and stored in a local motion data cache 304 for each pre-specified sampling interval. The activity mode recognition module 306 can use recorded time stamped data to estimate the type of activity: driving, walking, running or remaining substantially still. If no sufficient

Curry at 13:20-33, describing FIG. 3.

Curry - WO 2010/042545 - Curry is Merely a Call Handler

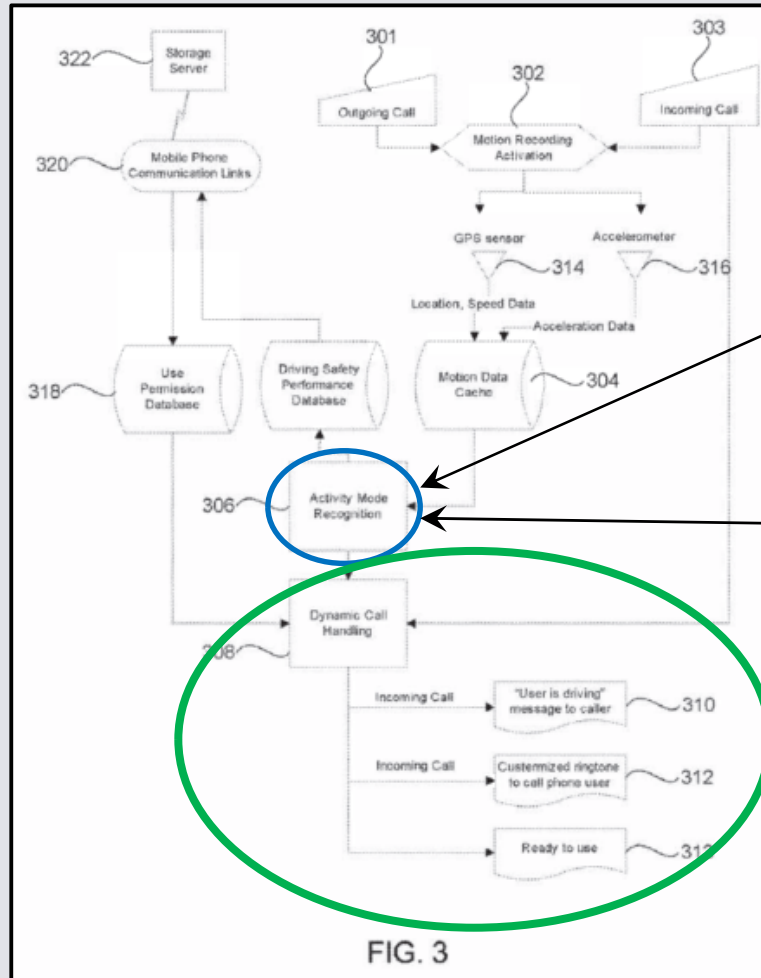


If the activity mode is recognized in real-time, the dynamical call handling module 308 can allow or disallow users to receive or make a call, text a message play games, or use other components or software programs on a mobile computing device such as a mobile phone. For an incoming call, a "user is driving" message 310 may be sent to the caller or other appropriate response messages may be similarly programmed and sent based on the collected data. Dependent on the pre-specified priority of a caller, the cell phone user can be notified by different ringtones 312 for different callers so that a decision can be made if the cell phone user needs to pull over to receive the call, or ignore the current in-coming call and make a call back after the user arrives at his/her destination. The dynamical call handling module 308 also determines if the cell phone is allowed to function based on use permission data 318.

The use permission data 318 can be communicated to the mobile computing device through the mobile phone communication link 320 from a computer or server 322, as previously discussed. Data from the motion data cache 304 and the activity mode recognition module 306 can be transmitted to a local driving safety performance database 324. The collected driving safety information can be sent back to the server 322 through mobile phone communication links 320. If the use permission database, activity mode

Curry at 14:5-23, describing FIG. 3.

Curry - WO 2010/042545 - Curry is Merely a Call Handler



Call handling may be based on raw sensor data or external data, not derived driving information associated with vehicle behavior.

data cache 304 for each pre-specified sampling interval. The activity mode recognition module 306 can use recorded time stamped data to estimate the type of activity: driving, walking, running or remaining substantially still. If no sufficient data are available to identify the activity mode with high confidence, the estimation result is temporally marked as unknown, and the activity mode recognition module 306 can wait for more motion data to make final estimations with high confidence.

If the activity mode is recognized in real-time, the dynamical call handling module 308 can allow or disallow users to receive or make a call, text a message play games, or use other components or software programs on a mobile computing device such as a mobile phone. For an incoming call, a "user is driving" message 310 may be sent to the caller or other appropriate response

To detect the complexity of a driving situation/context, the activity mode recognition module 306 can use a number of data sources, such as the motion data cache 304, traffic incident reports from public or private traffic information providers, real-time traffic information from roadside sensors, and local traffic data exchanges through vehicle-to-vehicle communications. A statistical model can be used to estimate and classify the complexity of driving situations and driving attention needs, and then accordingly prevent the cell phone use under complex/critical driving contexts.

Curry at 13:31-14:8; 15:24-31, describing FIG. 3.

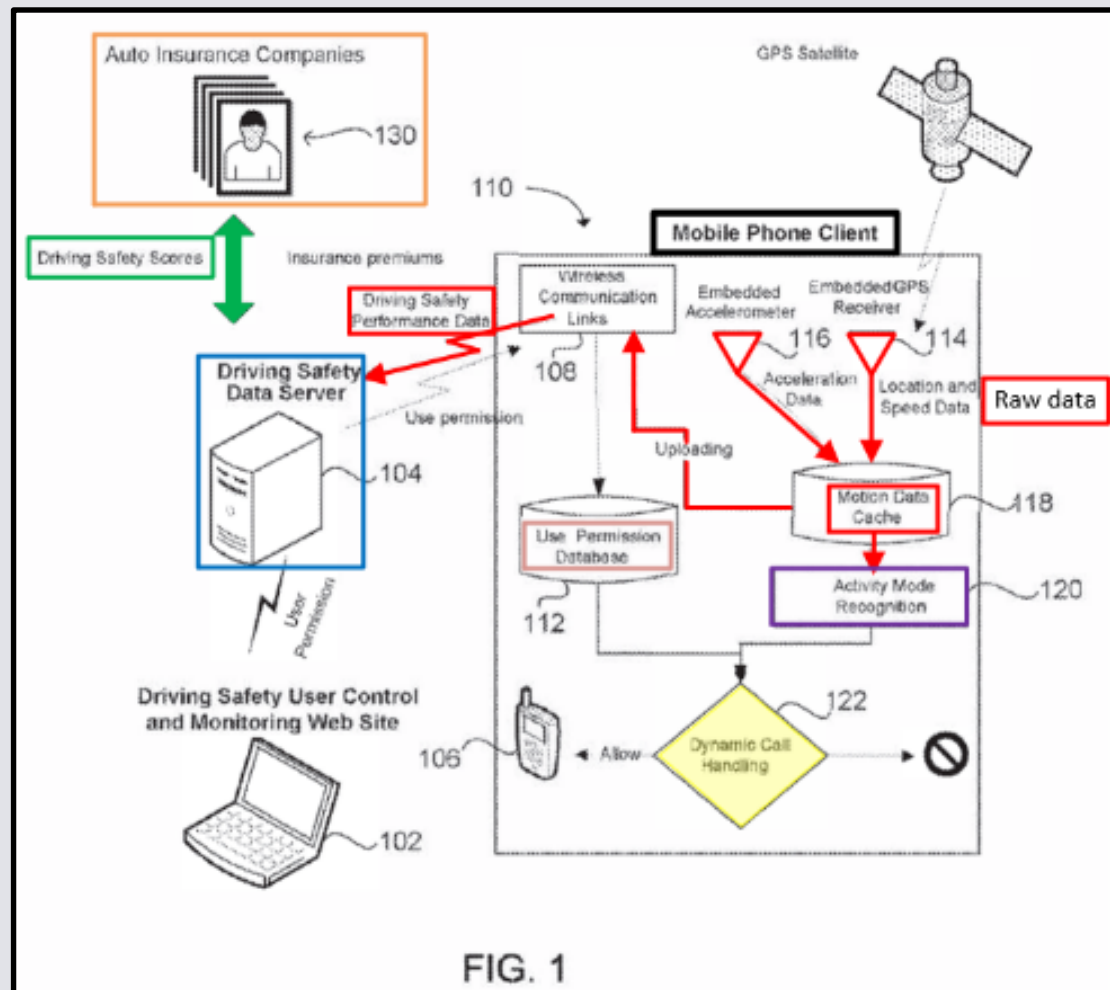
Curry – WO 2010/042545 – Curry is Merely a Call Handler

Nothing in Curry discloses otherwise:

- FIG. 1 discloses Curry's overall system and method for preventing cell phone use while driving.
- FIG. 2 discloses the functionality of Curry's "Driving Safety User Control and Monitoring Website," including score evaluation, external to Curry's phone.
- FIG. 3 discloses Activity Mode Recognition and Dynamical Call Handling performed by Curry's phone.
- FIG. 4 discloses Curry's recording period at the start of an outgoing or incoming phone call for post-processing at Curry's server.
- FIG. 5 discloses a flowchart for Activity Mode Recognition by Curry's phone.
- FIG. 6 discloses a flowchart for Curry's overall process of Activity Mode Recognition and Dynamical Call Handling by Curry's phone.

Curry at FIGs. 1-6.

Curry - WO 2010/042545 (Preventing Cell Phone Use)



Curry's phone collects **raw sensor data** and sends it to **Curry's server**, which processes the **raw sensor data**, calculates scores, and **shares scores** with **third parties**. Insurance premiums are sent back to the server according to **associated scores** over a selected time period. Curry at 12:19-13:19, FIG. 2.

Curry's phone uses the **raw sensor data** to determine and combine **activity mode** and with **use permission** data for **dynamical call handling**. Curry at 7:30-10:12, FIG. 1.

Curry - WO 2010/042545

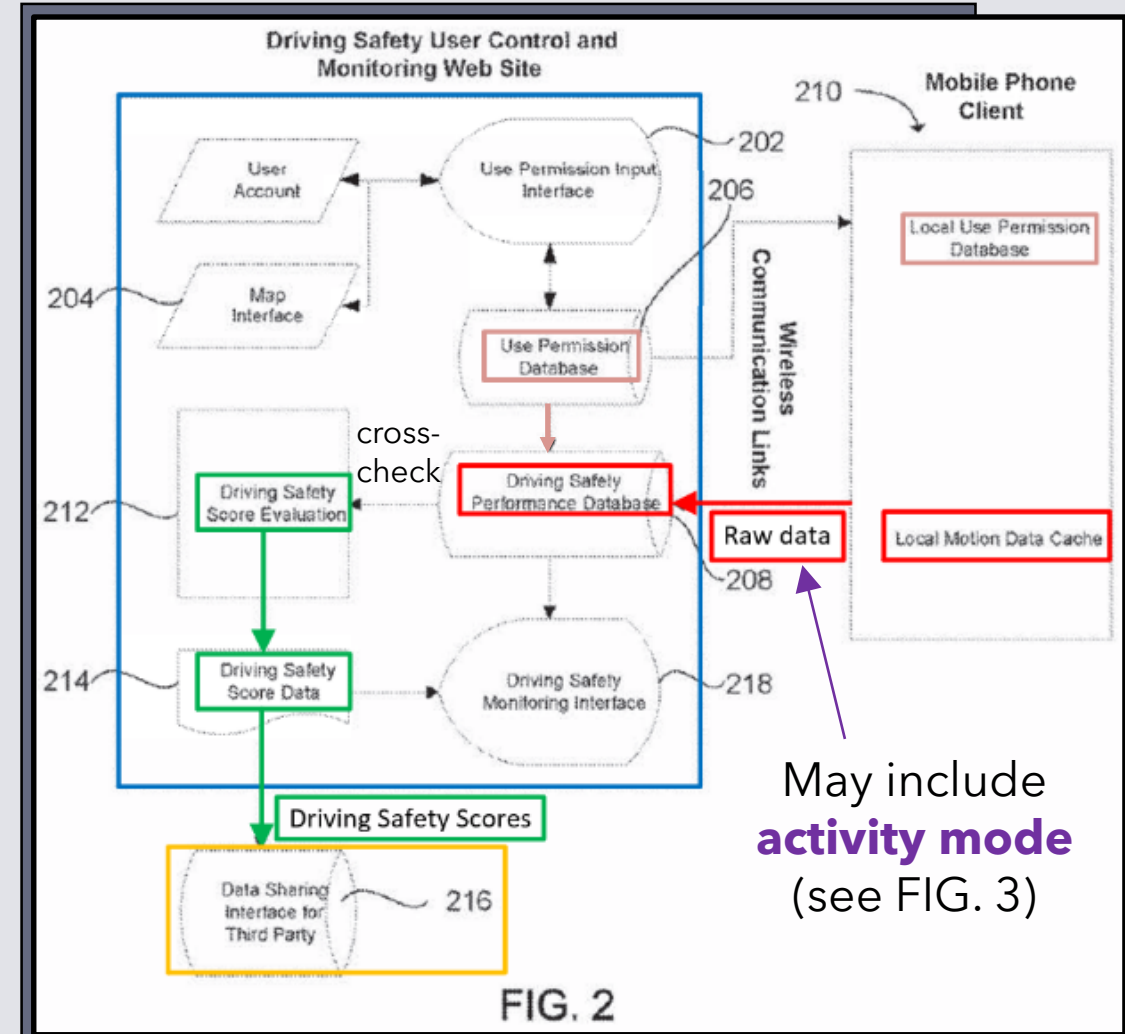
FIG. 2 illustrates a flow chart depicting a user permission management and driving safety monitoring system located on a web server. In one example

The motion data from a mobile phone can be transmitted to the driving safety performance database in the data server 208.

The safety performance data and use permission data can be cross-checked with each other and used in a later driving safety score evaluation module 212. For example, an initial driving score can be set as 100 points for a selected period, such as the period in which the car is in motion (i.e. the trip), or for a set period such as a day. Point deductions from the initial driving score can be determined by the relationship between types of driving safety violations and traffic accidents. For example, 1-10 mph over the speed limit may deduct 20 points, and 11-15 mph over the speed limit may deduct 30 points from the score. In addition, unsafe behaviors of talking-while-driving and texting-while-driving can be accordingly associated with different point penalties. The score over a selected time period (e.g. 1 year or 2 years) can be compiled and summarized to form a driving safety score. For example, the score may be an average of each

driving score over the time period. The driving safety score data 214 can be shared with a third party through a data sharing interface 216 such as database or XML format. A parent, employer, or insurer may review the driving performance and resulting safety score of a driver through a driving safety monitoring graphical interface 218.

Curry's server processes **raw sensor data from Curry's phone's local motion data cache**, calculates **scores**, and **shares scores** with **third parties**.



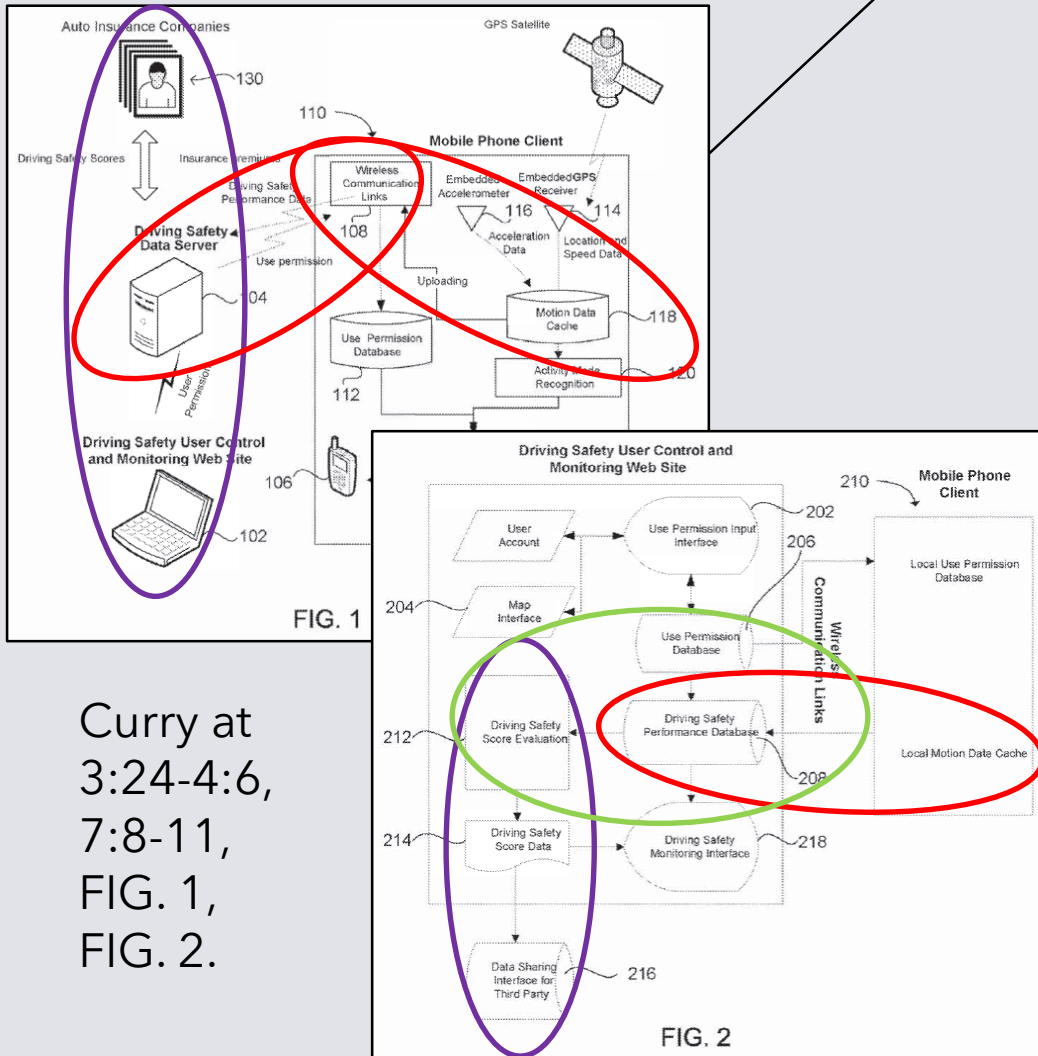
Curry at 12:19-13:19, FIG. 2.

Curry's phone uses **raw sensor data** for **Activity Mode Recognition** and **Dynamical Call Handling**. Even if Curry did not perform **Dynamical Call Handling**, as indicated as exemplary **here**, **Curry's phone** would still only determine **activity mode** and send **activity mode** and **raw sensor data** to **Curry's server** for processing. Curry at 13:20-14:26, FIG. 3.

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Curry - WO 2010/042545 - Server Processes Raw Sensor Data From Phone's Motion Data Cache



Curry at
3:24-4:6,
7:8-11,
FIG. 1,
FIG. 2.

The motion data cache can also be used to record the location, speed, and acceleration of the mobile wireless computing device each time a phone call is transmitted from or received by the wireless device. The data in the motion data cache can be transmitted to and stored on the data server. The data in the motion data cache can be compared with the user permission data to enable a driver safety statistic to be calculated based on when and where the wireless computing device was used and the motion of the device. The driver safety statistic may be decreased for certain user behaviors, such as use of the device while driving a vehicle, and use of the device during restricted time periods. In addition, the wireless device may collect data during periods other than when phone calls are answered or made. For example, the wireless device may collect speed and location information and report that information back to the data server. The driver safety statistic can also be decreased based on driving behavior, such as speeding, abnormal acceleration, abnormal deceleration, and taking sharp turns. The safety statistic can be reported to or calculated at the data server.

texting with mobile phones while driving. In one embodiment, the driving safety data can be recorded in mobile phones and then transmitted to a centrally managed data server through wireless communication links, such as GSM/GPRS. Usage restrictions on mobile phones, such as permissible traffic

Curry - WO 2010/042545 -
Server Processes Raw Sensor Data from Phone's Motion Data Cache

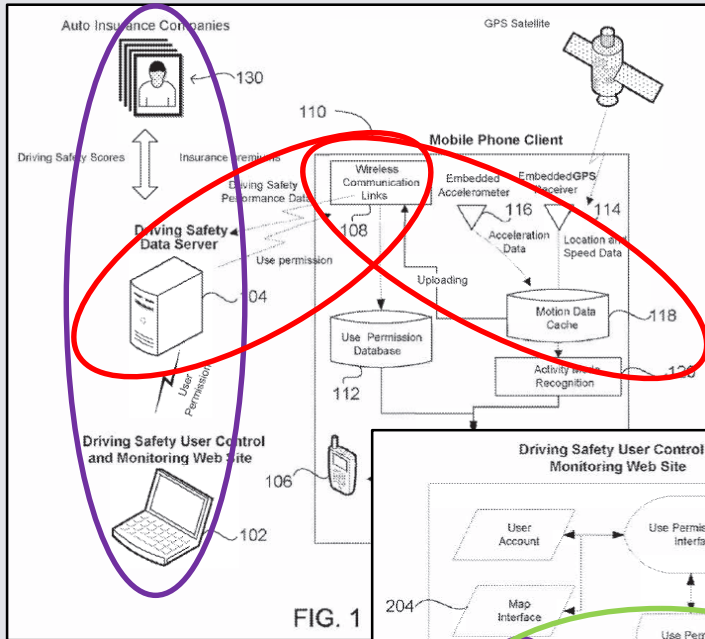


FIG. 1

Curry at
FIGs. 1, 2.

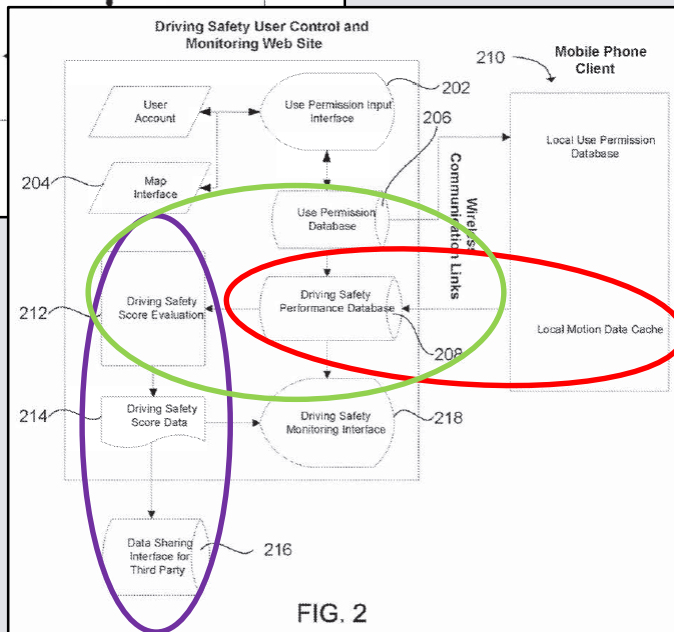


FIG. 2

The mobile phone client 110 utilizes the GPS 114 and accelerometer 116 sensors embedded in mobile phones to track location, speed and acceleration data of a driver. The communication links available in the mobile phone can be used to transit driving safety performance data to a central data server. The

Curry at
11:15-18.

The motion data from a mobile phone can be transmitted to the driving safety performance database in the data server 208.

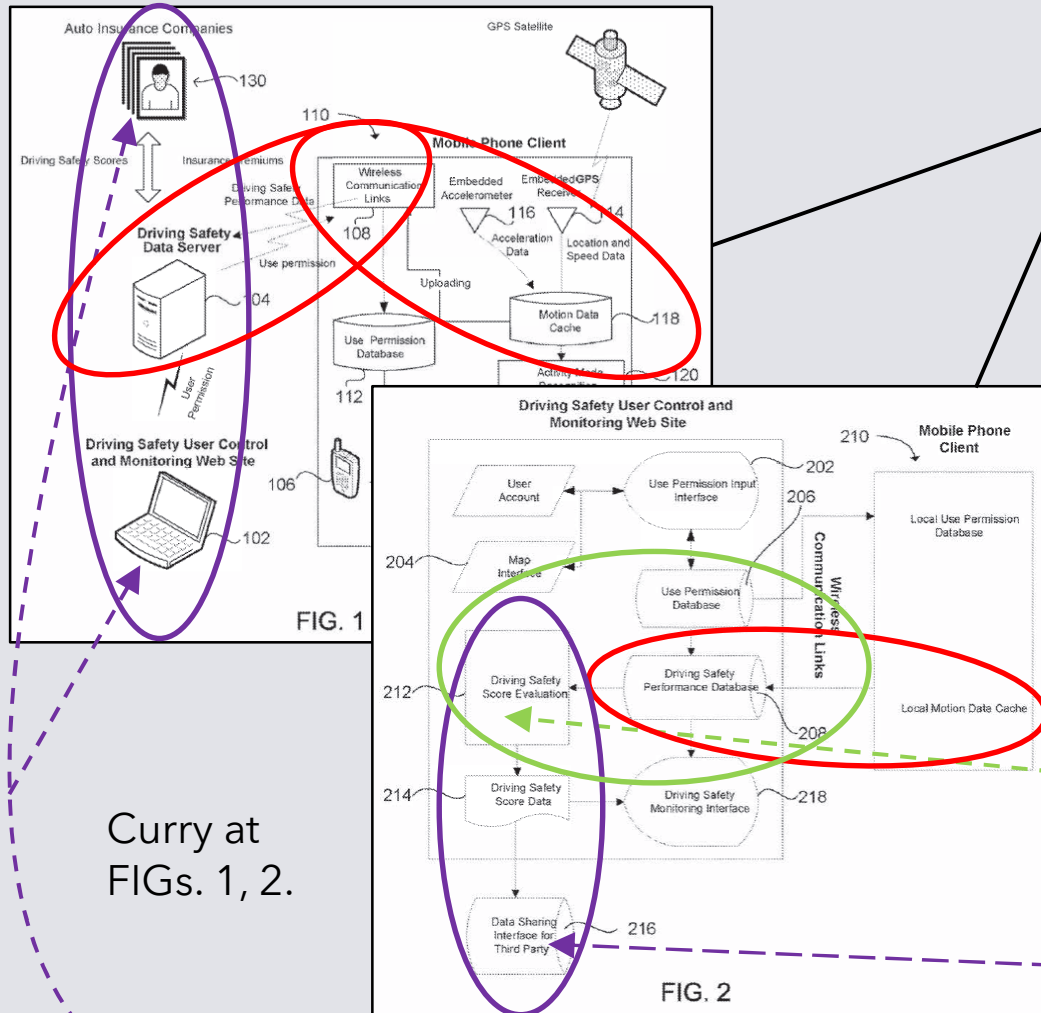
The safety performance data and use permission data can be cross-checked with each other and used in a later driving safety score evaluation module 212. For example, an initial driving score can be set as 100 points for a selected period, such as the period in which the car is in motion (i.e. the trip), or for a set period such as a day. Point deductions from the initial driving score can be determined by the relationship between types of driving safety violations and traffic accidents. For example, 1-10 mph over the speed limit may deduct 20

Curry at
13:1-9.

to designated mobile phones. A driving safety evaluation module can be used to perform a statistical analysis on collected raw driving data. The evaluation module can then calculate corresponding safety scores. The safety scores can be used by consumers and insurance agencies to determine insurance premiums

Curry at
7:13-15.

Curry - WO 2010/042545 - Server Processes Raw Sensor Data from Phone's Motion Data Cache



Motion data recording

When a call is made or received using a mobile phone 106, the mobile phone client 110 can record location, speed and acceleration data from sensors embedded in the wireless device, such as a GPS sensor 114 and accelerometer 116. The data can be recorded to a local motion data cache 118 for further processing. The local data cache can be used to store raw data for an extended time period of time in order to provide sufficient information for a user activity mode recognition program 120.

...

Motion data uploading

Through mobile phone communication links, motion data and activity mode estimation results of a user of the mobile phone 106 can be transmitted to the driving safety data server 104, and further displayed through an interactive user control website to enable visualization of possible violations of mobile phone use or unsafe driving behavior such as speeding, abnormal deceleration and sharp turns.

Safety score evaluation

Based on a statistical analysis method, the raw driving performance data of a user of the mobile phone 106 can be processed to provide a driving safety index or score for the user.

Safety evaluation data sharing

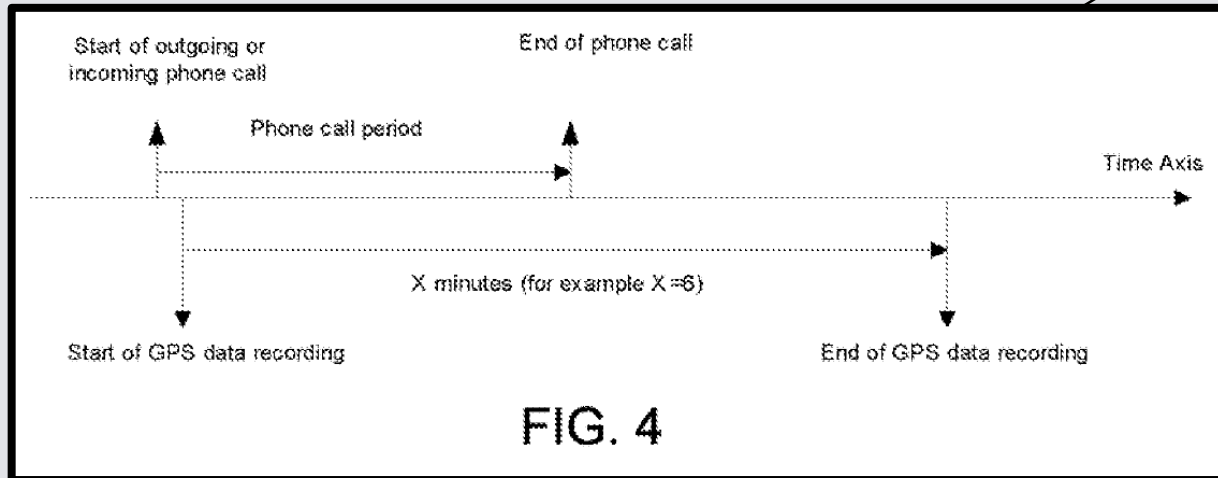
Through a data exchange server or a data exchange interface, a system user can share the safety score of the user of the mobile phone 106 with a third party such as an insurance company 130 to obtain insurance premiums. The

Curry at
8:29-9:3.

Curry at
9:22-33.

Curry at
10:2-5.

Curry - WO 2010/042545 - Recording Period is Untethered from Driving and is Used for Post-Processing by Curry's Server



- Recording is triggered by phone call, but recording is regardless of driving or length of call.
- Identifies "risky behaviors" as only "talking...or texting while driving."
- "Any unsafe driving behaviors can be penalized after the fact by deducting the driving safety score in the data server."

Curry at 16:7-33, FIG. 4.

FIG. 4 illustrates that the type of activity can be identified reliably using a post-processing technique of the present invention. Right after an incoming phone or text message is received or an outgoing phone call is made, the GPS sensor and accelerometer can start to record a motion time series. Regardless if the phone communication process (i.e. phone call or text message) is complete or not, the sensors can continue to collect the data for an extended time period, e.g. 6 minutes, to determine the type of the current activity. The risky behaviors of talking while driving or texting while driving may not be identified in real-time due to limited data, but the post-processing technique can deliver high-confidence estimation results. In this manner, any unsafe driving behaviors can be penalized after the fact by deducting the driving safety score in the data server, as previously discussed. In the extended data collection time period, if the user changes the activity mode, for example, from driving to fully stop, or from stop to driving, the system uses acceleration data from the accelerometer to determine the change of activity mode, and then further estimate the motion type before or after the change.

One of the key challenges is how to distinguish driving versus walking. In walking mode, talking through the mobile phone can be allowed, but texting while walking should be discouraged for safety concerns. In driving mode, both talking and texting actions should be prevented. If only GPS data are used in activity mode recognition, it is easy to identify driving mode when the speed is high (e.g. greater than 15 miles/hour). However, when the moving speed is low, it is difficult to distinguish driving, walking or running modes. On the other hand, the accelerometer data can be used to effectively recognize walking and running modes. But when using accelerometer data only, it can be difficult to distinguish if the car/user is moving at a relatively constant speed or remaining substantially stationary.

Curry - WO 2010/042545 -

Curry's reference to "adjust[ing] a related safety score" refers to post-processing by Curry's server.

- Curry's statistical analysis and scoring is performed at the server or by a third party. Curry at 3:24-32, 4:1-6, 7:13-17, 9:22-10:12, 13:1-19, 16:16-18, FIG. 1, FIG. 2.
- Curry does not disclose its phone calculating, reporting, or sharing safety statistics or scores.
- Curry refers to "adjust[ing] a related safety score" in reference to post-processing by its server. Curry at 16:13-18, referencing 11:6-10.
- "[T]he activity mode recognition module can be used to...adjust the related safety score" does not say that the activity mode recognition module adjusts the related safety score. See Curry at 11:8-10.

Instead of merely relying on GPS data, the mobile phone client 110 first records the position, speed and acceleration data for a certain time period. For example, in one exemplary embodiment, the data may be recorded for a period of up to several minutes. The motion data can be recorded even after a phone call or text messages ends, as shown in FIG. 4. In the post-processing stage, the activity mode recognition module can be used to determine the context of a phone call to a selected user based on previously collected motion data, and adjust the related safety score for the user if a violation is identified. The system can be used to prevent talking/texting while driving by penalizing the unsafe behavior after the fact. With better data availability, the user mode recognition program can better identify the context of a phone call, and make driving safety monitoring more reliable.

Curry at 11:3-14.

FIG. 4 illustrates that the type of activity can be identified reliably using a post-processing technique of the present invention. Right after an incoming phone or text message is received or an outgoing phone call is made, the GPS sensor and accelerometer can start to record a motion time series. Regardless if the phone communication process (i.e. phone call or text message) is complete or not, the sensors can continue to collect the data for an extended time period, e.g. 6 minutes, to determine the type of the current activity. The risky behaviors of talking while driving or texting while driving may not be identified in real-time due to limited data, but the post-processing technique can deliver high-confidence estimation results. In this manner, any unsafe driving behaviors can be penalized after the fact by deducting the driving safety score in the data server, as previously discussed. In the extended data collection time period, if the user changes the

Curry at 16:7-18.

Curry - WO 2010/042545

Curry's phone determines an activity mode from a fetched snapshot of sensor data to handle a call

Curry discloses challenges and difficulties in determining activity mode, so it uses both fetched accelerometer and GPS sensor data to do so, but Curry does not disclose its phone determining any abnormalities in fetched sensor data.

See Curry at FIG. 5, 16:23-17:14.

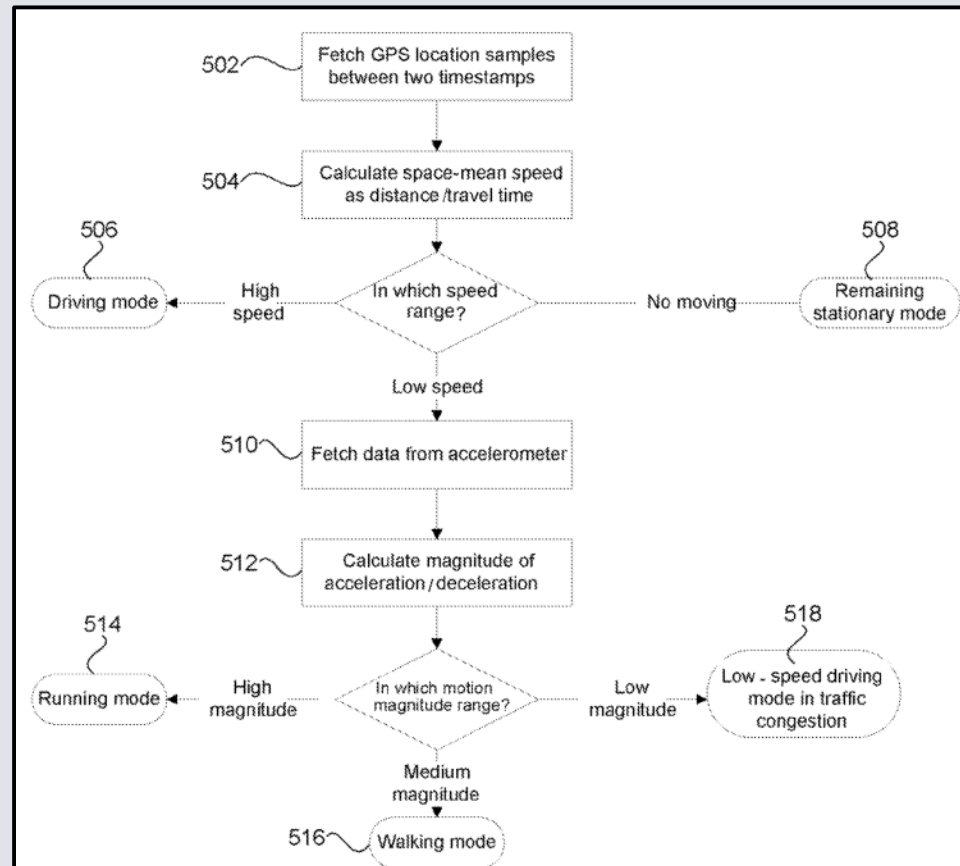


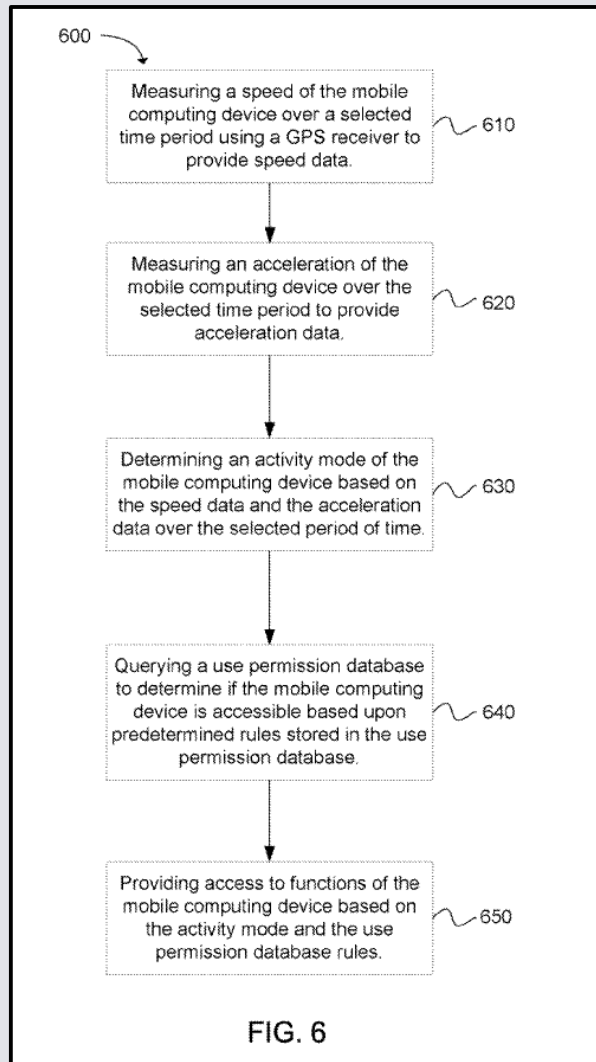
FIG. 5

One of the key challenges is how to distinguish driving versus walking. In walking mode, talking through the mobile phone can be allowed, but texting while walking should be discouraged for safety concerns. In driving mode, both talking and texting actions should be prevented. If only GPS data are used in activity mode recognition, it is easy to identify driving mode when the speed is high (e.g. greater than 15 miles/hour). However, when the moving speed is low, it is difficult to distinguish driving, walking or running modes. On the other hand, the accelerometer data can be used to effectively recognize walking and running modes. But when using accelerometer data only, it can be difficult to distinguish if the car/user is moving at a relatively constant speed or remaining substantially stationary.

FIG. 5 illustrates how to combine information from GPS and accelerometer sensors to precisely identify the type of activity. In FIG. 5, GPS location data are first fetched from different timestamps 502, and a space-mean speed measure is calculated 504 as traveled distance divided by time interval. If the space-mean speed is in a high-speed range, then the user is likely to be in driving mode 506. If the space-mean speed is substantially near zero or equal to zero, then the user is likely in "remaining stationary" mode 508. If a GPS measurement gives a median range space-mean speed (e.g. 1 mph- 15 mph), then accelerometer data need to be fetched 510 and the magnitude of acceleration/deceleration is calculated 512 for the same data collection time interval. If the motion magnitude is high, then the user can be identified as likely to be running 514. If the motion magnitude is in the medium range, then the user is walking 516, otherwise, the user is either driving at low speed purposely or driving under traffic congestion conditions 518. In accordance with an embodiment of the present invention, a

Curry - WO 2010/042545

Curry is merely a call handler or phone usage blocker, disclosing “a method...for monitoring and controlling the use of a mobile computing device...over a selected time period” (a snapshot), not a driving period.



conditions 518. In accordance with an embodiment of the present invention, a method 600 for monitoring and controlling the use of a mobile computing device is disclosed, as depicted in the flow chart of FIG. 6. The method includes the operation of measuring 610 a speed of the mobile computing device over a selected time period using a GPS receiver to provide speed data. An acceleration of the mobile computing device is also measured 620 over the selected time to provide acceleration data. An activity mode of the mobile computing device is determined 630 based on the speed data and the acceleration data gathered over the selected period of time. The activity mode can be selected from walking, running, driving, and stationary.

A use permission database can be queried 640 to determine if the mobile computing device is accessible based upon predetermined rules stored in the use permission database. As previously discussed, the use permission database contains predetermined temporal and geographic limitations at which the mobile computing device can be used. Access is provided 650 to functions of the mobile computing device based on the activity mode and the use permission database rules. Access to the mobile computing device can be provided to inbound calling, outbound calling, texting, and software applications on the mobile computing device based on the activity mode and the use permission database data. In addition, driver safety data can be communicated to a data storage device external from the mobile computing device. The driver safety data includes the acceleration data, speed data, and phone usage data to enable a usage of the mobile computing device to be monitored.

Curry at FIG. 6, 17:14-18:3.

Activity mode from a snapshot of raw sensor data, untethered to driving

Call handling/
phone usage
blocking

Raw sensor data and activity mode sent to external server for monitoring

Patent Owner's Expert Declaration Confirms that Curry is Merely a Call Handler that Relies on Its Server for Post- Processing for Driver Safety Scoring

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNITED SERVICES AUTOMOBILE ASSOCIATION,
Petitioner,

v.

AUTO TELEMATICS LTD.,
Patent Owner.

Case IPR2023-00857
Patent No. 10,198,879 B2

See Wilson Dec. for IPR2023-00857/00911 at ¶¶68, 75-76, 80-82, 88, 127, 137, 156-159.

81. Curry's server (not phone) may use such information to assist in scoring a driver and determining use permission policies. *See, e.g., id.*, 13:1-19. Thus, when Curry's user activity mode recognition program later determines that the user is driving during a call, a call handling program may then control (e.g., limit or prohibit) phone operation using these scores and policies. *Id.*, 8:4-27, 9:5-20.

127. Instead, Curry, at most, discloses a call handling program that is limited to handling a call/text at the time the call/text is received or made. It is clear from the disclosure of Curry that the role of the recording is to record data for later processing off the phone to analyze driver safety at the server, not on the phone. In my opinion, the recording period of Curry does not start a driving period as claimed; it merely discloses the start of a recording period, not the start of the period in which the vehicle is being driven. USAA-1005 at 11:3-7; 16:8-12; FIG. 2.

159. Curry's mobile phone simply does not perform other processing related to the raw sensor data, which instead is performed by Curry's remote server upon transmission. A full reading of Curry's specification shows there is no explicit support for any other sensor data processing by Curry's phone, including calculation of driver scores. A POSITA would have had no motivation, suggestion, teaching, or

Patent Owner's Expert Declaration – Confirms Curry Does Not Disclose Phone Processing Sensor Data During Driving Period

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNITED SERVICES AUTOMOBILE ASSOCIATION,
Petitioner,

v.

AUTO TELEMATICS LTD.,
Patent Owner.

Case IPR2023-00857
Patent No. 10,198,879 B2

Wilson Dec. for IPR2023-
00857/00911 at ¶¶83-84.

83. Because Curry addresses the problem and dangers associated with distracted driving caused by mobile device usage, it need not (and does not) disclose monitoring how a vehicle is being driven at all times. Curry does not disclose any data collection unrelated to a phone call, and specifically does not disclose any time period for data collection, other than a period starting with a phone call. Rather than tracking a user's driving information from the start of and throughout a driving period, the Curry system triggers all motion data collection upon the initiation or receipt of a call at the mobile device.

84. Further, while Curry's mobile device transmits certain collected raw data to a remote server, the Curry mobile device does not derive any driving information from the data collected from sensors on the mobile device, much less driving information that is "associated with how the vehicle is driven," and likewise does not store a selection of any such derived driving information in memory on the device, all as required by claim 1 of each of the '879 and '271 patents.

Rabu - US Pat. No. 8,682,399 (Ex. 1013)

Rabu determines Docking Status (Holder Status + Holder Motion Status), Indicating Whether a Holder is Located in a Moving or Stationary Vehicle

(12) **United States Patent**
Rabu

(54) **DETECTING DOCKING STATUS OF A PORTABLE DEVICE USING MOTION SENSOR DATA**

(75) Inventor: **Stanley Rabu**, Sunnyvale, CA (US)

(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1134 days.

(21) Appl. No.: **12/638,454**

(22) Filed: **Dec. 15, 2009**

(65) **Prior Publication Data**
US 2011/0141006 A1 Jun. 16, 2011

(51) Int. Cl. **H04M 1/00** (2006.01)

(52) U.S. Cl. **USPC** 455/569.2; 455/550.1; 455/566

(58) **Field of Classification Search**
USPC 455/550.1, 566, 569.2, 575.1, 575.6, 455/575.9, 90.3, 379/433.04
See application file for complete search history.

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(10) Patent No.: **US 8,682,399 B2**

(45) Date of Patent: **Mar. 25, 2014**

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* cited by examiner
Primary Examiner — Ping Hsieh
(74) *Attorney, Agent, or Firm* — Jennifer Loh

(57) **ABSTRACT**
Methods for operating a portable media device are provided. The method includes determining an orientation angle of the portable media device and a frequency spectrum associated with a motion of the portable media player. Based on the orientation angle and the frequency spectrum, the portable media player can determine a motion status and select a mode of operation based on the motion status. In addition, the method also includes determining whether the portable media player is in a dock, resting on a surface, or being handled by a person. The method further includes determining whether the portable media player is located in a moving vehicle, in a stationary vehicle, being held by a moving person, or being held by a stationary person.

23 Claims, 8 Drawing Sheets

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graph LR
    PMD400[PMD 400] --- SD406[STORAGE DEVICE 406]
    PMD400 --- GPS405[GPS 405]
    PMD400 --- GYRO407[GYROSCOPE 407]
    PMD400 --- ACCEL409[ACCELEROMETER 409]
    SD406 --- PROC404[PROCESSOR 404]
    GPS405 --- PROC404
    GYRO407 --- PROC404
    ACCEL409 --- PROC404
    PROC404 --- UI408[USER INTERFACE 408]
```

1

USAA 1013

(54) DETECTING DOCKING STATUS OF A PORTABLE DEVICE USING MOTION SENSOR DATA

Rabu at Title.

"The method includes determining...a frequency spectrum associated with a motion of the [PMD]...[to] ...determine a motion status and select a mode of operation based on the motion status."
Rabu at Abstract.

(57) **ABSTRACT**
Methods for operating a portable media device are provided. The method includes determining an orientation angle of the portable media device and a frequency spectrum associated with a motion of the portable media player. Based on the orientation angle and the frequency spectrum, the portable media player can determine a motion status and select a mode of operation based on the motion status. In addition, the method also includes determining whether the portable media player is in a dock, resting on a surface, or being handled by a person. The method further includes determining whether the portable media player is located in a moving vehicle, in a stationary vehicle, being held by a moving person, or being held by a stationary person.

status of the PMD. In some embodiments, the motion status may be a combination of a PMD holder status and a PMD holder motion status. The holder status can indicate how the PMD is being held, e.g., whether the PMD is docked in a dock, whether the PMD is resting on a surface, or whether the PMD is being held by a person. The holder motion status can indicate whether the holder, e.g., dock, the person, or the surface, is located in a moving vehicle or a stationary vehicle or in the case when the holder is a person, the holder motion status can indicate whether the person is walking or stationary.

Rabu at 1:42-52.

Rabu - US Pat. No. 8,682,399 - Holder Motion Status is Determined by Frequency Spectra

(12) **United States Patent**
Rabu

(10) **Patent No.:** **US 8,682,399 B2**
(45) **Date of Patent:** **Mar. 25, 2014**

(54) **DETECTING DOCKING STATUS OF A PORTABLE DEVICE USING MOTION SENSOR DATA**

(75) **Inventor:** Stanley Rabu, Sunnyvale, CA (US)

(73) **Assignee:** Apple Inc., Cupertino, CA (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1134 days.

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(51) **Int. Cl.**
H04M 1/00 (2006.01)

(52) **U.S. Cl.**
USPC 455/569.2; 455/550.1; 455/566

(58) **Field of Classification Search**
USPC 455/550.1, 566, 569.2, 575.1, 575.6, 455/575.9, 90.3; 379/433.04
See application file for complete search history.

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Ogawa, A., et al., "Identification of human activity modes with wearable sensors for autonomous human positioning system", 22nd Asian Conference on Remote Sensing, Centre for Remote Imaging, Sensing and Processing (CRISP), National University of Singapore, Singapore Institute of Surveyors and Valuers (SISV), Asian Association on Remote Sensing (AARS), Nov. 5-9, 2001, Singapore, 4 pages.
* cited by examiner
Primary Examiner — Ping Hsieh
(74) *Attorney, Agent, or Firm* — Jennifer Loh

(57) **ABSTRACT**
Methods for operating a portable media device are provided. The method includes determining an orientation angle of the portable media device and a frequency spectrum associated with a motion of the portable media player. Based on the orientation angle and the frequency spectrum, the portable media player can determine a motion status and select a mode of operation based on the motion status. In addition, the method also includes determining whether the portable media player is in a dock, resting on a surface, or being handled by a person. The method further includes determining whether the portable media player is located in a moving vehicle, in a stationary vehicle, being held by a moving person, or being held by a stationary person.

23 Claims, 8 Drawing Sheets

PMD 400

406

STORAGE DEVICE

405

GPS

407

GYROSCOPE

408

PROCESSOR 404

409

ACCELEROMETER

USER INTERFACE

1

USAA 1013

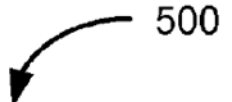
In some embodiments, the PMD can use inputs from internal motion sensors, such as an accelerometer and a gyroscope, to determine an orientation angle of the PMD. The orientation angle can be used to determine the holder status. In some embodiments, the PMD can determine a frequency spectrum associated with a current motion of the PMD (and holder). Based on the determined frequency spectrum, the PMD can determine the holder motion status. In addition, the PMD can select a mode of operation based on the holder status and the holder motion status. Every motion has a particular frequency spectrum associated with that motion. For

Rabu at 2:61-3:4.

56

AT-2004 DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

Rabu - US Pat. No. 8,682,399 - Rabu's Modes Depend on Both Holder Status and Holder Motion Status (see Rabu at FIGs. 6-10)



500

PMD Modes	Description
A	PMD handheld while located in a moving vehicle.
B	PMD resting in a moving vehicle
C	PMD handheld while person is in motion.
D	PMD docked in a moving vehicle
E	PMD docked in a desktop dock and stationary
F	PMD resting on a stationary surface
G	PMD docked in a stationary vehicle

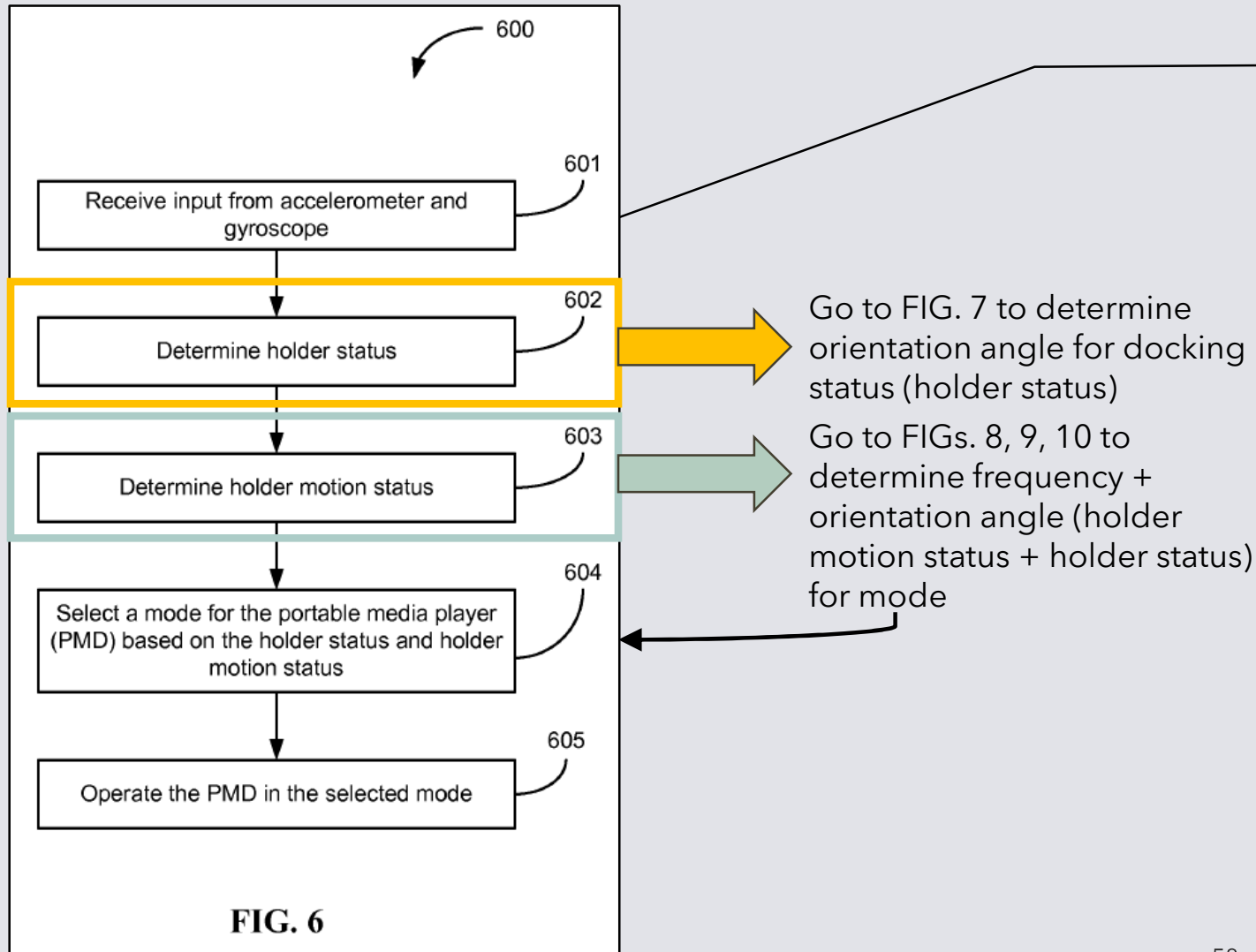
FIG. 5

Rabu at 5:53-6:17, FIG. 5.

In some embodiments, the PMD may operate in different modes depending on the PMD's motion status. FIG. 5 shows a table 500 listing some of the modes of operation for a PMD (e.g., PMD 400 of FIG. 4). The list of modes shown is for illustrative purposes only and one skilled in the art will realize that many other modes in addition to the listed modes or in lieu of the listed modes are possible. Some embodiments may also provide fewer modes than those listed.

Mode A can be selected when it is determined that the PMD is being held by a person (holder status) and that the person is located in a moving vehicle (holder motion status). **Mode B** can be selected when it is determined that the PMD is resting on a surface and that the surface is located in a moving vehicle, e.g., passenger seat of a moving car. **Mode C** can be selected when it is determined that the PMD is being held by a person and the person is moving, but the person is not moving as fast or in a pattern corresponding to a moving vehicle, e.g., walking, running, or jogging. **Mode D** can be selected when it is determined that the PMD is docked in a car dock (e.g., based on orientation angle) and the dock is located inside a moving vehicle (e.g., based on accelerometer information and GPS signals). **Mode E** can be selected when it is determined that the PMD is docked in a desktop dock and the desktop dock is resting on a stationary surface, e.g. a desk. **Mode F** can be selected when it is determined that the PMD is resting on a stationary surface, e.g., laying flat on a desk. **Mode G** can be selected when it is determined that the PMD is docked in a vehicle dock and that dock is located in a stationary vehicle. As described above, once the processor determines the holder status and the holder motion status, the processor can select any one of the modes described above and operate the PMD in that mode. In some embodiments,

Rabu - US Pat. No. 8,682,399 - Holder and Holder Motion Status *Together* are the Crux of Rabu



Examples of techniques for determining the motion status will now be described. These techniques can be implemented, e.g., in PMD 400 of FIG. 4. FIG. 6 is a flow diagram of a process 600 for operating the portable media device (PMD) according to an embodiment of the present invention. At block 601, the PMD can receive input from one or more motion sensors, e.g., accelerometer and gyroscope. In some embodiments, the input can indicate orientation angle and motion information of the PMD. At block 602, the PMD can determine a holder status. For example, in one embodiment, if the orientation angle is 15° with the vertical, the PMD is held in a dock, if orientation angle is 90° to vertical the PMD is resting on surface, and if the orientation angle is varying then the PMD is being handled by a person. FIG. 7 described below, illustrates a process for determining the holder status. At block 603, the PMD can determine a holder motion status. For example, in one embodiment, the PMD can determine whether it is in a moving vehicle, in a stationary vehicle, being handled by a moving person, or being handled a stationary person. This determination can be made based on determining a frequency spectrum associated with the holder motion and comparing that to frequency spectra of known motions. FIGS. 8, 9, and 10, described below, illustrate various processes for determining the holder motion status.

Rabu at 7:7-30, FIG. 6.

Rabu – US Pat. No. 8,682,399 – To Determine Rabu’s Modes, First Holder Status Is Determined, Then Holder Motion Status

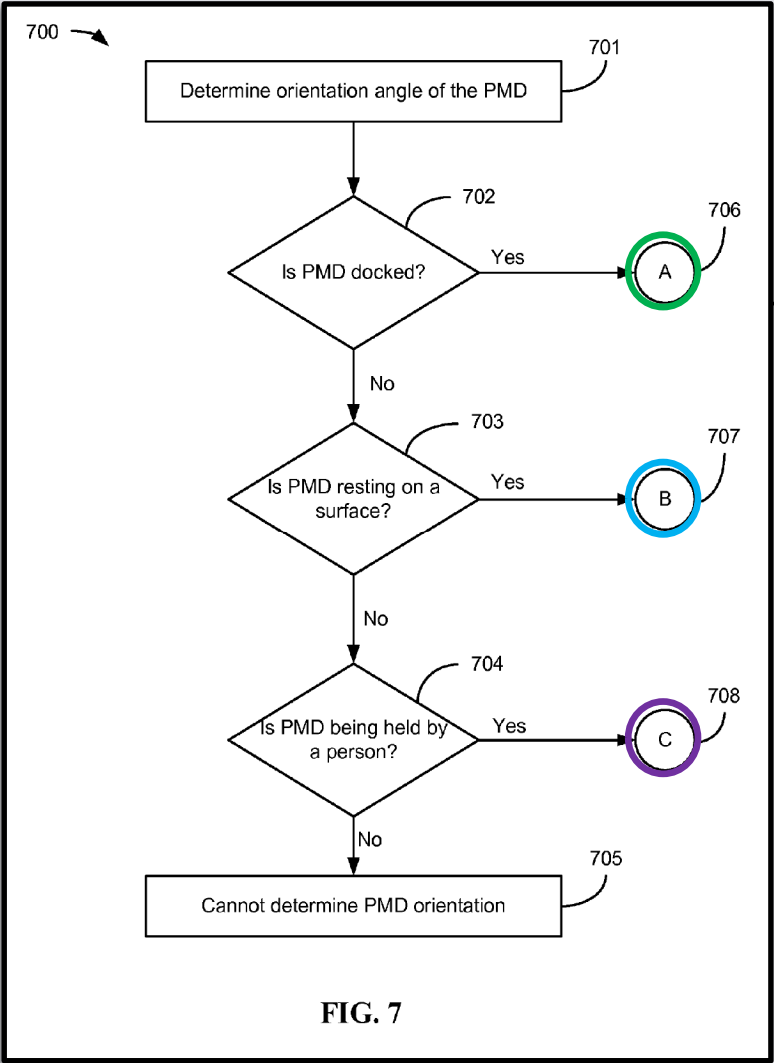


FIG. 7

FIG. 7 is a flow diagram of a process 700 for determining a holder status (e.g., block 603 of FIG. 6) of the portable media device according to an embodiment of the present invention. As described above, holder status can refer to the manner in which the PMD is held. In some embodiments, the orientation angle is used to determine the holder status. In other embodiments, other factors such as a status of the connector may be used to determine the holder status in addition to the orientation angle. At block 701, the PMD can determine

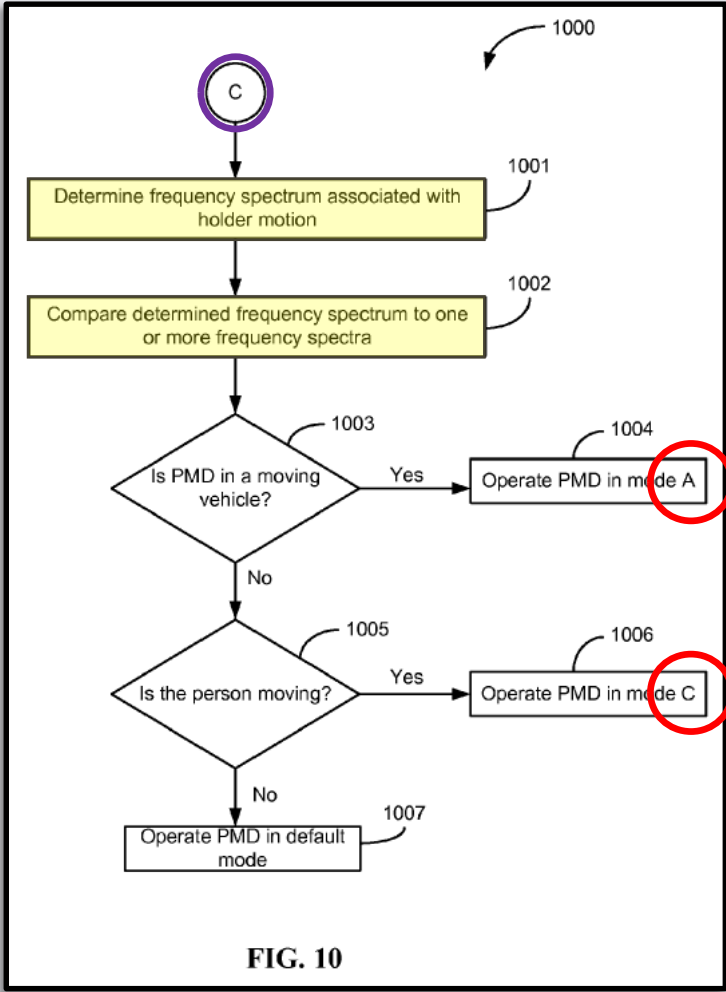
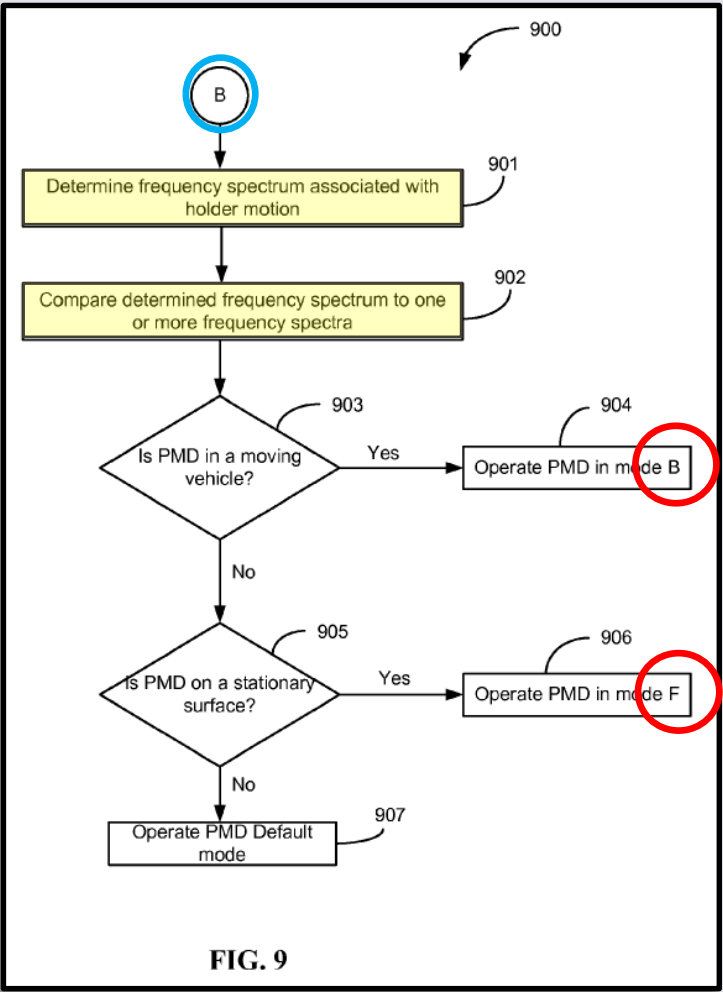
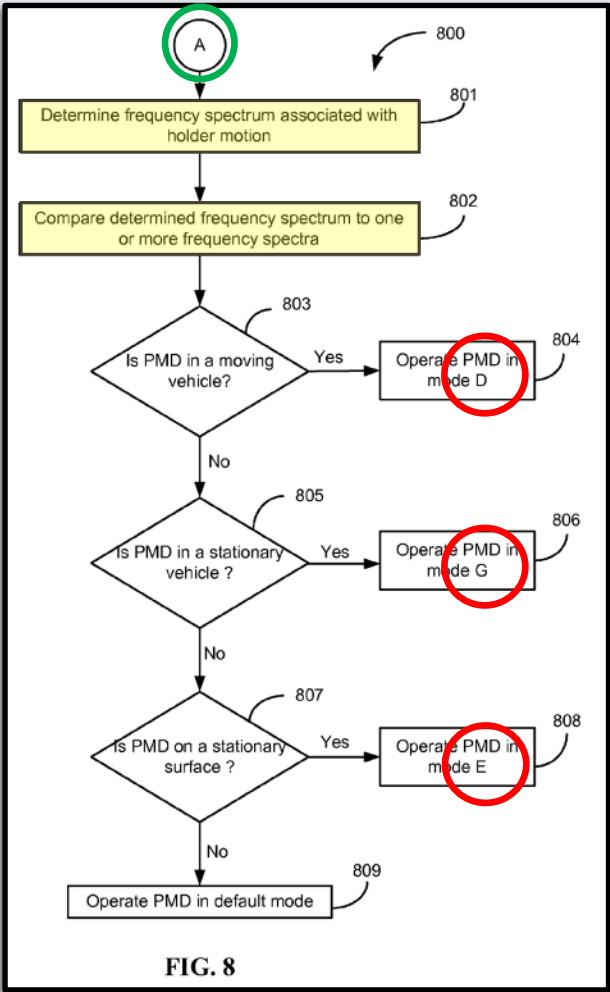
...

If at block 702 it is determined that the measured orientation angle corresponds to the orientation angle of the PMD when the PMD is docked, process 700 can end and transition to a process for determining the holder motion status at block 706. The various processes for determining holder motion statuses are described in detail below. If at block 702 it is determined that the measured orientation angle does not correspond to the orientation angle of the PMD when the PMD is docked, the PMD checks to see whether the measured orientation angle corresponds to the orientation angle of the PMD when the PMD is resting on a surface, at block 703. If at block 703 it is determined that the measured orientation angle corresponds to the orientation angle of the PMD when the PMD is resting on a surface, process 700 can end and transition to a process for determining the holder motion status at block 707. If at block 703 it is determined that the measured orientation angle does not correspond to the orientation angle of the PMD when the PMD is resting on a surface, the PMD, at block 704, checks to see whether the measured orientation angle corresponds to the orientation angle of the PMD when the PMD is being held by a person. If at block 704 it is determined that the measured orientation angle fluctuates between several values, the PMD can determine that it is being held by a person and process 700 ends and transitions to a process for determining the holder motion status at block 708. However, if the PMD is unable to determine its orienta-

Rabu at 8:12-67, FIG. 7.

Rabu - US Pat. No. 8,682,399 - Holder Motion Status

Rabu requires frequency spectra determination for all modes.
Rabu at 9:25-12:25, FIGs. 8-10 (illustrating modes A-G from FIGs. 5, 7).



Petitioner Repeatedly Cites to Rabu's Holder Motion Status Determination in IPR2023-00857 Petition

Rabu at 3:1-10 discusses the Rabu PMD "select[ing] a mode of operation based on the...holder motion status" which is determined by analyzing the PMD's frequency spectrum

Petitioner cites to this section at least at the following pages of its 00857 Petition:

- **10-13** Discussing Curry-Rabu phone as leveraging orientation "and motion data" to determine operating mode
- **8, 12, 14-15** Citing to Rabu Fig. 5 which describes switching operating modes for "fewer restrictions" based on determining that the phone is "docked in a moving vehicle" (as opposed to being "handheld while located in a moving vehicle")
- **15-16** Describing enhanced reliability of motion detection, generation and leverage of "more nuanced driving scores," and "adjustments to...operating modes"
- **23-27** Describing the determination of whether the Curry-Rabu phone is in a vehicle being driven (claim element [1.6])

Petitioner Repeatedly Cites to Rabu's Holder Motion Status Determination in IPR2023-00911 Petition

Rabu at 3:1-10 discusses the Rabu PMD "select[ing] a mode of operation based on the...holder motion status" which is determined by analyzing the PMD's frequency spectrum

Petitioner cites to this section at least at the following pages of its 00911 Petition:

- **12, 14** Discussing Curry-Rabu phone as leveraging orientation "and motion data" to determine operating mode
- **8, 12, 14-16** Citing to Rabu Fig. 5 which describes switching operating modes for "fewer restrictions" based on determining that the phone is "docked in a moving vehicle" (as opposed to being "handheld while located in a moving vehicle")
- **16-17** Describing enhanced reliability of motion detection, generation and leverage of "more nuanced driving scores," and "adjustments to...operating modes"
- **24-25, 29** Describing the determination of whether the Curry-Rabu phone is in a vehicle being driven (claim element [1.6])

Petitioner Repeatedly Cites to Rabu's Holder Motion Status Determination in IPR2023-00857 Petition

8:13 – 10:42 Discussing Rabu FIGs. 7-8 which rely on frequency spectra to determine the PMD's motion status in Rabu's governing methods.

Petitioner Cites to this Section at least at the following pages of its 00857 Petition:

- **11-12** Discussing Curry-Rabu phone as leveraging orientation “and motion data”
- **13-14** Describing POSITA's motivation to rely on Rabu's “orientation angle and motion status, and changing the phone's operating mode to account for that context”...“based on determining that the phone is ‘docked in a moving vehicle.’”
- **23-24, 27** Describing the determination of whether the Curry-Rabu phone is in a vehicle being driven (claim element [1.6])

Petitioner Repeatedly Cites to Rabu's Holder Motion Status Determination in IPR2023-00911 Petition

8:13 – 10:42 Discussing Rabu FIGs. 7-8 which rely on frequency spectra to determine the PMD's motion status in Rabu's governing methods.

Petitioner Cites to this Section at least at the following pages of its 00911 Petition:

- **12** Discussing Curry-Rabu phone as leveraging orientation "and motion data"
- **14** Describing POSITA's motivation to rely on Rabu's "orientation angle and motion status, and changing the phone's operating mode to account for that context"... "based on determining that the phone is 'docked in a moving vehicle.'"
- **24-25, 29** Describing the determination of whether the Curry-Rabu phone is in a vehicle being driven (claim element [1.6])

Petitioner Originally Relied on Rabu's Mode Shifting Capabilities as Motivation to Combine Curry with Rabu But Now Walks That Back

A person of ordinary skill in the art (“POSITA”)⁵ would have found obvious the integration of Rabu’s dock-status sensing and associated mode-shifting capabilities into Curry’s phone to promote safe driving. USAA-1003, ¶¶88-89. As explained below, the resulting Curry-Rabu device would define and determine different types of driving periods based on user inputs and sensor data, and restrict phone use and/or adjust driving scores depending on a type of driving period determined. *Id.*

For example, the Curry-Rabu phone would leverage orientation and motion data from its accelerometer to determine both vehicle motion and phone docking status upon a user accepting a phone call while the vehicle is in use, or manually switching from a stationary to driving activity mode through interactions with the phone’s user interface. USAA-1003, ¶89; USAA-1013, 3:1-10, 4:21-33, 8:13-10:42, 15:7-22, Figs. 1, 4-5, 7-8. Consistent with both Curry and Rabu, the Curry-Rabu phone would appropriately restrict phone interactions depending on the determined status. USAA-1005, 16:30-17:7, Figs. 3, 6; USAA-1013, 8:13-10:42, Fig. 5; USAA-1003, ¶89.

As explained below, the POSITA would have found relevant solutions and further motivations within Rabu, and would have expected success in incorporating Rabu’s solutions within Curry. USAA-1003, ¶94. For example, Rabu describes discerning phone usage context from accelerometer data indicating phone orientation angle and motion status, and changing the phone’s operating mode to account for that context. USAA-1013, 3:1-10, 4:21-33, Figs. 1, 4; USAA-1003, ¶94. For instance, Rabu’s Fig. 5 (below) and related description suggests switching operating modes based on determining that the phone is “docked in a moving vehicle.” USAA-1013, 1:36-2:14, 5:53-7:6, 8:13-10:42, 12:26-38, Figs. 5, 7, 8; USAA-1003, ¶94.

PMD Modes	Description
A	PMD handheld while located in a moving vehicle.
B	PMD resting in a moving vehicle
C	PMD handheld while person is in motion.
D	PMD docked in a moving vehicle
E	PMD docked in a desktop dock and stationary
F	PMD resting on a stationary surface
G	PMD docked in a stationary vehicle

USAA-1013, Fig. 5

IPR2023-00857
Pet. at 13-14.
See also
IPR2023-00911
Pet. at 14-15.

Petitioner's Expert Repeatedly Relied on Rabu's Mode Shifting Capabilities as Motivation to Combine Curry with Rabu

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Andrew William Wright

U.S. Patent No.: 10,198,879

Issue Date: February 5, 2019

Appl. Serial No.: 15/454,952

Filing Date: March 9, 2017

Attorney Docket No.: 36137-0027IP1

Title:

METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOUR

DECLARATION OF DR. WILLIAM R. MICHALSON

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: 28 April 2023

By: 

William R. Michalson, Ph.D.

1

USAA 1003

93. A POSITA would have readily found relevant solutions within Rabu, and would have expected success in incorporating Rabu's solutions within Curry. For example, Rabu explains at length that a smart phone processor leveraging a "generally conventional" accelerometer such as that found in Curry's phone can be used to determine both an orientation angle and motion status of the smart phone, for the purposes of discerning context associated with the phone's usage and changing the phone's operating mode in a manner that approximately accounts for that context. USAA-1013, 3:1-10, 4:21-33, Figs. 1, 4. For instance, as shown in Rabu's Fig. 5 (reproduced below), Rabu describes switching operating modes based on determining that the phone is "docked in a moving vehicle" (as opposed to being "handheld while located in a moving vehicle"). USAA-1013, 8:13-10:42, Figs. 5, 7, 8.

PMD Modes	Description
A	PMD handheld while located in a moving vehicle.
B	PMD resting in a moving vehicle
C	PMD handheld while person is in motion.
D	PMD docked in a moving vehicle
E	PMD docked in a desktop dock and stationary
F	PMD resting on a stationary surface
G	PMD docked in a stationary vehicle

USAA-1013, Fig. 5

Michalson Dec. for IPR2023-00857 at ¶93, citing Rabu at 3:1-10, 8:13-10:42, FIGs. 5, 7, 8.

See same for Michalson Dec. for IPR2023-00911 at ¶106 .

Petitioner's Expert Repeatedly Relied on Rabu's Mode Shifting Capabilities as Motivation to Combine Curry with Rabu

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Andrew William Wright
U.S. Patent No.: 10,198,879 Attorney Docket No.: 36137-0027IP1
Issue Date: February 5, 2019
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Dated: 28 April 2023 By: 
William R. Michalson, Ph.D.

1 USAA 1003

98. The Curry-Rabu combination would have increased user tolerance for Curry's monitoring techniques. USAA-1005, 7:5-22, 8:5-18, 11:3-14; USAA-1013, 1:36-2:14. For example, Rabu's docking status enabled a determination of when phone 106 is docked within a moving vehicle, which can then be inferred to mean that a user is not presently using phone 106 for texting when the vehicle is being driven. Rabu's docking status would have also improved Curry's use of an estimated context of mobile phone use in identifying unsafe driving behaviors. For example, the docking status would have enabled differentiation between (i) a user holding and using the phone while driving and (ii) using the phone while docked and while driving. The second scenario in this example is less likely to distract the user and less likely to be determined to represent an unsafe driving behavior.

Michalson Dec. for IPR2023-00857 at ¶98.
See also Michalson Dec. for IPR2023-00911 at ¶111.
See also Rabu at 5:53-6:17, FIG. 5 (docking status requires holder status and holder motion status with frequency analysis).

Petitioner's Expert Repeatedly Relied on Rabu's Mode Shifting Capabilities as Motivation to Combine Curry with Rabu

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Andrew William Wright
U.S. Patent No.: 10,198,879 Attorney Docket No.: 36137-0027IP1
Issue Date: February 5, 2019
Appl. Serial No.: 15/454,952
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Title: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOUR

DECLARATION OF DR. WILLIAM R. MICHALSON

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: 28 April 2023 By: 
William R. Michalson, Ph.D.

1 USAA 1003

102. The advantages of the Curry-Rabu combination discussed above would have motivated a POSITA to integrate Rabu's teachings into Curry's systems. This would have enabled a phone both to determine a start of a driving period based on user inputs and sensor data. The combination would have also enabled the phone to be removably attached to the vehicle via a dock while the vehicle is in use. Additionally, the docking status would have enabled the phone to adjust the phone's operating modes, make determinations of user driving behaviors, and generate safety scores. USAA-1005, 10:15-11:14, 13:20-16:22, 17:30-18:7, Figs. 3, 4, 6; USAA-1013, 24:8-3:10.

Michalson Dec. for IPR2023-00857 at ¶102. See also *id.* at ¶¶99-101.

Michalson Dec. for IPR2023-00911 at ¶115. See also *id.* at ¶¶113-114.

In Instituting this Proceeding, the Board Relied on Rabu's Determination of Mode

Trials@uspto.gov 571-272-7822	Paper 10 Date: December 19, 2023
UNITED STATES PATENT AND TRADEMARK OFFICE	
BEFORE THE PATENT TRIAL AND APPEAL BOARD	
UNITED SERVICES AUTOMOBILE ASSOCIATION, Petitioner,	
v.	
AUTO TELEMATICS LTD., Patent Owner.	
IPR2023-00857 Patent 10,198,879 B2	
Before GEORGE R. HOSKINS, FRANCES L. IPPOLITO, and SEAN P. O'HANLON, <i>Administrative Patent Judges</i> .	
O'HANLON, <i>Administrative Patent Judge</i> .	
DECISION Granting Institution of <i>Inter Partes</i> Review 35 U.S.C. § 314	

Next, we determine Petitioner has sufficiently explained that Rabu teaches “the mobile device is removably attached to the vehicle and the vehicle is in use,” as recited in the Determine Recitation, because:

(1) Rabu’s PMD can be docked and undocked to a holder on a vehicle;
(2) holder status can be calculated based on orientation angle; (3) the PMD can determine if the PMD is in a moving vehicle; and (4) the PMD selects a mode of operation based on the holder motion status.

In particular, Rabu teaches that a PMD may have a holder status, which can indicate how the PMD is being held and whether the PMD is in motion. *See* Ex. 1013, 2:52–60. Rabu discloses that

the PMD can determine holder status by calculating the orientation angle of the PMD with respect to a surface, e.g., ground, dock, etc. The value of the orientation angle can be used to determine the holder status. In some embodiments, the PMD can determine a frequency spectrum associated with its current motion based on inputs from the accelerometer and the gyroscope. Based on the determined frequency spectrum, the PMD can determine whether it is in a moving vehicle, in a stationary vehicle, being held by a moving person, or being held by a stationary person.

Id. at 1:66–2:8 (emphases added). Referring to Figures 1–3, Rabu further teaches that a PMD may be configured to connect to a dock (e.g., automobile dock, vehicle holder) and that the orientation angle of a PMD “when it is being held by a person will be different than the orientation angle when PMD 100 is docked in a dock.” *Id.* at 3:38–41, 3:59–67. Rabu further teaches that the PMD selects modes of operation based on the holder motion status. *Id.* at 2:8–11, 5:53–60, Fig. 5.

Inst. Dec.
at 29-30
for
IPR2023-
00857.
See also
Inst. Dec.
at 33-34
for
IPR2023-
00911.

Patent Owner's Expert Criticizes Reliability of Rabu's Frequency Spectra Analysis

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNITED SERVICES AUTOMOBILE ASSOCIATION,
Petitioner,

v.

AUTO TELEMATICS LTD.,
Patent Owner.

Case IPR2023-00857
Patent No. 10,198,879 B2

103. Although Rabu cites to Ogawa et al. (*id.* at 7:54-60) for “examples of motion spectra associated with different types of motion,” Ogawa’s disclosure presents limited experimentation (e.g., few trials, few subjects) and limited disclosure of determining differences between types of motion with like spectra. *See, generally*, Ex. AT-2003. Thus, in my opinion the overall accuracy of correctly determining motion status would be very limited for different mobile devices, drivers, vehicles, roadways, and situations, and the expectation of success in combining Rabu with Curry for improved mode determination would have been low for a POSITA attempting to implement the features of the claims of the ’879 and ’271 patents.

...

164. In particular, Rabu requires that the “determination [of activity mode is] made based on determining a frequency spectrum associated with the holder motion and comparing that to frequency spectra of known motions.” USAA-1013 at 7:26-28. Rabu continues: “[f]or example, a motion spectrum associated with a car does not show a marked peak at any frequency values, but the amplitude gets larger at around 6-9 Hz and 11-14 Hz.” *Id.* at 7:45-47, citing Ex. AT-2003 (Ogawa) at 4. However, this observation appears to be based on a single sample “measured taking a seat to a passenger” and with the sensor attached “by the belt on a subject’s waist.” *Id.* at 1-2.

165. For a POSITA to have achieved success incorporating these teachings into Curry’s system and avoiding “unpleasant user experiences,” in my opinion this characterization of the “driving spectra” would have been required to be precisely quantified and evaluated across many different factors. A few of these factors to

Wilson Dec. for
IPR2023-
00857/00911 at
¶¶100-103, 163-167.

Katayama - EP 1,914,691 - No Motivation to Combine

(Asserted for '879 Patent Claims 9, 10, 14, 15, 17, 18, 32, 33, 35-38 and '271 Patent Claim 1)

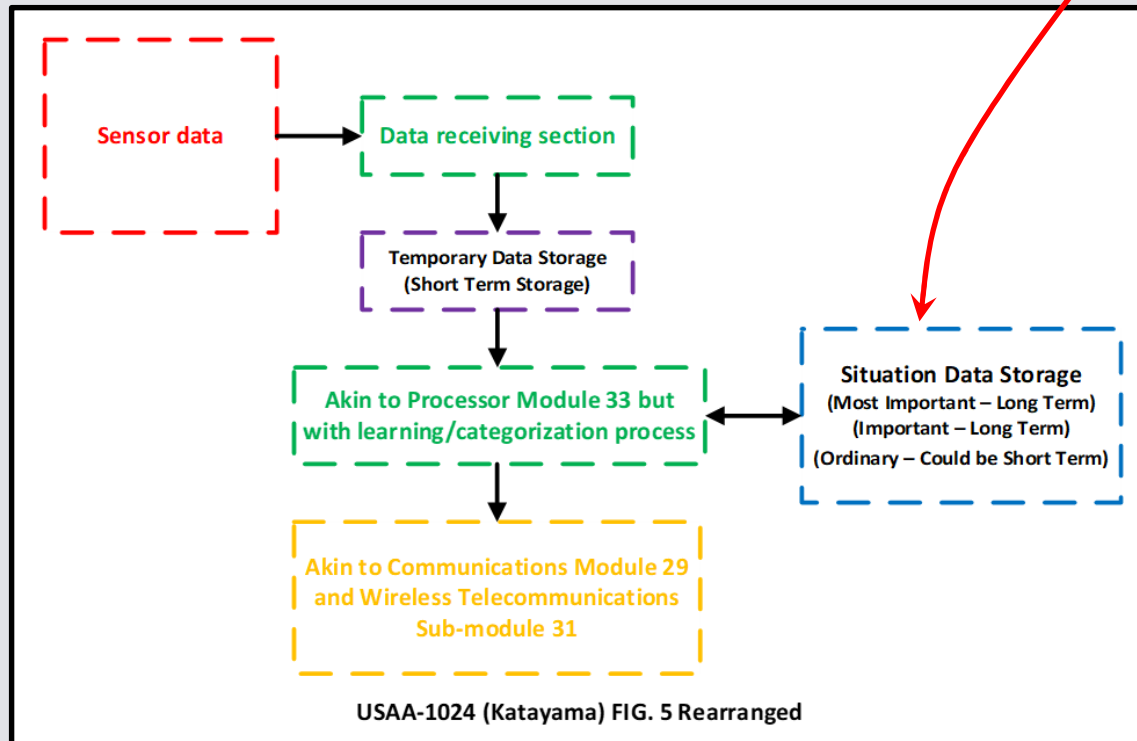
Petitioner's arguments regarding Katayama are irrelevant and inaccurate and/or inapplicable. Katayama (Ex 1024) pertains to a vehicle-mounted driving recorder for post-event analysis of situation data and significantly differs from the '879 and '271 patents:

1. **Mobile Telecommunications Device:** Katayama does not disclose a mobile telecommunications device, a critical element in the '879 and '271 claims. Katayama has no configuration limitations of such a device.
2. **Downloadable Application:** Katayama lacks the downloadable application of the independent claims of the '879 and '271 patents and has no disclosure of data communication or processing by a mobile app.
3. **Data Storage and Sensor Requirement:** Katayama relies on data from vehicle sensors and is powered by a vehicle battery, emphasizing its non-mobile nature. Such a configuration (Plante) was rejected in the related '487 patent prosecution.
4. **Memory Configuration:** The '879 and '271 patents detail long-term memory for persistent storage and short-term memory for transient storage of driving information. Instead, Katayama categorizes data based on importance using a learning function and stores all data in the same memory section, regardless of importance. Katayama contradicts the separate storage configurations required by the '879 patent (claims 9, 10, 35, 36) and as Petitioner argues for the '271 patent (claim 1).

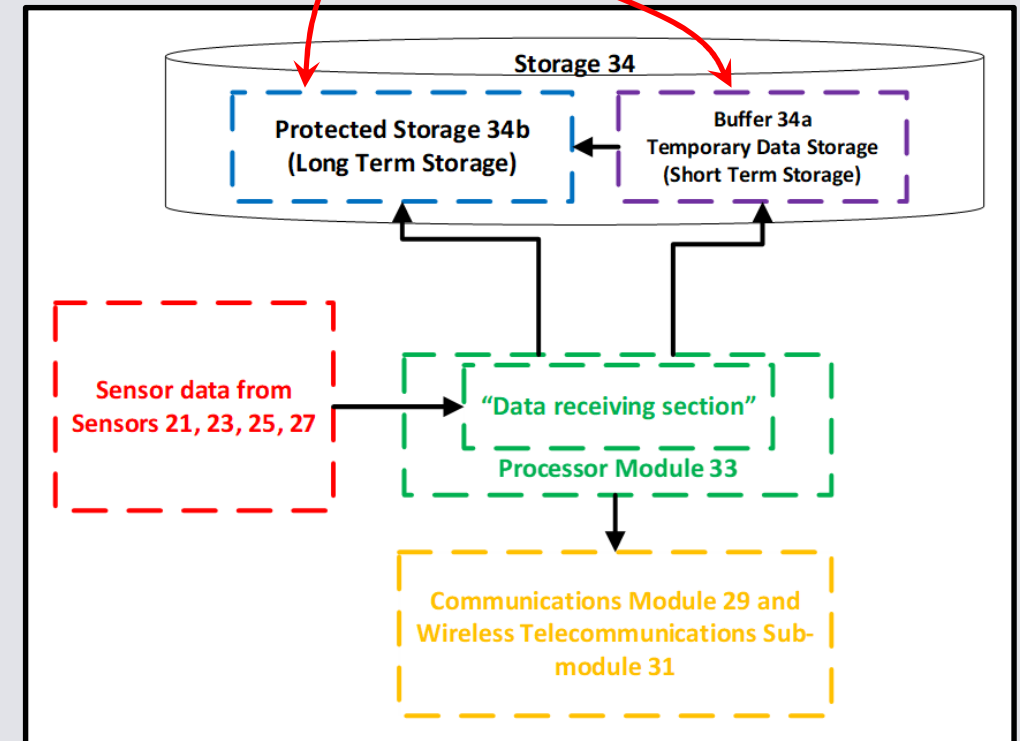
See PO's Sur Reply for IPR2023-00857 at 27-28 and for IPR2023-00911 at 28-29. See *also* PO's Response in IPR2023-00911 at 54-57. See *also* Wilson Dec. for IPR2023-00857/00911 at ¶¶177-179.

Katayama - EP 1,914,691 Storage vs. the '879 and '271 Patent Storage

Katayama does not have two different memories as required by the claims; rather, after processing, Katayama stores differently categorized data in one memory versus two memories in the '879 and '271 patents.



Katayama, FIG. 5 (redrawn), [0044]-[0057].



'879 Patent, FIG. 3 (redrawn), 15:41-18:10.

'271 Patent, FIG. 3 (redrawn), 15:16-17:46.

Katayama – EP 1,914,691 (Ex. 1024)

Katayama's approach to data management, where all data is initially moved to a temporary storage and then categorized for storage ***in the same memory section***, fails to meet the specific memory requirements of the '879 and '271 patents, including distinct long-term and short-term memory with different data update rates. Considering these key differences, a POSITA would not have looked to Katayama.

See PO's Sur Reply for IPR2023-00857 at 27-28 and for IPR2023-00911 at 28-29. See *also* PO's Response in IPR2023-00911 at 54-57; Wilson Dec. for IPR2023-00857/00911 at ¶¶177-179.

Callopy – WO 2010/062899 A1 (Ex. 1045)

- Callopy is a system for “dynamic insurance customization and adoption” using a mobile device to communicate an insurance rate adjustment or incentive offer to a vehicle occupant, where vehicle operation information is gathered from vehicle sensors of an on-board monitoring system. Callopy at Title, Abstract, [0023], [0027].
- Callopy’s mobile device is a pass-through for sending vehicle information from Callopy’s on-board monitoring system and does not evaluate vehicle sensor data. Callopy at [0027]. Like Curry, Callopy can “determine whether the driver uses their cell phone while driving.” Callopy at [0038], [00191]. See *also* IPR2023-00911 POR at 26.
- Petitioner depends on Curry’s mobile device to calculate driver scores in the Callopy-Curry combination. See IPR2023-00911 Pet. at 61.
- Neither Curry’s nor Callopy’s mobile device derives driving information or calculates or adjusts driver scores according to the claims. See POR at 59-63. **See also slide 50.**
- In the system of claims 6 and 7, derivation of driving information and calculation of a driver score **by a mobile device without use of vehicle sensors** is inventive, and the claims are patentable over Callopy-Curry. See POR at 59-63.

Callopy – WO 2010/062899 A1 (Ex. 1045)

- Petitioner’s citations to Callopy disclose a system that is far different from the ‘271 Patent.

....” USAA-1045, Abstract. Cited portions of Callopy disclose an on-board, embedded vehicle “system for real-time monitoring of a driver to facilitate determination of insurance rate(s)” by an insurance provider. *Id.*, [00307]. *See also id.*, [00322], [00332]. Callopy relies on components external to a mobile device for its processing and storage related to monitoring driving. AT-2001, ¶¶104-106.

Callopy has key differences from the ‘271 patent, including that Callopy (1) does not depend on the sensors in a mobile device, (2) performs all analysis for insurance customization off the mobile device (at its insurance provider system), and (3) discloses a user interface that is external to the mobile device (at Callopy’s remote monitoring system). AT-2001, ¶107.

IPR2023-00911 POR at 26.

- Curry does not cure Callopy, and Petitioner’s obviousness analysis is deficient.
- Specifically, driving information derived by the mobile device is not disclosed in Callopy or Curry. IPR2023-00911 POR at 60.
- Petitioner admits that “Callopy does not...teach calculating scores....” IPR2023-00911 Pet. at 61.
- PO has demonstrated that Curry does not disclose calculating scores by its mobile device. See slides 43-44, 50, 53. *See also* POR at 62-63.

Auto Telematics, Ltd Patent Owner's Oral Hearing Demonstratives

Case No. IPR2023-00857
U.S. Patent No. 10,198,879 B2
Case No. IPR2023-00911
U.S. Patent No. 9,311,271 B2