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(54) **DETERMINING DRIVING PATTERNS FROM ON-BOARD VEHICLE SENSOR DATA**

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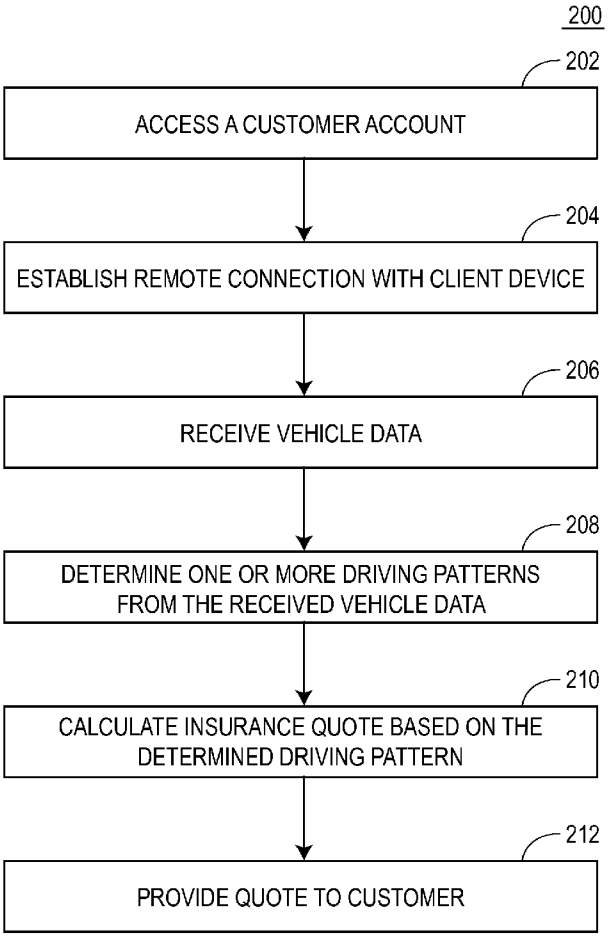
(57) **ABSTRACT**

A computer implemented method for providing insurance receives vehicle data that indicates one or more driving maneuvers of a vehicle, wherein the vehicle data originates from one or more sensors. The method also analyzes the received vehicle data to determine a driving pattern associated with one or more operators of the vehicle, wherein the driving pattern includes a plurality of driving maneuvers and the vehicle corresponds to an insurance policy data structure having a rating data component. The method further determines that the driving pattern indicates a change in the rating and adjusts the rating data component. The method further processes one or more insurance options based at least in part on the changed rating.



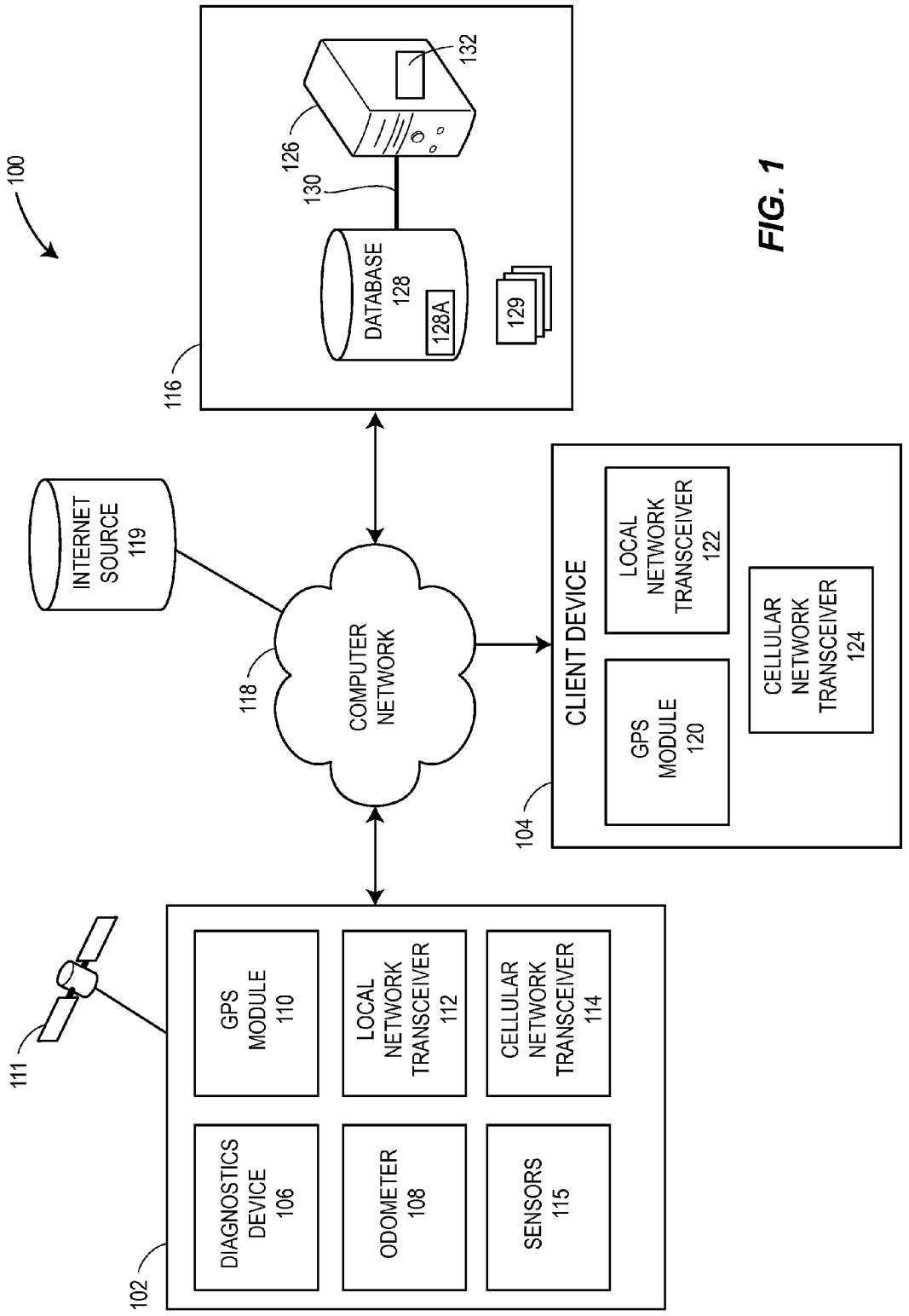

100
116
126
132
130
DATABASE
128
128A
129
INTERNET
SOURCE
119
118
COMPUTER
NETWORK
CLIENT DEVICE
LOCAL
NETWORK
TRANSCEIVER
122
GPS
MODULE
120
CELLULAR
NETWORK
TRANSCEIVER
124
104
111
102
GPS
MODULE
110
LOCAL
NETWORK
TRANSCEIVER
112
CELLULAR
NETWORK
TRANSCEIVER
114
DIAGNOSTICS
DEVICE
106
ODOMETER
108
SENSORS
115

FIG. 1

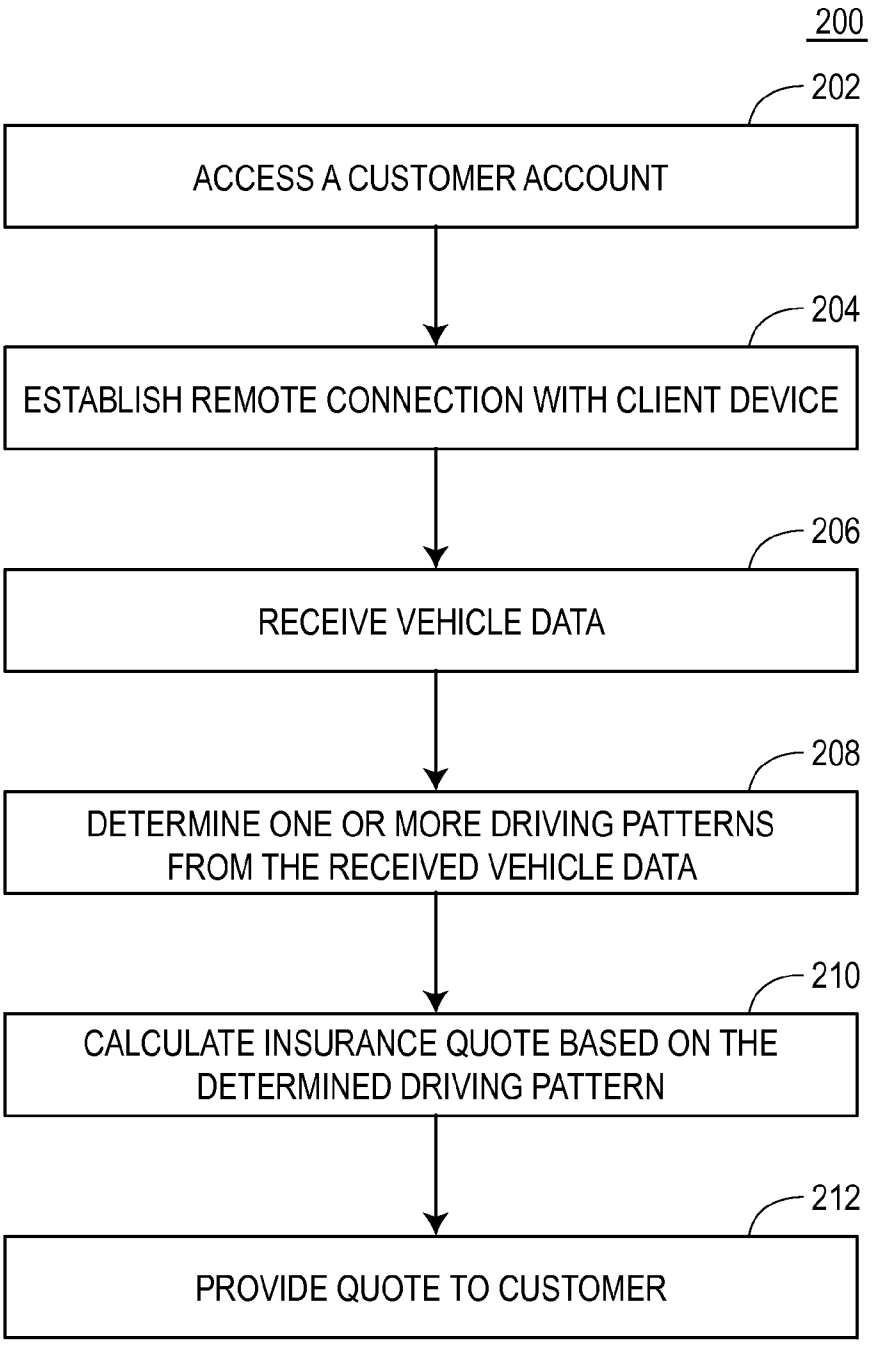

200
202
ACCESS A CUSTOMER ACCOUNT
204
ESTABLISH REMOTE CONNECTION WITH CLIENT DEVICE
206
RECEIVE VEHICLE DATA
208
DETERMINE ONE OR MORE DRIVING PATTERNS FROM THE RECEIVED VEHICLE DATA
210
CALCULATE INSURANCE QUOTE BASED ON THE DETERMINED DRIVING PATTERN
212
PROVIDE QUOTE TO CUSTOMER

FIG. 2A

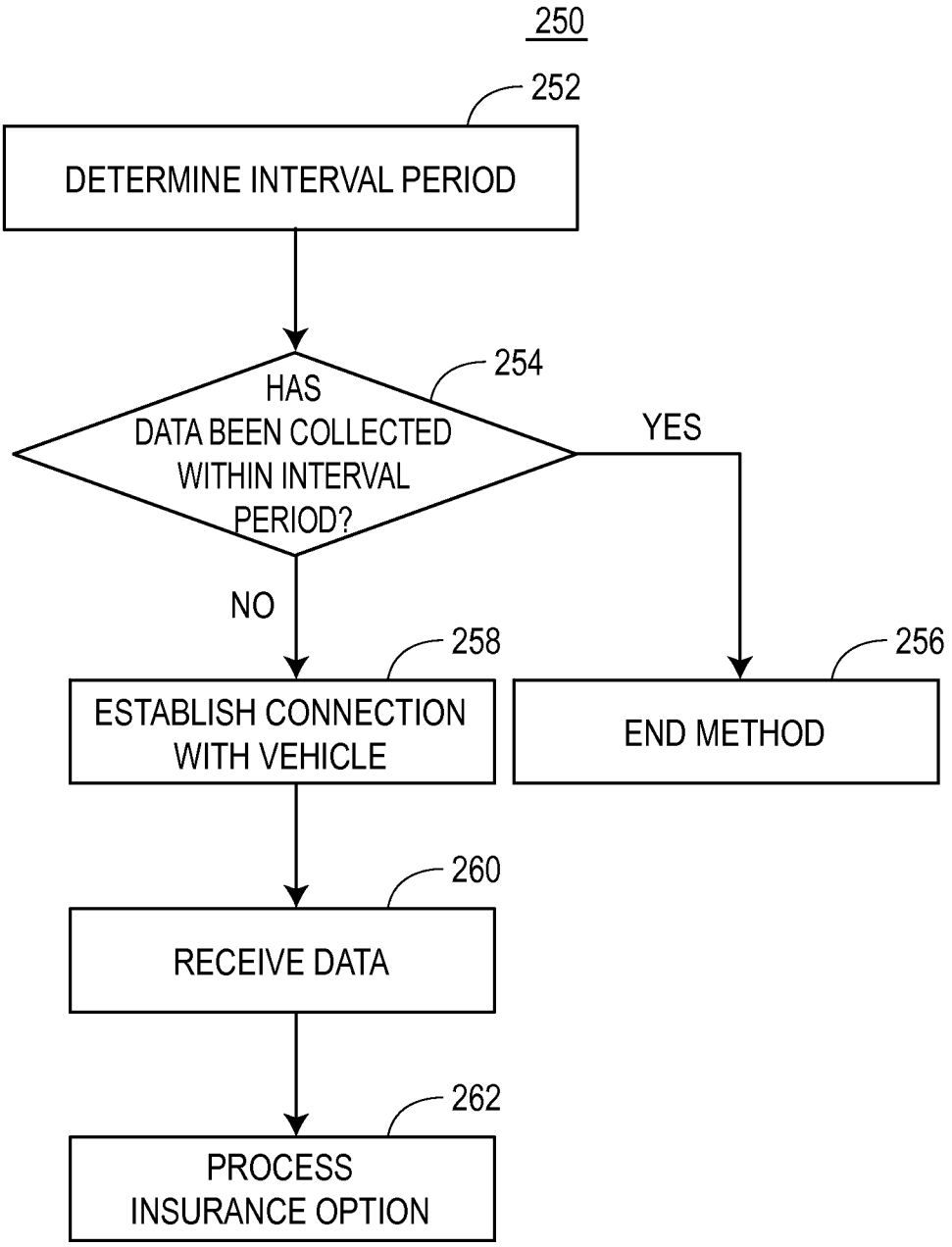

250
252
DETERMINE INTERVAL PERIOD
254
HAS DATA BEEN COLLECTED WITHIN INTERVAL PERIOD?
YES
NO
256
END METHOD
258
ESTABLISH CONNECTION WITH VEHICLE
260
RECEIVE DATA
262
PROCESS INSURANCE OPTION

FIG. 2B

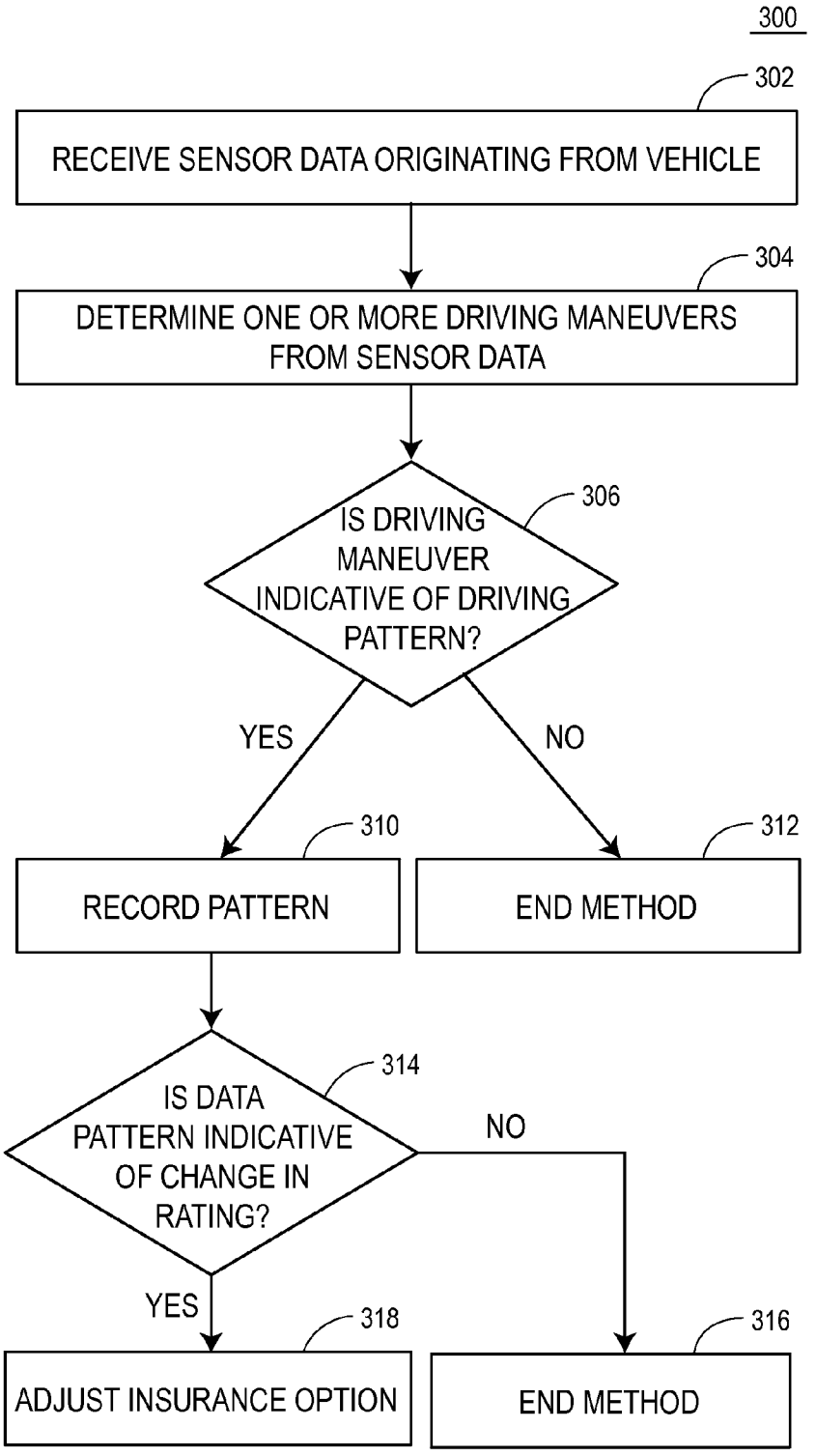

300
302
RECEIVE SENSOR DATA ORIGINATING FROM VEHICLE
304
DETERMINE ONE OR MORE DRIVING MANEUVERS FROM SENSOR DATA
306
IS DRIVING MANEUVER INDICATIVE OF DRIVING PATTERN?
YES
NO
310
RECORD PATTERN
312
END METHOD
314
IS DATA PATTERN INDICATIVE OF CHANGE IN RATING?
NO
YES
318
ADJUST INSURANCE OPTION
316
END METHOD

FIG. 3

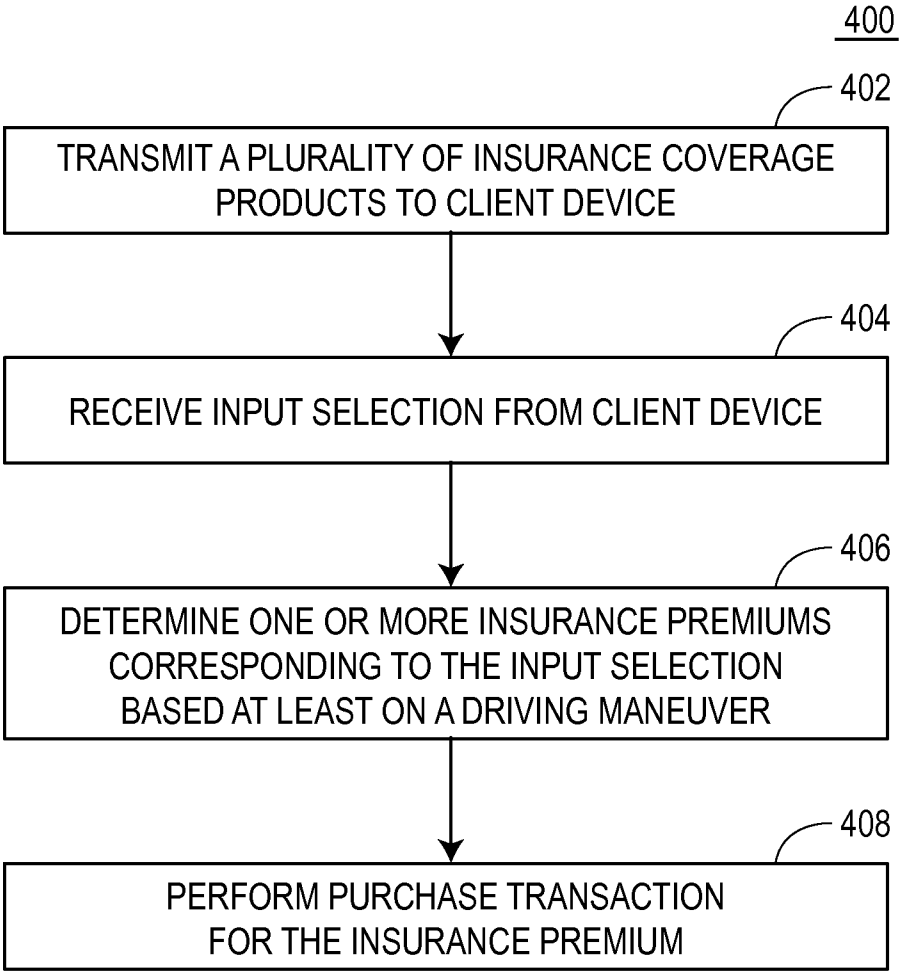

400
402
TRANSMIT A PLURALITY OF INSURANCE COVERAGE PRODUCTS TO CLIENT DEVICE
404
RECEIVE INPUT SELECTION FROM CLIENT DEVICE
406
DETERMINE ONE OR MORE INSURANCE PREMIUMS CORRESPONDING TO THE INPUT SELECTION BASED AT LEAST ON A DRIVING MANEUVER
408
PERFORM PURCHASE TRANSACTION FOR THE INSURANCE PREMIUM

FIG. 4A

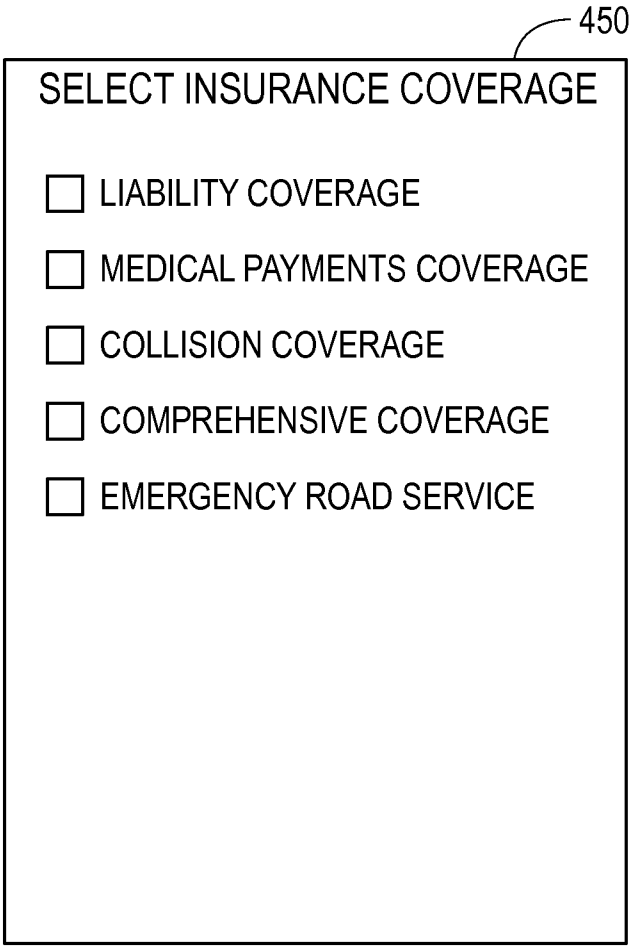

450
SELECT INSURANCE COVERAGE
LIABILITY COVERAGE
MEDICAL PAYMENTS COVERAGE
COLLISION COVERAGE
COMPREHENSIVE COVERAGE
EMERGENCY ROAD SERVICE

FIG. 4B

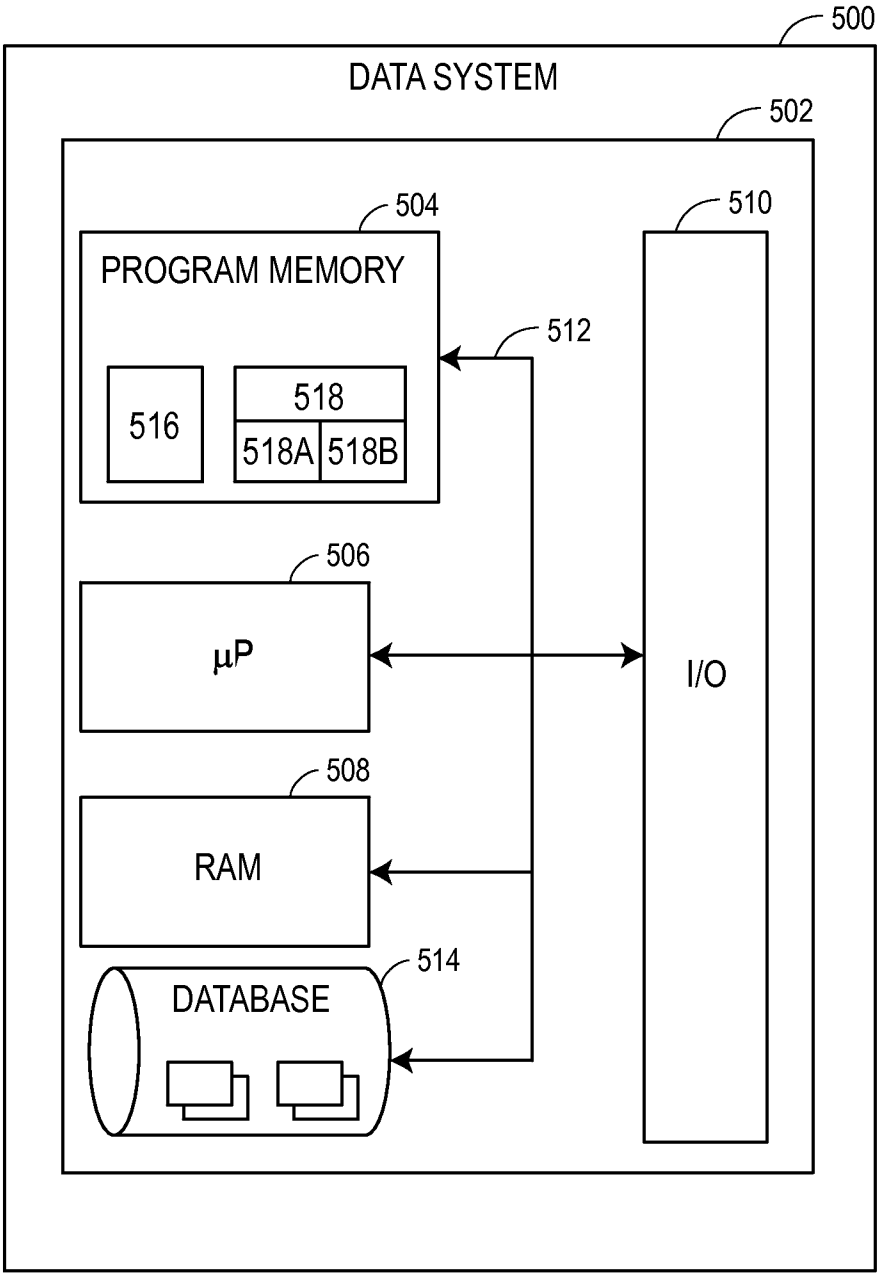

500
DATA SYSTEM
502
504
PROGRAM MEMORY
516
518
518A
518B
512
510
506
µP
I/O
508
RAM
514
DATABASE

FIG. 5

DETERMINING DRIVING PATTERNS FROM ON-BOARD VEHICLE SENSOR DATA

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/775,652, filed Mar. 10, 2013, which is incorporated by reference herein.

FIELD OF THE DISCLOSURE

[0002] This disclosure generally relates to insurance premiums and, more particularly, to establishing and using common driving routes for assessing, pricing and provisioning of vehicle insurance.

BACKGROUND

[0003] The background description provided herein is for the purpose of generally presenting the context of the disclosure. Work of the presently named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

[0004] Insurance companies desire to collect vehicle and driver behavior data for use in enhancing policy holder risk assessment. Many companies employ vehicle monitoring system for a variety of purposes, including determining of insurance risk and/or premiums. These systems may monitor many vehicle attributes, such as location, speed, acceleration/deceleration, etc. The monitoring devices are integrated with the vehicle or plugged into the vehicle systems. Many of these monitoring systems require expert installation into the vehicle and further require the user to periodically withdraw the monitoring device to download the trip data.

SUMMARY

[0005] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0006] In one embodiment, a computer implemented method for providing insurance comprises receiving, via a computer network, vehicle data that indicates one or more driving maneuvers of a vehicle, wherein the vehicle data originates from one or more sensors. The method also comprises analyzing, by one or more processors, the received vehicle data to determine a driving pattern associated with one or more operators of the vehicle, wherein the driving pattern includes a plurality of driving maneuvers and the vehicle corresponds to an insurance policy data structure having a rating data component. The method further comprises determining, by the one or more processors, that the driving pattern indicates a change in the rating and adjusting, by the one or more processors, the rating data component. The method also comprises processing, by the one or more processors, one or more insurance options based at least in part on the changed rating.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is a block diagram of an example computing system in which the techniques for determining driving patterns from on-board vehicle sensor data can be implemented;

[0008] FIG. **2**A is a flow diagram of an example method for calculating an insurance quote based on a determined driving pattern;

[0009] FIG. **2**B is a flow diagram of an example method for determining whether vehicle data has been collected within a determined interval period;

[0010] FIG. **3** is a flow diagram of an example method for determining a driving pattern from received vehicle data;

[0011] FIG. **4**A is a flow diagram of an example method for performing a purchase transaction for an insurance product;

[0012] FIG. **4**B is a diagram illustrating an example viewport of a client device displaying a plurality of insurance coverage products; and

[0013] FIG. **5** is an exemplary architecture of a data system of a system and method for orienting telematics data.

[0014] The figures depict a preferred embodiment of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.

DETAILED DESCRIPTION

[0015] The present disclosure is directed towards a method for monitoring vehicle operational characteristics and driver behavior to obtain data relevant for assessing, pricing, and provisioning of vehicle insurance. In this manner, the method of the present disclosure provides a more accurate determination of price quotes for vehicle insurance.

[0016] A system of sensors such as vehicle mileage sensors, time of day sensors, vehicle location sensors (e.g., driver pad on garage floor), speed sensors, passenger seat occupancy sensors or operational sensors for maneuvers such as vehicle movements, rapid acceleration, sudden turns, and sudden stops is used to monitor, record and transmit data that may be used in assessing, pricing and provisioning vehicle insurance. In some embodiments, a diagnostics device may be selected for use with current industry standard on board diagnostics systems such as the On Board Diagnostics-II (OBD-II) system. The diagnostics device may be inserted and/or installed in a customer's vehicle OBD-II system to obtain speed, odometer data, and other relevant vehicle data. In some embodiments, the vehicle may also access external databases to aggregate and transmit additional vehicle and/or customer data such as customer demographic data, vehicle condition data, usage data, and other characteristic data as needed to assess, price, and provision vehicle insurance.

[0017] Because vehicle usage data and additional vehicle and/or customer data is transmitted directly from the vehicle to the insurance agency, in some embodiments, direct input from the customer may not be required. Based on the data received from the vehicle, an insurance company may automatically make updates and adjustments to the vehicle policy whether in real-time during the term of the policy, or at a renewal time for the policy, or other times. In some embodiments, the coverage types and quotes may be displayed to the customer by onboard display screen in the vehicle, or via remote connection from the vehicle to a client device. In further embodiments, the customer may opt for automatic

renewals, or to receive automatic renewal alerts. For example, a renewal alert may be presented through the client device or even through the vehicle using an on board computer and LCD, a "dummy light," etc. At the time of purchase of a vehicle, a company may also offer financial incentives to a customer to encourage registration with such self-insurance services, based on the interest in the insured product.

[0018] These techniques are discussed in more detail below with reference to FIGS. **1-4**. In general, the techniques discussed below can be implemented on a server device, or partially implemented on a client device, and partially implemented on a server device.

[0019] FIG. **1** illustrates various aspects of an exemplary architecture implementing a system **100** for determining driving patterns from on-board vehicle sensor data. The high-level architecture includes both hardware and software applications, as well as various data communications channels for communicating data between the various hardware and software components. The system **100** for adjusting insurance policies based on common driving routes and other risk factors may include various software and hardware components or modules.

[0020] The system **100** for adjusting insurance policies based on common driving routes and other risk factors may include front end components, including a vehicle **102** and a client device **104**. The vehicle may include an on board diagnostics connector **106**, an odometer **108** and a GPS **110** module for communicating with one or more GPS satellites **111**. The vehicle **102** may also include a local network transceiver **112** and/or a cellular network transceiver **114** for communicating with backend components **116** via the computer network **118**.

[0021] The computer network **118** may be a network such as the Internet or other type of suitable network (e.g., local area network (LAN), a metropolitan area network (MAN), a wide area network (WAN), a mobile, a wired or wireless network, a private network, a virtual private network, etc.). The computer network **118** may also be one or more cellular networks such as code division multiple access (CDMA) network, GSM (Global System for Mobile Communications) network, WiMAX (Worldwide Interoperability for Microwave Access) network, Long Term Evolution (LTE) network, etc.

[0022] In some embodiments, the client device **104** may be placed in the vehicle **102**. The client device **104** may be a personal computer, a smart phone, a tablet computer, a smart watch, a head mounted display, a wearable computer or other suitable client device. In some embodiments, the client device **104** may also include a GPS module **120** for communicating with the one or more GPS satellites **111**. The client device **104** may also include a local network transceiver **122** and/or a cellular network transceiver **124** for communicating with the backend components **116** via the computer network **118**. In an embodiment, the client device **102** may also execute one or more applications to allow a customer to manage a customer account, purchase one or more insurance products, view driving statistics, change settings, etc. In some embodiments, both the vehicle **102** and the client device **104** may include additional sensors. The sensors may collect data at a variety of sample rates, such as, for example, at a sample rate of at least once per second.

[0023] The back end components **116** may include a data server **126** and a database **128**. The back end components may communicate with each other through a communication network **130** such as a local area network or other type of suitable network (e.g., the Internet, a metropolitan area network (MAN), a wide area network (WAN), a mobile, a wired or wireless network, a private network, a virtual private network, etc.). In some embodiments, the back end components **116**, the vehicle **102** and/or the client device **104** may also communicate with one or more internet sources **119** via the computer network **118**. For example, the internet source may be a third party database.

[0024] In some embodiments, the system **100** for determining driving patterns from on-board vehicle sensor data in general and the data server **126** in particular may include computer-executable instructions **132**. A processor of the data server **126** may execute the instructions **132** to instantiate one or more modules for retrieving and analyzing data from one or more databases **128**, as discussed in further detail below. The database **128** may be a data storage device such as random-access memory (RAM), hard disk drive (HDD), flash memory, flash memory such as a solid state drive (SSD), etc. The database may store one or more insurance policy data structures **128** associated with a customer account. The insurance policy data structure may include assorted information corresponding to the customer account such as a rating component **129**. In some embodiments, a customer account may be associated with one than one driver.

[0025] Turning now to FIG. **2**A, a flow chart depicts an exemplary method **200** for calculating an insurance quote based on a determined driving pattern. At block **202**, a processor of a data server (such as the data server **126** illustrated in FIG. **1**) may execute an instruction to access a customer account for an insurance company. In some embodiments, the processor may execute an instruction to create an insurance company account if there is no current user account. The account may be used, for example, to purchase insurance products, adjust coverage for insurance products, etc. At block **204**, the processor may execute an instruction to establish a remote connection with a client device (such as the vehicle **102** illustrated in FIG. **1**) and at block **206**, the processor may execute an instruction to receive vehicle data from the client device. For example, vehicle data may include odometer data, GPS data, data from a diagnostics device, such as an On-Board Diagnostics device, or from one or more additional sensors placed in the vehicle.

[0026] At block **208**, the processor may execute an instruction to determine one or more driving behaviors from the received vehicle data. For example, the processor may execute an instruction implementing one or more blocks of the method **400**, discussed in reference to FIG. **4** below. At block **210**, the processor may execute an instruction to calculate one or more insurance quotes based on the determined driving behavior. In some embodiments, a customer may have already purchased one or more insurance products from the insurance company and the processor may execute an instruction to adjust one or more the insurance quotes based on the determined driving behavior. At block **212**, the processor may execute an instruction to transmit one or more insurance quotes to a customer.

[0027] Turning now to FIG. **2**B, a flow chart depicts an exemplary method **250** for determining whether vehicle data has been collected within a determined interval period. At block **252**, a processor of a data server (such as the data server **126** illustrated in FIG. **1**) may execute an instruction to determine an interval period for transmitting data. For example, the interval period may be hours, days, months, years, etc. In

some embodiments, a customer may set a preference for an interval period. At block **254**, the processor may execute an instruction to determine whether or not vehicle data has been collected within the interval period. If the processor executing the instruction determines that vehicle data has been collected within the interval period (YES branch of block **254**), then, at block **256**, the processor may execute an instruction to end the method **250**.

[0028] If the processor executing the instruction determines that vehicle data has not been collected within the interval period, (NO branch of block **254**) then at block **258** the processor may execute an instruction to establish a connection with the vehicle. At block **260**, the processor receive vehicle data from the vehicle and at block **262**, the processor may execute an instruction to process an insurance option. For example, the processor may execute an instruction to calculate a price quote or price quote adjustment based on the vehicle data.

[0029] Referring now to FIG. **3**, a flow chart depicts an exemplary method **300** for determining a driving pattern from received vehicle data. At block **302**, a processor of a data server (such as the data server **126** illustrated in FIG. **1**) may receive sensor data that originates from one or more sensors that record the vehicle data for the vehicle associated with an insurance account. In some embodiments, the vehicle data is indicative of a driving maneuver for a vehicle and the driving maneuver includes one or more of rapid acceleration, a sudden turn, a vehicle movement, and a sudden stop. As discussed above, the processor may receive vehicle data at regular intervals from a variety of different sensors such as vehicle mileage sensors, time of day sensors, vehicle location sensors (e.g., driver pad on garage floor), speed sensors, passenger seat occupancy sensors or operational sensors. At block **304**, the processor may execute an instruction to determine one or more diving maneuvers from the vehicle data. The vehicle data may include a variety of sensor readings, including accelerometer values over a certain sample period. The received vehicle data may be indicative of one or more driving maneuvers such as rapid acceleration, sudden turns, and sudden stops. Of course these are only example driving maneuvers and those of ordinary skill in the art will recognize that the received vehicle data may be indicative of a wide variety of driving maneuvers. In some embodiments, the processor may further execute an instruction to classify the driving maneuvers (i.e. unsafe, safe, etc.) or rank the driving maneuvers via one or more ranking schemes.

[0030] At block **306**, the processor may further execute an instruction to determine if one of the driving maneuvers is indicative of a driving pattern of the vehicle. The driving pattern may include a plurality of driving maneuvers. In some embodiments, the vehicle corresponds to an insurance policy data structure having a rating, such as the data structure **128**A and the rating component **129** illustrated in FIG. **1**. If the processor executing the instruction determines that the driving maneuvers are not indicative of a driving pattern (NO branch of block **306**), at block **308**, the processor may execute an instruction to end the method **300**.

[0031] If the processor executing the instruction determines that the driving maneuvers are indicative of a driving pattern, at block **310**, the processor may execute an instruction to record the pattern. For example, if the vehicle data indicates a certain number of unsafe driving maneuvers, the processor executing the instruction may determine that the driving maneuvers are indicative of an unsafe driving pattern. At block **312**, the processor may execute an instruction to determine if the determined driving pattern is indicative of a change in rating for the insurance premium.

[0032] For example, if the received vehicle data indicates rapid acceleration a certain number of times over a certain period of time, this may indicate a change in rating that reflects this unsafe driving behavior. This change may affect one or more insurance options associated with the insurance policy. The processor may execute an instruction to analyze the accelerometer values and determine if there are any spikes in speed. For example, if the received vehicle data indicates consistent rapid acceleration, this may indicate a change in rating that reflects this unsafe driving behavior. This change in rating may also affect one or more insurance options associated with the driver's insurance policy.

[0033] In one embodiment, the processor may analyze one or more driving patterns to identify an operator of a vehicle. The processor may execute an instruction to determine an operator driving pattern associated with a first operator of the vehicle and to analyze the received vehicle data to determine whether the driving pattern corresponds to the operator driving pattern or corresponds to an unknown driver. For example, a customer may have previously indicated that there is only one driver of a vehicle that is insured, but there are actually two people driving the vehicle. Accordingly, the processor use this analysis to determine that the driving pattern at certain times is different than the driving pattern at other times and further analyze this information to determine that there are indeed two drivers. The processor may further execute an instruction to process one or more insurance options based on this analysis. In some embodiments, two or more drivers may already be associated with the vehicle. Accordingly, the analysis can determine driving patterns, such as unique driving patterns, for each driver and then determine the safety of each driver as well as the amount of time each driver spends driving the vehicle. The processor may further execute an instruction to process one or more insurance options based on this analysis.

[0034] The processor may execute an instruction to determine if the number of spikes in speed meet a threshold amount that would result in a change in rating. If the processor determines that the threshold amount is met, then the processor may execute an instruction to adjust the rating component of the insurance policy data structure. The processor may further execute an instruction to process one or more insurance options based at least in part on the changed rating. For example, the processor may execute an instruction to remove certain discounts, add certain discounts, increase or decrease an insurance premium, etc.

[0035] In some embodiments, the processor executing the instruction may determine that the driving maneuvers and/or patterns are indicative of unsafe behavior, but the unsafe behavior is already reflected in the rating and thus the insurance premium does not need to be adjusted. If the processor executing the instruction determines that the determined driving pattern is not indicative of a change in rating for the insurance premium (NO branch of block **312**), at block **314**, the processor may execute an instruction to end the method **300**.

[0036] If the processor executing the instruction determines that the determined driving pattern is indicative of a change in rating for the insurance premium (YES branch of block **312**), at block **316**, the processor may execute an instruction to adjust an insurance option. For example, the

processor may execute an instruction to adjust the rating component of the insurance policy data structure. In some embodiments, the method **300** may be used to determine an initial insurance premium for the customer.

[0037] In an embodiment, the processor may execute an instruction to notify the customer about the driving pattern, change in rating, etc., before adjusting the rating component of the insurance policy data structure and/or adjusting/determining an insurance premium. By notifying the customer, the customer may have an opportunity to adjust their behavior to avoid an increased premium. The customer may be notified by, for example, a notification in an application, an e-mail, phone call, etc.

[0038] In some embodiments, the processor may also execute an instruction to associate the driving maneuver, driving pattern, rating and/or insurance premium with the customer account. In some embodiments, this may also involve saving certain data to one or more databases. As described above, if the customer does not have a customer account, the processor may execute an instruction to create one. For example, if the vehicle data indicates that number of unsafe driving maneuvers, the processor executing the instruction may determine that the driving maneuvers are indicative of an unsafe driving pattern.

[0039] Referring now to FIG. **4**A, a flow chart depicts an exemplary method **400** for performing a purchase transaction for an insurance product. The method **400** may be used to present a price quote for an insurance product to a customer and perform a purchase transaction for the insurance product.

[0040] At block **402** a processor of a data server, (such as the data server **126** described in reference to FIG. **1**), may execute an instruction to transmit a plurality of insurance coverage products to a client device. After transmitting the plurality of insurance coverage products to the client device, a processor of the client device may display the plurality of insurance coverage products within a viewport of the client device. For example, turning briefly to the example viewport **450** of a client device displaying a plurality of insurance coverage products illustrated in FIG. **4**B the insurance products may include different coverage types associated with vehicle insurance, such as liability coverage, medical payments coverage, collision coverage, comprehensive coverage and emergency road service. In some embodiments, the coverage types and quote may be displayed to the customer by onboard display screen in the vehicle to be insured, or via remote connection from the vehicle to the client device. Of course, these are only example insurance products and those skilled in the art will recognize that other types of insurance products may be transmitted to the client device during operation of the method **400**.

[0041] A user may make an input selection of an insurance coverage product and a processor of the client device may receive the input selection and transmit the input selection to the data server. At block **404**, the processor may receive an input selection of an insurance product from the client device in response to the transmission. At block **406**, the processor may execute an instruction to determine one or more insurance premiums corresponding to the received input selection based at least in part on the driving maneuver. For example, the processor may execute an instruction incorporating one or more steps from the method **300** in determining the one or more insurance premiums. The processor may also execute an instruction to transmit the one or more insurance premiums to the client device. At block **408**, the processor may further execute an instruction to perform a purchase transaction for the insurance product.

[0042] Referring now to FIG. **5**, a data system **500** includes a controller **502**. Exemplary data systems include the vehicle **102**, the client device **104** and the data server **118** as illustrated in FIG. **1**. The controller **502** includes a program memory **504**, a microcontroller or a microprocessor (μP) **506**, a random-access memory (RAM) **508**, and an input/output (I/O) circuit **510**, all of which are interconnected via an address/data bus **512**. The program memory **504** may store computer-executable instructions, which may be executed by the microprocessor **506**. In some embodiments, the controller **502** may also include, or otherwise be communicatively connected to, a database **514** or other data storage mechanism (e.g., one or more hard disk drives, optical storage drives, solid state storage devices, etc.). It should be appreciated that although FIG. **5** depicts only one microprocessor **506**, the controller **502** may include multiple microprocessors **506**. Similarly, the memory **504** of the controller **502** may include multiple RAMs **516** and multiple program memories **518**, **518**A and **518**B storing one or more corresponding server application modules, according to the controller's particular configuration.

[0043] Although FIG. **5** depicts the I/O circuit **510** as a single block, the I/O circuit **510** may include a number of different types of I/O circuits (not depicted), including but not limited to, additional load balancing equipment, firewalls, etc. The RAM(s) **516**, **508** and the program memories **518**, **518**A and **518**B may be implemented in a known form of computer storage media, including but not limited to, semiconductor memories, magnetically readable memories, and/or optically readable memories, for example, but does not include transitory media such as carrier waves.

[0044] The following additional considerations apply to the foregoing discussion. Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter of the present disclosure.

[0045] Additionally, certain embodiments are described herein as including logic or a number of components, modules, or mechanisms. Modules may constitute either software modules (e.g., code stored on a machine-readable medium) or hardware modules. A hardware module is tangible unit capable of performing certain operations and may be configured or arranged in a certain manner. In example embodiments, one or more computer systems (e.g., a standalone, client or server computer system) or one or more hardware modules of a computer system (e.g., a processor or a group of processors) may be configured by software (e.g., an application or application portion) as a hardware module that operates to perform certain operations as described herein.

[0046] A hardware module may comprise dedicated circuitry or logic that is permanently configured (e.g., as a spe-

cial-purpose processor, such as a field programmable gate array (FPGA) or an application-specific integrated circuit (ASIC)) to perform certain operations. A hardware module may also comprise programmable logic or circuitry (e.g., as encompassed within a general-purpose processor or other programmable processor) that is temporarily configured by software to perform certain operations. It will be appreciated that the decision to implement a hardware module in dedicated and permanently configured circuitry or in temporarily configured circuitry (e.g., configured by software) may be driven by cost and time considerations.

[0047] Accordingly, the term hardware should be understood to encompass a tangible entity, be that an entity that is physically constructed, permanently configured (e.g., hardwired), or temporarily configured (e.g., programmed) to operate in a certain manner or to perform certain operations described herein. Considering embodiments in which hardware modules are temporarily configured (e.g., programmed), each of the hardware modules need not be configured or instantiated at any one instance in time. For example, where the hardware modules comprise a general-purpose processor configured using software, the general-purpose processor may be configured as respective different hardware modules at different times. Software may accordingly configure a processor, for example, to constitute a particular hardware module at one instance of time and to constitute a different hardware module at a different instance of time.

[0048] Hardware and software modules can provide information to, and receive information from, other hardware and/or software modules. Accordingly, the described hardware modules may be regarded as being communicatively coupled. Where multiple of such hardware or software modules exist contemporaneously, communications may be achieved through signal transmission (e.g., over appropriate circuits and buses) that connect the hardware or software modules. In embodiments in which multiple hardware modules or software are configured or instantiated at different times, communications between such hardware or software modules may be achieved, for example, through the storage and retrieval of information in memory structures to which the multiple hardware or software modules have access. For example, one hardware or software module may perform an operation and store the output of that operation in a memory device to which it is communicatively coupled. A further hardware or software module may then, at a later time, access the memory device to retrieve and process the stored output. Hardware and software modules may also initiate communications with input or output devices, and can operate on a resource (e.g., a collection of information).

[0049] The various operations of example methods described herein may be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules that operate to perform one or more operations or functions. The modules referred to herein may, in some example embodiments, comprise processor-implemented modules.

[0050] Similarly, the methods or routines described herein may be at least partially processor-implemented. For example, at least some of the operations of a method may be performed by one or processors or processor-implemented hardware modules. The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the processor or processors may be located in a single location (e.g., within a home environment, an office environment or as a server farm), while in other embodiments the processors may be distributed across a number of locations.

[0051] The one or more processors may also operate to support performance of the relevant operations in a "cloud computing" environment or as an SaaS. For example, as indicated above, at least some of the operations may be performed by a group of computers (as examples of machines including processors), these operations being accessible via a network (e.g., the Internet) and via one or more appropriate interfaces (e.g., APIs).

[0052] The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the one or more processors or processor-implemented modules may be located in a single geographic location (e.g., within a home environment, an office environment, or a server farm). In other example embodiments, the one or more processors or processor-implemented modules may be distributed across a number of geographic locations.

[0053] Some portions of this specification are presented in terms of algorithms or symbolic representations of operations on data stored as bits or binary digital signals within a machine memory (e.g., a computer memory). These algorithms or symbolic representations are examples of techniques used by those of ordinary skill in the data processing arts to convey the substance of their work to others skilled in the art. As used herein, an "algorithm" or a "routine" is a self-consistent sequence of operations or similar processing leading to a desired result. In this context, algorithms, routines and operations involve physical manipulation of physical quantities. Typically, but not necessarily, such quantities may take the form of electrical, magnetic, or optical signals capable of being stored, accessed, transferred, combined, compared, or otherwise manipulated by a machine. It is convenient at times, principally for reasons of common usage, to refer to such signals using words such as "data," "content," "bits," "values," "elements," "symbols," "characters," "terms," "numbers," "numerals," or the like. These words, however, are merely convenient labels and are to be associated with appropriate physical quantities.

[0054] Unless specifically stated otherwise, discussions herein using words such as "processing," "computing," "calculating," "determining," "presenting," "displaying," or the like may refer to actions or processes of a machine (e.g., a computer) that manipulates or transforms data represented as physical (e.g., electronic, magnetic, or optical) quantities within one or more memories (e.g., volatile memory, non-volatile memory, or a combination thereof), registers, or other machine components that receive, store, transmit, or display information.

[0055] As used herein any reference to "one embodiment" or "an embodiment" means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

[0056] Some embodiments may be described using the expression "coupled" and "connected" along with their derivatives. For example, some embodiments may be described using the term "coupled" to indicate that two or more elements are in direct physical or electrical contact. The term "coupled," however, may also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other. The embodiments are not limited in this context.

[0057] As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0058] In addition, use of the "a" or "an" are employed to describe elements and components of the embodiments herein. This is done merely for convenience and to give a general sense of the description. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

[0059] Upon reading this disclosure, those of skill in the art will appreciate still additional alternative structural and functional designs for determining driving patterns from on-board vehicle sensor data through the disclosed principles herein. Thus, while particular embodiments and applications have been illustrated and described, it is to be understood that the disclosed embodiments are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation and details of the method and apparatus disclosed herein without departing from the spirit and scope defined in the appended claims.

What is claimed is:

1. A computer implemented method for providing insurance, the method comprising:

receiving, via a computer network, vehicle data that indicates one or more driving maneuvers of a vehicle, wherein the vehicle data originates from one or more sensors;

analyzing, by one or more processors, the received vehicle data to determine a driving pattern associated with one or more operators of the vehicle, wherein the driving pattern includes a plurality of driving maneuvers and the vehicle corresponds to an insurance policy data structure having a rating data component;

determining, by the one or more processors, that the driving pattern indicates a change in the rating;

adjusting, by the one or more processors, the rating data component; and

processing, by the one or more processors, one or more insurance options based at least in part on the changed rating.

2. The computer implemented method of claim **1**, further comprising:

receiving, via the computer network, a plurality of vehicle characteristic data, wherein the plurality of vehicle characteristic data is indicative of vehicle condition and/or vehicle usage; and

processing, at the one or more processors, the one or more insurance options based at least in part on the received vehicle characteristic data.

3. The computer implemented method of claim **1** further comprising:

receiving, via the computer network, a plurality of customer data from a third party database, wherein the customer data is associated with one or more operators of the vehicle; and

determining, by the one or more processors, that the plurality of customer data from the third party database indicates a change in the rating.

4. The computer implemented method of claim **1** further comprising:

determining, by the one or more processors, an interval period for receiving the vehicle data;

determining, by the one or more processors, that vehicle data has not been collected within the interval period; and

establishing, via the computer network, a connection with the vehicle in response to the determination that vehicle data has not been collected within the interval period.

5. The computer implemented method of claim **1** further comprising:

adjusting, by the one or more processors, a price quote associated with the insurance policy data structure based at least in part on the changed rating.

6. The computer implemented method of claim **1**, wherein the plurality of vehicle data is received without any intervention from a current operator of the vehicle.

7. The computer implemented method of claim **1**, wherein the driving maneuver includes one or more of a vehicle movement, a rapid acceleration, a sudden turn, or a sudden stop.

8. The computer implemented method of claim **1** further comprising:

determining, by the one or more processors, an operator driving pattern associated with a known operator of the vehicle; and

analyzing, by the one or more processors, the received vehicle data to determine whether the driving pattern corresponds to the known operator or an unknown operator.

9. The computer implemented method of claim **1**, wherein the one or more sensors record the vehicle data at a sample rate of at least once per second.

10. A computer device for providing insurance, the device comprising:

one or more processors; and

one or more memories coupled to the one or more processors;

wherein the one or more memories include computer executable instructions stored therein, that, when executed by the one or more processors, cause the one or more processors to:

receive, via a computer network, vehicle data that indicates one or more driving maneuvers of a vehicle, wherein the plurality of vehicle data originates from one or more sensors;

analyze the plurality of vehicle data to determine a driving pattern associated with one or more operators of the

vehicle wherein the driving pattern includes a plurality of driving maneuvers and the vehicle corresponds to an insurance policy data structure having a rating data component;

determine that the driving pattern indicates a change in the rating;

adjust the rating data component; and

process one or more insurance options based at least in part on the changed rating.

11. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to:

receive, via the computer network, a plurality of vehicle characteristic data, wherein the plurality of vehicle characteristic data is indicative of vehicle condition and/or vehicle usage; and

process the one or more insurance options based at least in part on the received vehicle characteristic data.

12. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to:

receive, via the computer network, a plurality of customer data from a third party database, wherein the customer data is associated with the one or more operators of the vehicle; and

determine that the customer data plurality of customer data from the third party database indicates a change in the rating.

13. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to:

determine an interval period for receiving the vehicle data;

determine that vehicle data has not been collected within the interval period; and

establishing, via the computer network, a connection with a vehicle in response to the determination that vehicle data has not been collected within the interval period.

14. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to adjust a price quote associated with the insurance policy data structure based at least in part on the changed rating.

15. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to receive the plurality of vehicle data without any intervention from a current operator of the vehicle.

16. The computer implemented method of claim **10** wherein the computer executable instructions further cause the one or more processors to determine that the driving maneuver includes one or more of a vehicle movement, a rapid acceleration, a sudden turn, or a sudden stop.

17. The computer implemented method of claim **10** wherein the received vehicle data is recorded at a sample rate of at least once per second.

18. The computer device of claim **10** wherein the computer executable instructions further cause the one or more processors to:

determine an operator driving pattern associated with a known operator of the vehicle; and

analyze the received vehicle data to determine whether the driving pattern corresponds to the known operator or an unknown operator.

19. A non-transitory computer readable storage medium comprising non-transitory computer readable instructions stored thereon, that, when executed by one or more processors, cause the one or more processors to:

receive, via a computer network, vehicle data that indicates one or more driving maneuvers of a vehicle, wherein the vehicle data originates from one or more sensors;

analyze the received vehicle data to determine a driving pattern associated with one or more operators of the vehicle, wherein the driving pattern includes a plurality of driving maneuvers and the vehicle corresponds to an insurance policy data structure having a rating data component;

determine that the driving pattern indicates of a change in the rating;

adjust the rating of the rating data component; and

process one or more insurance options based at least in part on the changed rating.

20. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to:

receive, via the computer network, a plurality of vehicle characteristic data, wherein the plurality of vehicle characteristic data is indicative of vehicle condition and/or vehicle usage; and

process the one or more insurance options based at least in part on the received vehicle characteristic data.

21. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to:

receive, via the computer network, a plurality of customer data from a third party database, wherein the customer data is associated with the one or more operators of the vehicle; and

determine that the plurality of customer data from the third party database indicates of a change in the rating.

22. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to:

determine an interval period for receiving the vehicle data;

determine that vehicle data has not been collected within the interval period; and

establishing, via the computer network, a connection with the vehicle in response to the determination that vehicle data has not been collected within the interval period.

23. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to:

adjust a price quote associated with the insurance policy data structure based at least in part on the changed rating.

24. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to receive the plurality of vehicle data without any intervention from the current operator of the vehicle.

25. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to determine that the driving maneuver includes one or more of a vehicle movement, a rapid acceleration, a sudden turn, or a sudden stop.

26. The non-transitory computer readable storage medium of claim **19** wherein the received vehicle data is recorded at a sample rate of at least once per second.

27. The non-transitory computer readable storage medium of claim **19**, wherein the computer readable instructions when executed on the one or more processors further cause the one or more processors to:

determine an operator driving pattern associated with a known operator of the vehicle; and

analyze the received vehicle data to determine whether the driving pattern corresponds to the known operator or an unknown operator.

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