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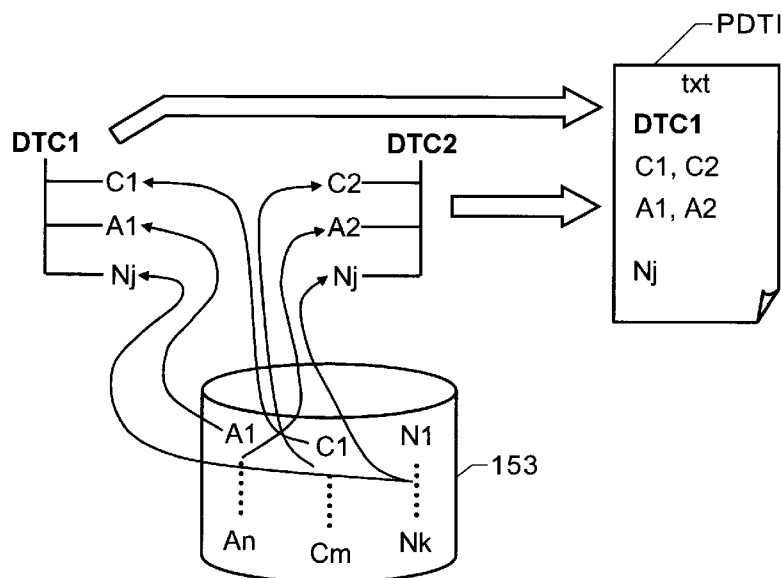


Fig. 2

(57) Abstract: A processing unit receives fault codes (DTC1, DTC2) from a vehicle and provides diagnostic fault information (PDTI) via an output interface. Each fault code received (DTC1, DTC2) is associated with an unique identity, and a database (153) contains at least one range of information items (A1 An; C1 Cm, N1, Nj) each pertaining to a certain fault code (DTC1, DTC2). The processing unit generates the diagnostic fault information (PDTI) dynamically on the basis of at least one fault code received (DTC1, DTC2) and at least one information item (C1, A1, Nj; C2, A2, Nj) thereto pertaining from the database (153).

System and method for providing diagnostic fault information

BACKGROUND TO THE INVENTION AND PRIOR ART

5 The present invention relates generally to the identification and rectification of faults in motor vehicles. The invention relates in particular to a system according to the preamble of claim 1 and a method according to the preamble of claim 12. It relates also to a computer programme according to claim 23 and a
10 computer-readable medium according to claim 24.

Today's motor vehicles are very complex technical systems supervised by automatic functions. In for example heavy vehicles, e.g. trucks and buses, a unit or group of units is usually controlled by means of electronic control units (ECUs)
15 which are connected to the units via a communication bus. Any faults in each of the vehicle's components and units may thereby be detected via respective ECUs which look after them, and be reported in the course of troubleshooting to a central location in the form of standardised fault codes, e.g. DTCs
20 (*diagnostic trouble codes*).

DE 10 2007 010 978 A1 describes a solution for fault diagnosis whereby a Bayesian network defines the cause and effect relationship between components and fault events. An evaluation unit evaluates the Bayesian network and determines
25 a dependency value for the fault in each component. The evaluation unit generates a list of faulty components which is sorted on the basis of the dependency value. A user, e.g. a repairer, is provided with the list via an output unit.

US 2009/0006476 refers to an experience-based (*case based*)
30 system for processing of vehicle diagnostic data with the object of identifying remedial measures deemed likely to rectify faults detected in a vehicle. The processing is conducted remotely, away from the vehicle, and involves ranking the identified

remedial measures by matching in a database of previously received diagnostic data and associated remedial measures. The remedial measure associated with the highest ranking combination of diagnostic data is regarded as being the most likely to solve the fault detected. The most likely remedial measure is reproduced on a vehicle repair database, resulting in the extraction of a corresponding repair procedure for the most likely remedial measure.

EP 1 895 377 A1 refers to a fault diagnosis solution for a complex system comprising a plurality of components each regarded as potentially being in any of the states of health described as "normal", "suspected faulty" or "confirmed faulty". On the basis of the results of tests, minimal conflicts which clarify the test results are identified. A respective readiness status is derived which indicates a definitive value or a non-definitive value depending on whether or not further testing of a component is expected to alter its state of health. In the case of a non-definitive value, future minimal conflicts are identified which express every combination of potentially faulty components which is consistent with a current range of minimal conflicts. The minimal conflicts serve as a basis for determining the further tests which might potentially produce results such as to cause said readiness status to change to the definitive value for one or more of the components. A status report is generated after evaluation of at least one of the further tests. Reliable diagnoses may thus also be arrived at for very complex systems, e.g. modern motor vehicles. It is also possible in a given situation to decide whether continued testing is sensible or not.

30 PROBLEM ASSOCIATED WITH PRIOR ART

Although the above solutions have many advantageous characteristics, there is no effective solution for presenting appropriate information for a user of a diagnostic tool, e.g. a repairer, when two or more faults in a motor vehicle occur at the

same time.

SUMMARY OF THE INVENTION

The object of the present invention is therefore to propose a solution which solves the above problem.

- 5 One aspect of the invention achieves the object by the system described in the introduction which comprises a database containing at least one range of information items. Each information item is here associated with a certain fault code. The processing unit is configured to generate the diagnostic fault
10 information dynamically on the basis of at least one fault code received and at least one information item therewith associated from the database.

- This system is advantageous in that the proposed dynamically generated fault information may be adapted to convey a composite
15 picture of all of the fault codes concerned. Moreover, any redundant information overlapping from two or more fault codes may be eliminated, thereby improving the relevance of the information presented and consequently leading to a shorter average expected fault rectification time.

- 20 In one embodiment of this aspect of the invention, the processing unit is configured, if more than one fault code is received from the vehicle, to generate diagnostic fault information concerning a current fault code on the basis of at least one information item pertaining to the current fault code and at least one information
25 item pertaining to at least one other of said fault codes received. Synergy effects as described above are thus achieved.

- In another embodiment of this aspect of the invention, the processing unit is configured, if more than one fault code is received from the vehicle, to calculate a respective probability
30 rating for each information item pertaining to a current fault code, and to generate diagnostic fault information concerning a current fault code, in such a way that information based on at least one information item pertaining to the current fault code with a

relatively high probability is given a higher ranking than information based on one or more information items pertaining to the current fault code with only relatively low probability. This is advantageous in making it easier for the user to assimilate
5 effectively and appropriately the information presented.

In yet another embodiment of this aspect of the invention, the processing unit is configured, if two or more information items have the same calculated probability rating, to generate diagnostic fault information concerning a fault code which incorporates said
10 information items in such a way that the diagnostic fault information presented has its content ranked in an *a priori* order of probability for said two or more information items. The information presentation is thus given a further enhanced relevance.

In a further embodiment of this aspect of the invention, each of
15 said information items is regarded as comprising at least one suggested cause pertaining to respective fault codes. The processing unit is further configured to include in diagnostic fault information concerning a certain fault code at least one suggested cause pertaining to that fault code. This is desirable in making it
20 easier for a repairer to rectify the current fault.

If more than one fault code is received from the vehicle, the processing unit is with advantage also configured to generate diagnostic fault information concerning a current fault code in such a way as to include at least one suggested cause pertaining to at
25 least one fault code in addition to the current fault code, thereby further simplifying the repairer's prioritisation of his/her work.

In a further embodiment of this aspect of the invention, the processing unit is configured to calculate a respective probability rating for each suggested cause pertaining to a current fault code,
30 and to rank the suggested causes in the diagnostic fault information in such a way that a suggested cause which pertains to the current fault code with a relatively high probability is given a higher ranking than a suggested cause which pertains to the current fault code with a relatively low probability. In a similar way
35 to that indicated above, the information presentation is thus given

an enhanced relevance and the repairer's work prioritisation is facilitated. If however two or more suggested causes pertaining to a current fault code have the same calculated probability rating, the processing unit is with advantage configured to rank them in an *a priori* order of their probability.

In yet another embodiment of this aspect of the invention, each of said information items is regarded as comprising at least one suggested remedy pertaining to respective fault codes. The processing unit is in this case configured to include in diagnostic fault information concerning a certain fault code at least one suggested remedy pertaining to that fault code. An average expected fault rectification time may thus be considerably shortened.

In a further embodiment of this aspect of the invention, the processing unit is configured, if more than one fault code is received from the vehicle, to generate diagnostic fault information concerning a current fault code in such a way as to include at least one suggested remedy pertaining to at least one fault code in addition to the current fault code. This likewise helps to improve the repairer's work situation and shorten the average expected fault rectification time.

In a further embodiment of this aspect of the invention, the processing unit is configured to calculate a respective probability rating for each suggested remedy pertaining to a current fault code. The processing unit is also configured to rank the suggested remedies in the diagnostic fault information in such a way that a suggested remedy which pertains to the current fault code with a relatively high probability is given a higher ranking than a suggested remedy which pertains to the current fault code with a relatively low probability. In a similar way to that indicated above, the presentation of suggested remedies is thus likewise given an enhanced relevance, facilitating the repairer's work.

Another aspect of the invention achieves the object by the method described in the introduction which further comprises retrieving

from a database at least one respective information item pertaining to each fault code received, and generating the diagnostic fault information dynamically on the basis of at least one fault code received and at least one information item thereto pertaining. The advantages of this method and of its preferred embodiments are indicated by the above discussion with reference to the proposed system.

A further aspect of the invention achieves the object by a computer programme which is directly downloadable to the internal memory of a computer and which comprises software for controlling steps according to the method proposed above when said programme is run on a computer.

Yet another aspect of the invention achieves the object by a computer-readable medium which has stored on it a programme adapted to enabling a computer to control steps according to the method proposed above.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be explained in more detail on the basis of embodiments described by way of examples and with reference to the attached drawings.

Figure 1 is a schematic diagram of a motor vehicle connected to the proposed diagnostic system,

Figure 2 illustrates graphically how diagnostic fault information is assembled and presented according to an embodiment of the invention, and

Figure 3 is a flowchart illustrating the general method according to the invention.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

We refer initially to Figures 1 and 2. Figure 1 is a schematic

diagram of a motor vehicle 100 connected to a system 150 for provision of diagnostic fault information PDTI according to the invention. Figure 2 illustrates graphically how diagnostic fault information PDTI is assembled and presented according to an embodiment of the invention.

The vehicle 100 comprises here a number of components $k_1, k_2, \dots, k_n, \dots, k_s$. A first ECU 110 looks after a first group of components k_1 and k_2 , a second ECU 130 looks after a second group of components $k_n, \dots, k_s$, and communication between components $k_1, k_2, \dots, k_n, \dots, k_s$ and the ECUs 110 and 130 takes place across a communication bus 120. The first ECU 110 is regarded as being also equipped with an interface for external data communication, e.g. for conveying fault codes DTC to the proposed system 150. Alternatively, the system 150 may be integrated in the vehicle 100.

In any case, the system 150 comprises a processing unit 155, a database 153 and an output interface 157.

The database 153 contains at least one range of information items C, A each pertaining to a certain fault code DTC. A first type of information item C may here comprise information concerning faults detected, whereas a second type of information item A describes recommended fault rectifying measures.

The processing unit 155 is configured, to receive fault codes DTC from the vehicle 100, e.g. via an input interface 151. Each fault code received DTC is regarded as associated with a unique identity (e.g. a specific number, a number of characters or a combination thereof) for unambiguous identification. The processing unit is configured to generate the diagnostic fault information PDTI dynamically on the basis of at least one fault code received DTC and at least one information item C and/or A thereto pertaining from the database 153. It is further configured to provide the diagnostic fault information PDTI via the output interface 157 for presentation for a user. Continued automatic processing of the fault information PDTI, e.g. for the production of

various forms of statistical data, is of course not ruled out.

Should the vehicle 100 be affected by multiple faults so that the input interface 151 receives more than one fault code DTC1 and DTC2 from the vehicle, the processing unit is configured in one
5 embodiment of the invention to generate diagnostic fault information PDTI concerning a current fault code DTC2 on the basis of at least one information item C2 and A2 pertaining to the current fault code DTC2 and at least one information item C1 and A1 pertaining to at least one other of said fault codes received
10 DTC1.

If more than one fault code DTC1 and DTC2 are received from the vehicle, the processing unit is with advantage also configured to calculate a respective probability rating for each information item pertaining to a current fault code, say DTC1.

15 In another embodiment of the invention, each information item comprises at least one suggested cause C1 and C2 pertaining specifically to respective fault codes DTC1 and DTC2. The processing unit is further configured to include in diagnostic fault information PDTI concerning a certain fault code DTC1 at least
20 one suggested cause C1 pertaining to that fault code.

If more than one fault code DTC1 and DTC2 are received from the vehicle, the processing unit is with advantage configured to generate diagnostic fault information PDTI concerning a current fault code DTC2 in such a way that the diagnostic fault information
25 PDTI includes at least one suggested cause C1 pertaining to at least one fault code DTC1 in addition to the current fault code DTC2. This fault information PDTI is with advantage generated by the processing unit at the time when the current fault code DTC2 is chosen/marked by a user via a user interface, e.g. by marking of
30 the fault code DTC2 on a screen.

In one embodiment of the invention, the processing unit is configured to calculate a respective probability rating for each suggested cause C1 and C2 pertaining to a current fault code DTC2. It is further configured to rank the suggested causes in the

diagnostic fault information PDTI in such a way that a suggested cause C1 which pertains to the current fault code DTC2 and is of relatively high probability is given a higher ranking than a suggested cause C2 which pertains to the current fault code DTC2 but is of relatively low probability. This may for example mean that C1 appears before/ahead of/above C2. Figure 2 illustrates an example where information concerning a first detected fault C1 appears before information concerning a second detected fault C2.

It is generally preferable that the processing unit be configured to generate diagnostic fault information PDTI concerning a current fault code, here DTC1, in such a way that information based on at least one information item which pertains to the current fault code DTC1 and is of relatively high probability is given a higher ranking than information based on one or more information items which pertain to the current fault code DTC1 but is of only relatively low probability.

Should two or more information items appear with the same calculated probability rating, the processing unit is configured in one embodiment of the invention to generate the diagnostic fault information PDTI on the basis of *a priori* probabilities. This means for example that it may be configured to generate diagnostic fault information PDTI concerning a fault code DTC2 incorporating information items C1 and C2 in such a way that the diagnostic fault information PDTI presented has its content ranked in an *a priori* order of their probability.

Two or more suggested causes C1 and C2 pertaining to a current fault code DTC2 may have the same calculated probability rating. In such cases the processing unit is configured in one embodiment of the invention to rank the suggested causes C1 and C2 in an *a priori* order of their probability. The *a priori* probability P for a certain fault F and a certain fault code DTC is given by $P(F \mid \text{DTC validated})$. Similarly, a strength P for the fault F given the fault code DTC is indicated as $P(\text{DTC validated} \mid F)$.

Given a set of validated fault codes (i.e. fault codes whose validity is regarded as strong) and relating information (e.g. suggested

causes), the processing unit in one embodiment of the invention calculates first the so-called minimal cardinality diagnoses, e.g. in accordance with [3] Reiter, R., "A theory of diagnosis from first principles. *Artificial Intelligence*", 32(1):57-95, April 1987, DOI:10.1016/0004-3702 (87) 90062-2 and Biteus, J. et al., "An algorithm for computing the diagnoses with minimal cardinality in a distributed system", *Engineering Applications of Artificial Intelligence*, 21(2): pp 269-276, March 2008. DOI:10.1016/j.engappai. 2007.03.006. The likely fault for a marked fault code DTC corresponds here to the intersection between the set of minimal cardinality diagnoses and the set of possible causes for the marked fault code DTC. The least likely faults for the marked fault code DTC are the complement to the set of the likely faults with respect to the set of possible causes for the marked fault code DTC. The likely and less likely causes are sorted in declining order given the *a priori* probability of the cause, assuming that the marked fault code DTC is validated.

In another embodiment of the invention, each information item comprises also at least one suggested remedy A1 and A2 pertaining to respective fault codes DTC1 and DTC2. The processing unit is here configured to include in diagnostic fault information PDTI concerning a certain fault code, e.g. DTC1, at least one suggested remedy A1 pertaining to that fault code.

If more than one fault code, e.g. DTC1 and DTC2, are received from the vehicle, the processing unit is with advantage configured, in a similar way to that indicated above, to generate diagnostic fault information PDTI concerning a current fault code, say DTC2, in such a way that the diagnostic fault information PDTI at the time of marking of the current fault code DTC2 includes also at least one suggested remedy A1 pertaining to at least one fault code DTC1 in addition to the current fault code DTC2. It should be noted that a prerequisite for this is that there is also some form of connection between the fault code DTC2 and the suggested remedy A1.

In one embodiment of the invention, the processing unit is

- specifically configured to calculate a respective probability rating for each suggested remedy A1 and A2 pertaining to a current fault code DTC2. It is further configured to rank the suggested remedies A1 and A2 in the diagnostic fault information PDTI in such a way that a suggested remedy, say A1, which pertains to the current fault code DTC2 and is of relatively high probability is given a higher ranking than a suggested remedy, say A2, which pertains to the current fault code DTC2 but is of relatively low probability. A1 may thus here be presented before/in front of/above A2.
- 10 The diagnostic fault information PDTI presented via the output interface 157 may for example comprise details in the form of fault codes DTC with designations and descriptions, such as “FF01 – Electrical fault in fuel shutoff valve” and “FF03 – Short-circuit of fuel shutoff valve to battery voltage”. When a first of the fault codes DTC, say FF01, is chosen/marked in a corresponding input interface, the following text information txt may be presented via the output interface 157: “Detection: *Control unit indicates electrical fault on legs connected to fuel shutoff valve*”; “Cause: (likely fault) *air/fuel pressure sensor (T110) short-circuited to battery voltage*, (less likely fault) *air/fuel pressure sensor (T110) short-circuited to earth*”; “Comment”: [System reaction] *diesel particle filter preventing fuel injection*” and “Remedial measure”: *if air/fuel pressure sensor (T110) short-circuited to battery voltage, change fuel pressure sensor (T110)*; *if air/fuel pressure sensor (T110) short-circuited to earth, change fuel pressure sensor (T110)*.

The way described above in which the processing unit 155 and other units and components which form part of the system 150 work is with advantage controlled by software/programmeware/a range of computer programme instructions stored in a memory unit (M) in communicative connection with the processing unit 155.

To summarise, the general method according to the invention will now be described with reference to the flowchart in Figure 3.

35 A first step 310 investigates whether at least one fault code DTC

has been received by the system. If such is not the case, the method goes back and stays at step 310 to continue investigating whether at least one fault code DTC has been received. In the opposite case, i.e. if one or more fault codes *have* been received, 5 the method moves on to a step 320 in which at least one respective information item C, A pertaining to each fault code received DTC is retrieved from a database 153.

This is followed by a step 330 in which diagnostic fault information PDTI is generated dynamically on the basis of the at least one fault 10 code received DTC and said at least one information item thereto pertaining. The method according to the invention thereupon ends.

The method steps described with reference to Figure 3 may be controlled by means of a programmed computer apparatus. In 15 addition, although the embodiments of the invention described above with reference to the drawings comprise a computer and processes conducted in a computer, the invention extends to computer programmes, particularly computer programmes on or in a support suited to practical implementation of the invention. The 20 programme may be in the form of source code, object code, a code which is intermediate between source and object code, e.g. in partly compiled form, or in any other form suitable for use in implementing the process according to the invention. The support may be any entity or device capable of carrying the 25 programme. It may for example comprise a storage medium such as a flash memory, a ROM (read only memory), e.g. a CD (compact disc) or a semiconductor ROM, EPROM (electrically programmable ROM), EEPROM (erasable EPROM), or a magnetic recording medium, e.g. a floppy disc or hard disc. It 30 may also be a transmitting support such as an electrical or optical signal which can be conveyed through an electrical or optical cable or via radio or in some other way. Where the programme takes the form of a signal which can be conveyed directly by a cable or some other device or means, the support 35 may take the form of such a cable, device or means.

Alternatively, the support may be an integrated circuit in which the programme is embedded, in which case the integrated circuit is adapted to conducting, or being used in the conducting of, the respective processes.

- 5 The invention is not restricted to the embodiments described with reference to the drawings but may be varied freely within the scope of the claims set out below.

Claims

1. A system for provision of diagnostic fault information (PDTI) concerning a motor vehicle (100), which system comprises a processing unit (155) configured to receive fault codes (DTC) from the vehicle (100), each fault code received (DTC) being associated with a unique identity, and to provide the diagnostic fault information (PDTI) via an output interface (157),
5 **characterised** in that
the system comprises a database (153) containing at least one range of information items (C, A) which each pertain to a certain fault code (DTC), and
10 the processing unit (155) is configured to generate the diagnostic fault information (PDTI) dynamically on the basis of at least one fault code received (DTC) and at least one information item (C, A) thereto pertaining from the database (153).
15
2. The system according to claim 1, in which if more than one fault code (DTC1, DTC2) is received from the vehicle (100) the processing unit (155) is configured to generate diagnostic fault information (PDTI) concerning a current fault code (DTC2) on the basis of at least one information item (C2, A2) pertaining to the current fault code (DTC2) and at least one information item (C1, A1) pertaining to at least one other of said fault codes received (DTC1).
20
25
3. The system according to claim 2, in which if more than one fault code (DTC1, DTC2) is received from the vehicle (100) the processing unit (155) is configured
to calculate a respective probability rating for each
30 information item pertaining to a current fault code (DTC2), and
to generate diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that information based on at least one information item which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher
35 ranking than information based on one or more information items which pertain to the current fault code (DTC2) but are of only

relatively low probability.

4. The system according to claim 3, in which if two or more information items have the same calculated probability rating the processing unit (155) is configured to generate diagnostic fault information (PDTI) concerning a fault code (DTC2) incorporating said information items in such a way that the diagnostic fault information (PDTI) presented has its content ranked according to an *a priori* order of probability for said two or more information items.
5. The system according to either of claims 1 and 2, in which each of said information items comprises at least one suggested cause (C1; C2) pertaining to respective fault codes (DTC1, DTC2), and the processing unit (155) is configured to include in diagnostic fault information (PDTI) concerning a certain fault code (DTC1) at least one suggested cause (C1) pertaining to that fault code.
6. The system according to claim 5, in which if more than one fault code (DTC1, DTC2) is received from the vehicle (100) the processing unit (155) is configured to generate diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that the diagnostic fault information (PDTI) includes at least one suggested cause (C1) pertaining to at least one fault code (DTC1) in addition to the current fault code (DTC2).
7. The system according to claim 6, in which the processing unit (155) is configured
- to calculate a respective probability rating for each suggested cause (C1; C2) which pertains to a current fault code (DTC2), and
- to rank the suggested causes in the diagnostic fault information (PDTI) in such a way that a suggested cause (C1) which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher ranking than a suggested cause (C2) which pertains to the current fault code (DTC2) but is of

relatively low probability.

8. The system according to claim 7, in which if two or more suggested causes (C1; C2) pertaining to a current fault code (DTC2) have the same calculated probability rating the processing unit (155) is configured to mutually rank said two or more suggested causes (C1; C2) in an *a priori* order of their probability.
9. The system according to either of claims 1 and 2, in which each of said information items comprises at least one suggested remedy (A1; A2) pertaining to respective fault codes (DTC1, DTC2), and the processing unit (155) is configured to include in diagnostic fault information (PDTI) concerning a certain fault code (DTC1) at least one suggested remedy (A1) which pertains to that fault code.
10. The system according to claim 9, in which if more than one fault code (DTC1, DTC2) is received from the vehicle (100) the processing unit (155) is configured to generate diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that the diagnostic fault information (PDTI) includes at least one suggested remedy (A1) pertaining to at least one fault code (DTC1) in addition to the current fault code (DTC2).
11. The system according to claim 10, in which the processing unit (155) is configured
- to calculate a respective probability rating for each suggested remedy (A1; A2) which pertains to a current fault code (DTC2), and
- to rank the suggested remedies (A1, A2) in the diagnostic fault information (PDTI) in such a way that a suggested remedy (A1) which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher ranking than a suggested remedy (A2) which pertains to the current fault code (DTC2) but is of relatively low probability.

12. A method for provision of diagnostic fault information (PDTI) concerning a motor vehicle (100), which method comprises
receiving from the vehicle (100) fault codes (DTC) each associated with a unique identity, and
5 providing the diagnostic fault information (PDTI) via an output interface (157),
characterised by
retrieving from a database (153) at least one respective information item (C, A) pertaining to each fault code received
10 (DTC), and
generating the diagnostic fault information (PDTI) dynamically on the basis of at least one fault code received (DTC) and at least one information item (C, A) thereto pertaining.
- 15 13. The method according to claim 12, which, if more than one fault code (DTC1, DTC2) is received from the vehicle (100), comprises generating diagnostic fault information (PDTI) concerning a current fault code (DTC2) on the basis of at least one information item (C2, A2) pertaining to the current fault code
20 (DTC2) and at least one information item (C1, A1) pertaining to at least one other of said fault codes received (DTC1).
14. The method according to claim 13, which, if more than one fault code (DTC1, DTC2) is received from the vehicle (100),
25 comprises
calculating a respective probability rating for each information item pertaining to a current fault code (DTC2), and
generating diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that information based on
30 at least one information item which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher ranking than information based on one or more information items which pertain to the current fault code (DTC2) but are of only relatively low probability.
- 35 15. The method according to claim 14, which, if two or more

information items have the same calculated probability rating, comprises generating diagnostic fault information (PDTI) concerning a fault code (DTC2) incorporating said information items in such a way that the diagnostic fault information (PDTI) presented has its content ranked according to an *a priori* order of probability for said two or more information items.

16. The method according to either of claims 12 and 13, in which each of said information items comprises at least one suggested cause (C1; C2) pertaining to respective fault codes (DTC1, DTC2) and the method comprises including in diagnostic fault information (PDTI) concerning a certain fault code (DTC1) at least one suggested cause (C1) which pertains to that fault code.

17. The method according to claim 16, which, if more than one fault code (DTC1, DTC2) is received from the vehicle (100), comprises generating diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that the diagnostic fault information (PDTI) includes at least one suggested cause (C1) pertaining to at least one fault code (DTC1) in addition to the current fault code (DTC2).

18. The method according to claim 17, further comprising calculating a respective probability rating for each suggested cause (C1; C2) which pertains to a current fault code (DTC2), and ranking the suggested causes in the diagnostic fault information (PDTI) in such a way that a suggested cause (C1) which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher ranking than a suggested cause (C2) which pertains to the current fault code (DTC2) but is of relatively low probability.

19. The method according to claim 18, which, if two or more suggested causes (C1; C2) pertaining to a current fault code (DTC2) have the same calculated probability rating, comprises mutual ranking of said two or more suggested causes (C1; C2) in

an *a priori* order of their probability.

20. The method according to either of claims 12 and 13, in which each of said information items comprises at least one suggested
5 remedy (A1; A2) pertaining to current fault codes (DTC1, DTC2) and the method comprises including in diagnostic fault information (PDTI) concerning a certain fault code (DTC1) at least one suggested remedy (A1) pertaining to that fault code.
- 10 21. The method according to claim 20, which, if more than one fault code (DTC1, DTC2) is received from the vehicle (100), comprises generating diagnostic fault information (PDTI) concerning a current fault code (DTC2) in such a way that the diagnostic fault information (PDTI) includes at least one suggested
15 remedy (A1) pertaining to at least one fault code (DTC1) in addition to the current fault code (DTC2).
22. The method according to claim 21, further comprising calculating a respective probability rating for each suggested
20 remedy (A1; A2) which pertains to a current fault code (DTC2), and ranking the suggested remedies (A1, A2) in the diagnostic fault information (PDTI) in such a way that a suggested remedy (A1) which pertains to the current fault code (DTC2) and is of relatively high probability is given a higher ranking than a
25 suggested remedy (A2) which pertains to the current fault code (DTC2) but is of relatively low probability.
23. A computer programme directly downloadable to the internal memory (M) of a computer and comprising software for controlling
30 steps according to any one of claims 12 to 22 when said programme is run on the computer.
24. A computer-readable medium (M) which has stored on it a programme adapted to enabling a computer to control steps
35 according to any one of claims 12 to 22.

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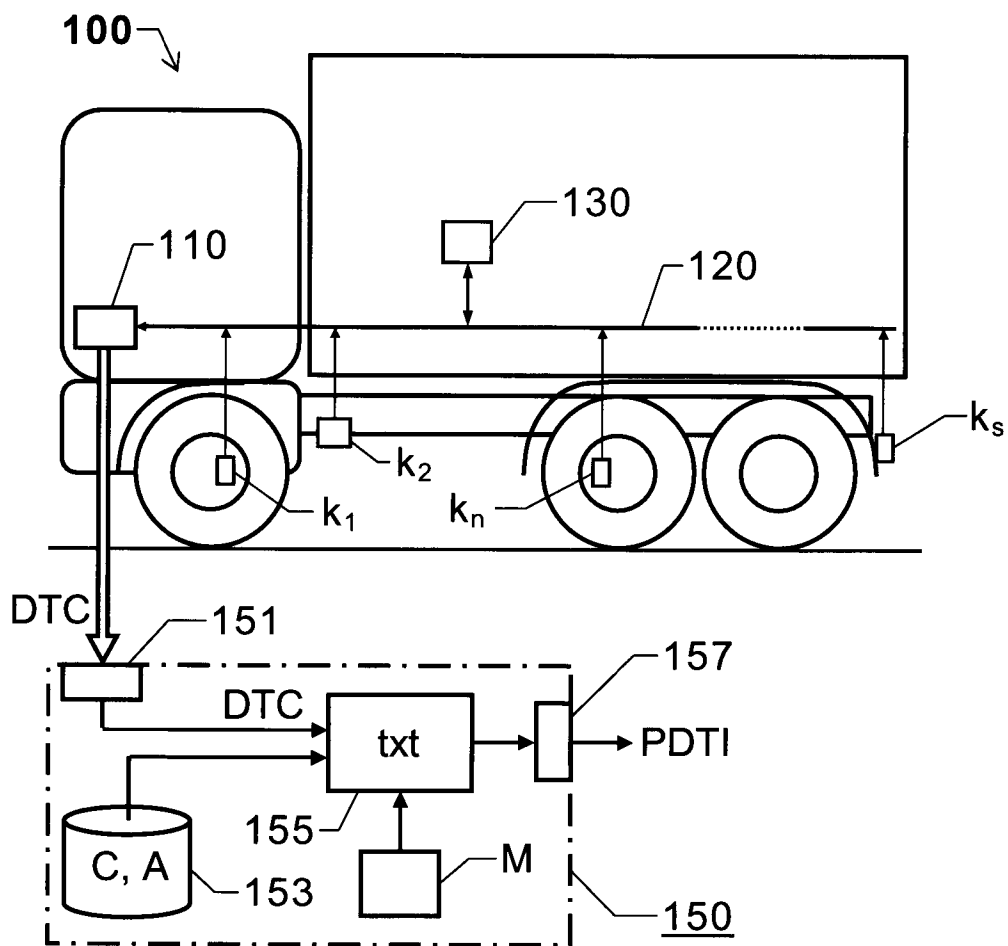


Fig. 1

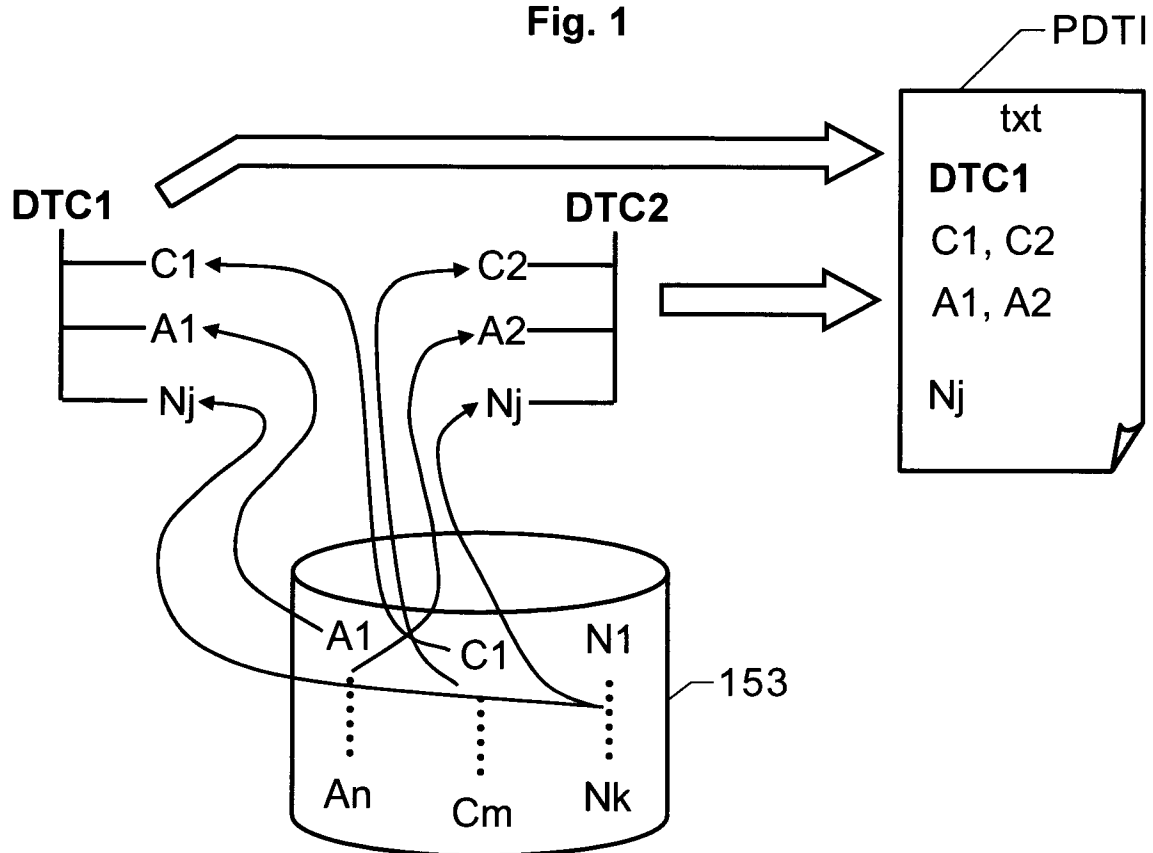


Fig. 2

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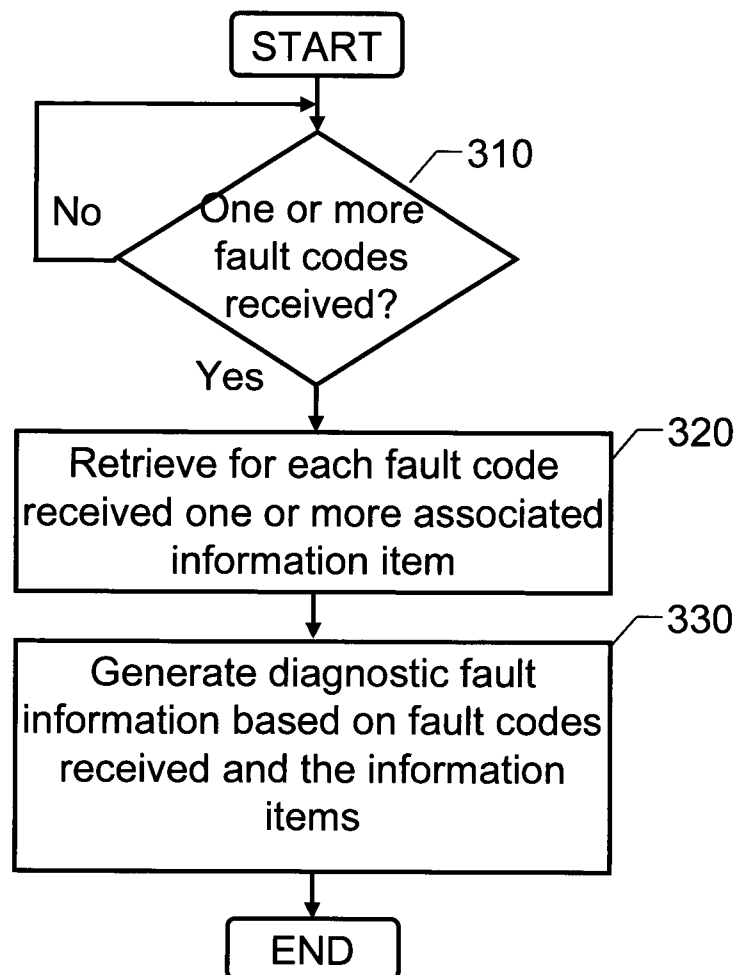


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/050006

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G05B, G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20110225096 A1 (CHO HANBUM ET AL), 15 September 2011 (2011-09-15); paragraphs [0022]-[0038], [0046]; figure 1	1, 5, 9, 12, 16, 20, 23, 24
A	--	2-4, 6-8, 10-11, 13-15, 17-19, 21-22
X	US 20090006476 A1 (ANDREASEN KEITH ET AL), 1 January 2009 (2009-01-01); abstract; paragraphs [0029]-[0030]	1, 5, 9, 12, 16, 20, 23, 24
A	--	2-4, 6-8, 10-11, 13-15, 17-19, 21-22



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

31-05-2013

Date of mailing of the international search report

31-05-2013

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/050006

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20110246018 A1 (BERTOSA THOMAS ET AL), 6 October 2011 (2011-10-06); abstract; paragraphs [0043]-[0048]	1, 5, 9, 12, 16, 20, 23, 24
A	-- -----	2-4, 6-8, 10-11, 13-15, 17-19, 21-22

Continuation of: second sheet**International Patent Classification (IPC)***G07C 5/08* (2006.01)*G05B 23/02* (2006.01)*G05B 19/048* (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2013/050006

US	20110225096 A1	15/09/2011	NONE		
US	20090006476 A1	01/01/2009	US	8019503 B2	13/09/2011
US	20110246018 A1	06/10/2011	NONE		