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(54) **Title:** SCHEDULING OF MAINTENANCE

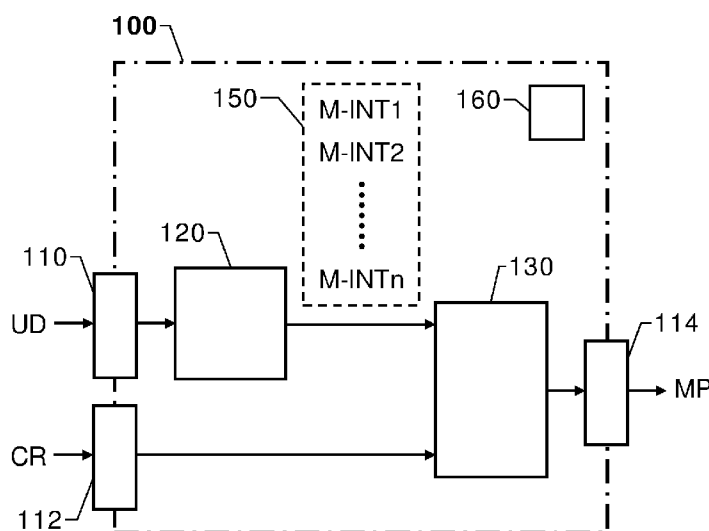


Fig. 1

(57) **Abstract:** A planning entity (100), which schedules a motor vehicle's maintenance visits to a workshop, includes: first and second input interfaces (110, 112), a main processing module (130) and an output interface (114). The first input interface (110) receives utilization data (UD) representing how the motor vehicle has been used during a data collection period. The second input interface (112) receives a client request (CR) containing at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data (UD). Based on the utilization data (UD) and the client request (CR), the main processing module (130) generates a maintenance program (MP) that is presented via the output interface (114). The maintenance program (MP) describes recommended visits to a workshop in terms of a series of time instances (T1, T2, ..., Ty) to each of which is associated a set of maintenance instances (MI1, MI2, ..., MIn) to execute at that time instance (T1, T2, ..., Ty).

Scheduling of Maintenance

THE BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates generally to scheduling of maintenance for motor vehicles. More particularly the invention relates to a planning entity according to the preamble of claim 1. The invention also relates to a method according to the preamble of claim 11, a computer program according to claim 19 and a computer program product according to claim 20.

Service and maintenance of mechanical equipment has been needed as long as such equipment has existed. Moreover, especially for motor vehicles in commercial use, (e.g. trucks and buses), it is interesting to minimize the downtime, i.e. when the vehicle cannot be used (for example because it is in a workshop for maintenance). Hence, there is a balance between the requirement to perform maintenance in order to maximize the useful lifespan, and the wish to avoid unnecessary workshop visits. Historically, tests and theoretical models have been employed to accomplish relevant maintenance programs for different types of products, such as motor vehicles.

Within the vehicle industry, it has been common practice to assign intervals for when maintenance shall be performed, and which measures that shall be taken at each maintenance occasion. For instance, a given maintenance occasion may be of smaller type (when only relatively few measures are taken), or larger type (when comparatively many measures are taken). Depending on how much the vehicle is expected to be used and the owner's demand for availability, the dates for the smaller and larger maintenance occasions are assigned. However, such a static maintenance schedule is problematic because the use conditions may change dramatically during the lifespan of the vehicle. Consequently, workshop visits may occur too frequently or too seldom relative to when maintenance is actually needed. Moreover, since it is generally desired to keep the number of workshop visits low, a number of maintenance instances must

always be scheduled to a common point in time, which is determined by the shortest maintenance interval for the maintenance instances concerned. Hence, in respect of all other maintenance instances except the maintenance instance associated with the
5 shortest interval, the workshop visit actually comes too soon.

US 2003/00655771 reveals a method for creating a maintenance algorithm for a fleet of vehicles. Here, maintenance information can be collected and displayed in each vehicle of the fleet. In the fleet vehicles, sensor data that are indicative of a stress on
10 components in the vehicles are used to derive stress variables. The ascertained stress variables are stored in the vehicles for a predetermined period and, if a wear-related event occurs, wear variables that characterize a wear-related event are additionally ascertained. The stress variables and the wear variables are
15 transmitted to a central location or station, in which the previous maintenance algorithm is checked with the use of the stress and wear variables, and, if applicable, an improved maintenance algorithm can be derived. The maintenance algorithm serves in establishing and indicating a time when the vehicle should be
20 serviced.

US 2006/0136105 describes a solution wherein vehicle telematics is employed to improve maintenance scheduling. Specifically, vehicle condition information is collected from diverse sources, which include real time data collected from vehicle sensors
25 over an intelligent vehicle controller area network. The network is provided with facilities for generating records with stamps allowing their correlation with vehicle inspection results and the generation of trend reports to be used in scheduling maintenance.

30 US 2008/0269977 discloses a system, wherein user generated service rules operate upon selected vehicle operating variables, vehicle configurations and vehicle vocations to produce estimates of the service life of diverse, routine service items. Items with corresponding projected service lives are then grouped for
35 service to reduce overall service frequency.

PROBLEMS ASSOCIATED WITH THE PRIOR ART

Thus various solutions are known for recording utilization data for motor vehicles, and based on the recorded data, adapt a maintenance plan for each vehicle and/or adjust other arrangements where use factors are relevant. However, considering the use conditions alone does not allow full flexibility and efficiency in the maintenance planning. In fact, the known solutions are comparatively inflexible in terms of adaptation to user requirements that are not directly related to the use and wear of the vehicles.

SUMMARY OF THE INVENTION

The object of the present invention is therefore to provide a solution, which offers maintenance scheduling with improved flexibility in terms of the users' requirements, for instance regarding vehicle availability and environmental issues.

According to one aspect of the invention, the object is achieved by the initially described planning entity, wherein the planning entity includes a second input interface configured to receive a client request containing at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data. The main processing module is configured to generate the maintenance program on the further basis of the client request.

This planning entity is advantageous because it renders it possible to weigh into the planning for example a user's requirement concerning uptime or to minimize the vehicle's environmental influence. Thus, the at least one parameter of the client request may specify a desired uptime for the motor vehicle between two consecutive visits to the workshop and/or a maximally allowed environmental influence caused by the motor vehicle between two consecutive visits to the workshop.

According to one embodiment of this aspect of the invention, the main processing module is configured to derive at least one boundary condition from the client request, and implement an

iterative optimizing algorithm with respect to a target function. The main processing module is further configured to maximize the target function while fulfilling the at least one boundary condition, and thus return a valid solution to an optimization problem. Then, based on this solution, the main processing module is configured to generate the maintenance program. Consequently, the maintenance program is produced very efficiently while considering highly diverse criteria.

According to another embodiment of this aspect of the invention, the optimizing algorithm is an Anytime algorithm arranged to return a valid solution at each iteration completed by the optimizing algorithm. Hence, the maintenance program may be improved by allowing the algorithm to run through many iterations. However, an acceptable maintenance program can be produced in each iteration. Preferably, the Anytime algorithm is arranged to, at each iteration completed by the optimizing algorithm, return the best solution so far.

According to yet another embodiment of this aspect of the invention, the planning entity includes an auxiliary processing module configured to derive a respective maintenance interval for at least one maintenance instance in respect of the motor vehicle. Namely, the maintenance program describes recommended visits to a workshop, and is preferably based on the at least one maintenance interval. The utilization data, in turn, contains a predefined set of condition factors. Using condition factors is advantageous because these factors render it possible to weigh in various aspects of the use. For example, the auxiliary processing module may be configured to compute the at least one maintenance interval on the further basis of at least one weight factor associated to each condition factor in the predefined set of condition factors. Each weight factor reflects how the condition factor to which it is associated influences the wear of at least one component being the subject of a given maintenance instance. Thereby, very high precision can be attained in how the condition factors influence the maintenance intervals for the individual components of the motor vehicle.

Furthermore, the at least one maintenance interval may be expressed in terms of an operating time for the motor vehicle and/or a distance driven by the motor vehicle. In such a case, the auxiliary processing module is configured to compute the at least one maintenance interval based on the condition factors such that the maintenance interval is either decreased or increased from a nominal value depending on whether the data reflected by a particular condition factor is expected to intensify or reduce the wear of a component being the subject of the maintenance instance. As a result, the maintenance program can be made especially relevant for each vehicle.

According to still another embodiment of this aspect of the invention, the auxiliary processing module is configured to compute the at least one maintenance interval on the further basis of the at least one weight factor, such that the influence of a particular condition factor on a given maintenance instance is either raised or lowered depending on whether the condition factor is deemed to be relatively important or relatively unimportant for the wear of the component being the subject of the maintenance instance.

According to a further embodiment of this aspect of the invention, the condition factors express: a weight of the motor vehicle, a driver's driving behavior, topographic data, traffic conditions, road conditions and/or climate conditions in an environment where the motor vehicle has been operated during the data collection period. As a result, the key aspects for planning the maintenance can be modeled with high accuracy.

According to another aspect of the invention, the object is achieved by the method described initially, wherein a client request is received that contains at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data. The maintenance program is then generated on the further basis of the client request. The advantages of this method, as well as the preferred embodiments thereof, are apparent from the discussion above with reference to the proposed planning entity.

According to a further aspect of the invention the object is achieved by a computer program loadable into the internal memory of a computer, comprising software for controlling the above proposed method when said program is run on a computer.

- 5 According to another aspect of the invention the object is achieved by a computer program product, having a program recorded thereon, where the program is to make a computer control the above proposed method.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 The present invention is now to be explained more closely by means of embodiments, which are disclosed as examples, and with reference to the attached drawings.

Figure 1 shows a block diagram over a planning entity according to one embodiment of the invention,

- 15 Figure 2 exemplifies a maintenance plan according to one embodiment of the invention,

Figure 3 shows a block diagram over an auxiliary processing module according to one embodiment of the invention, and

- 20 Figure 4 shows a flow diagram illustrating the general method according to the invention.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

- We refer initially to Figure 1 showing a block diagram over a planning entity for scheduling a motor vehicle's maintenance visits to a workshop according to one embodiment of the invention. The planning entity includes first and second input interfaces 110 and 112 respectively, a main processing module 130 and an output interface 114. Preferably, an auxiliary processing module 120 is also included.

- 30 The first input interface 110 is configured to receive utilization data UD representing how the motor vehicle has been used du-

ring a data collection period (representing any defined interval, say 24 hours to six months). Thus, the data collection period may be relatively short or relatively long depending what is deemed to be appropriate with regard to the vehicle and its expected usage.

The second input interface 112 is configured to receive a client request CR containing at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data UD. Thus, the client request CR may for example contain parameters specifying a desired uptime for the motor vehicle between two consecutive visits to the workshop, and/or a maximally allowed environmental influence caused by the motor vehicle between two consecutive visits to the workshop. To some extent, said requests may involve contradictory constraints because prolonging the interval between consecutive workshop visits generally increases the vehicle's environmental influence.

The main processing module 130 is configured to generate a maintenance program MP describing recommended visits to a workshop in terms of a series of time instances T1, T2, ..., Ty (see Figure 2) to each of which is associated a set of maintenance instances MI1, MI2, ..., MI_n to be executed at that time instance T1, T2, ..., Ty. The main processing module 130 generates the maintenance program MP based on the utilization data UD and the client request CR.

According to one embodiment of the invention, the main processing module 130 is configured to derive at least one boundary condition from the client request CR. Analogously, the main processing module 130 is configured to derive at least one boundary condition from the utilization data UD. Additionally, the main processing module 130 is configured to implement an iterative optimizing algorithm with respect to a target function, which is to be maximized while fulfilling said boundary conditions. As a result, the main processing module 130 returns a valid solution to an optimization problem. On the further basis of this solution, the main processing module 130 generates the

5 maintenance program MP. Preferably, the maintenance program MP has the general structure illustrated in Figure 2, i.e. represents a matrix that for each maintenance instance MI1, MI2, ..., MIn specifies time instances T1, T2, ..., Ty (say particular weeks) when the maintenance instance shall be handled at a workshop.

10 According to one embodiment of the invention, the optimizing algorithm implemented by the main processing module 130 is an Anytime algorithm that is arranged to return a valid solution at each iteration completed by the optimizing algorithm. Moreover, this algorithm is preferably arranged to, at each completed iteration; return the best solution so far. Consequently, a fully acceptable maintenance program MP can normally be obtained very quickly. However, a better maintenance program MP can be
15 expected if the algorithm is allowed to run through many iterations.

Turning now to Figure 3, we see a block diagram over the auxiliary processing module 120 according to one embodiment of the invention.

20 In this embodiment, it is presumed that the utilization data UD contains a predefined set of condition factors d1, d2, ..., dx. For example the condition factors d1, d2, ..., dx may here express the actual weight of the motor vehicle during the data collection period; or if the weight has varied, respective actual weights of
25 the motor vehicle during each of a number of intervals within this period (preferably factored by the relative duration of each interval). Alternatively, or as a complement, the condition factors d1, d2, ..., dx may also express a driver's driving behavior during the data collection period, topographic data, traffic conditions, road conditions and/or climate conditions reflecting an environment wherein the motor vehicle has been operated during
30 the data collection period. The data collection period may have any extension in time suitable for the implementation, for example as indicated above.

35 The auxiliary processing module 120 is configured to derive a

respective maintenance interval M-INT1, M-INT2, ..., M-INTn for at least one maintenance instance MI1, MI2, ..., MIn of the motor vehicle. The maintenance intervals M-INT1, M-INT2, ..., M-INTn may be arranged in a listing 150, which is fed to the main processing module 130. A maintenance interval M-INT for a maintenance instance MI1 is the time between two consecutive maintenance occasions for a component in the motor vehicle. Thus, if a first maintenance instance MI1 is represented by the oil filter, a first maintenance interval M-INT1 reflects the interval from installing a new oil filter until this filter must be replaced.

A processor 320 of the auxiliary processing module 120 is configured to derive the maintenance intervals M-INT1, M-INT2, ..., M-INTn based on the utilization data UD, preferably by computing the maintenance intervals M-INT1, M-INT2, ..., M-INTn based on the condition factors d1, d2, ..., dx and at least one weight factor w1, w2, ..., wx associated to each condition factor in the predefined set of condition factors d1, d2, ..., dx. The weight factors w1, w2, ..., wx, in turn, may be stored in a data storage 340 accessible by the processor 320. Each weight factor reflects how the condition factor to which it is associated influences the wear of at least one component being the subject of a given maintenance instance MI1, MI2, ..., MIn.

According to embodiments of the invention, the maintenance interval M-INT1, M-INT2, ..., M-INTn is expressed in terms of an operating time and/or a distance driven by the motor vehicle. The processor 320 is further preferably configured to compute the maintenance interval M-INT1, M-INT2, ..., M-INTn based on the condition factors d1, d2, ..., dx, such that the maintenance interval M-INT1, M-INT2, ..., M-INTn is either decreased/shortened or increased/prolonged from a nominal value depending on whether the data reflected by a particular condition factor is expected to intensify or reduce the wear of a component being the subject of the maintenance instance MI1, MI2, ..., MIn. For example, the respective correlations between the condition factors d1, d2, ..., dx and the maintenance intervals M-INT1, M-INT2, ..., M-INTn are assigned manually by an expert who en-

ters his/her knowledge into a computer program comprising software for controlling the processor 320.

It also advantageous if the processor 320 is configured to compute each maintenance interval M-INT1, M-INT2, ..., M-INTn on the further basis of the at least one weight factor w1, w2, ..., wx, such that the influence of a particular condition factor d1, d2, ..., dx on a given maintenance instance MI1, MI2, ..., MIn is either raised or lowered depending on whether the condition factor is deemed to be relatively important or relatively unimportant for the wear of the component being the subject of the maintenance instance MI1, MI2, ..., MIn. Analogous to the above, the weight factors w1, w2, ..., wx may be assigned manually by an expert in the form of parameters in a computer program for controlling the processor 320. Here, the expert assigns the weight factors w1, w2, ..., wx based on empirical knowledge about relationships between the condition factors d1, d2, ..., dx and the maintenance instances MI1, MI2, ..., MIn.

Preferably, each maintenance interval M-INT1, M-INT2, ..., M-INTn is associated with a minimal value and a maximal value. The minimal value represents a value below the nominal value for the maintenance interval M-INT1, M-INT2, ..., M-INTn, and correspondingly, the maximal value represents a value above the nominal value. The minimal and maximal values express a shortest and a longest recommended interval respectively between two consecutive visits to the workshop in the maintenance program MP. I.e. the minimal and maximal values may be expressed in terms of driving distance and/or operating time for the motor vehicle.

In practice, the minimal and maximal values may be used as follows. If, based on the condition factors d1, d2, ..., dx and weight factors w1, w2, ..., wx, a given maintenance interval M-INT1, M-INT2, ..., M-INTn is computed to a value below the minimal value, the processor 320 is configured to assign the maintenance interval M-INT1, M-INT2, ..., M-INTn to the minimal value. Analogously, if, based on the condition factors d1, d2, ..., dx and weight factors w1, w2, ..., wx, a given maintenance interval M-

INT1, M-INT2, ..., M-INT_n is computed to a value above the maximal value, the processor 320 is configured to assign the maintenance interval M-INT1, M-INT2, ..., M-INT_n to the maximal value. Thus, also under extreme use conditions, the maintenance program MP will contain reasonable maintenance intervals.

According to one embodiment of the invention, the first input interface 110 is connected to at least one communication network, which, in turn, has at least one wireless interface towards the motor vehicle. The input interface 110 is further configured to collect the utilization data UD via the at least one wireless interface. Consequently, utilization data UD in respect to a large number of vehicles may be fed into the auxiliary processing module 120 in very convenient manner.

Analogously, it is preferable that the second input interface 112 is connected to at least one communication network, which, in turn, has at least one interface, preferably wireless, towards the motor vehicle, such that the second input interface 112 can collect the client requests CR via the at least one interface.

The above procedure implemented by the planning entity 100 is preferably controlled by a computer program loaded into a memory 160 of the planning entity 100, or an external memory unit accessible by the planning entity 100 (not shown). The computer program, in turn, contains software for controlling the steps of the procedure when the program is run on the processing modules 120 and 130 of the planning entity 100.

In order to sum up, the general method of scheduling a motor vehicle's visits to a workshop according to the invention will be described below with reference to the flow diagram in figure 4.

In a first step 410, it is checked whether utilization data have been received, which utilization data represent how the motor vehicle has been used during a data collection period; and if so, a step 420 follows. Otherwise, the procedure loops back and stays in step 410.

In step 420, it is checked whether a client request has been received, which client request contains at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data; and if so, a step 430 follows. Otherwise, the procedure loops back and stays in step 420.

In step 430 a maintenance program is generated, which describes recommended visits to a workshop in terms of a series of time instances to each of which is associated a set of maintenance instances to execute at the respective time instance. The maintenance program is generated based on the utilization data and the client request. Subsequently, the procedure ends.

The process steps, as well as any sub-sequence of steps, described with reference to the figure 4 above may be controlled by means of a programmed computer apparatus. Moreover, although the embodiments of the invention described above with reference to the drawings comprise computer apparatus and processes performed in computer apparatus, the invention thus also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of source code; object code, a code intermediate source and object code such as in partially compiled form, or in any other form suitable for use in the implementation of the process according to the invention. The carrier may be any entity or device capable of carrying the program. For example, the carrier may comprise a storage medium, such as a Flash memory, a ROM (Read Only Memory), for example a CD (Compact Disc) or a semiconductor ROM, an EPROM (Erasable Programmable Read-Only Memory), an EEPROM (Electrically Erasable Programmable Read-Only Memory), or a magnetic recording medium, for example a floppy disc or hard disc. Further, the carrier may be a transmissible carrier such as an electrical or optical signal, which may be conveyed via electrical or optical cable or by radio or by other means. When the program is embodied in a signal, which may be conveyed, directly by a cable or other device or means, the carrier may be constituted by such cable or device or means. Alternatively, the carrier may be

an integrated circuit in which the program is embedded, the integrated circuit being adapted for performing, or for use in the performance of, the relevant processes.

5 The invention is not restricted to the described embodiments in the figures, but may be varied freely within the scope of the claims.

Claims

1. A planning entity (100) for scheduling a motor vehicle's maintenance visits to a workshop, the planning entity comprising:
- 5 a first input interface (110) configured to receive utilization data (UD) representing how the motor vehicle has been used during a data collection period,
- a main processing module (130) configured to, based on the utilization data (UD), generate a maintenance program (MP)
- 10 describing recommended visits to a workshop in terms of a series of time instances (T1, T2, ..., Ty) to each of which is associated a set of maintenance instances (M11, M12, ..., M1n) to execute at that time instance (T1, T2, ..., Ty), and
- an output interface (114) configured to present the maintenance program (MP),
- 15 **characterized in that**
- the planning entity (100) comprises a second input interface (112) configured to receive a client request (CR) containing at least one parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data (UD), and
- 20 the main processing module (130) is configured to generate the maintenance program (MP) on the further basis of the client request (CR).
- 25 2. The planning entity (100) according to claim 1, wherein the at least one parameter specifies one of:
- a desired uptime for the motor vehicle between two consecutive visits to the workshop, and
- a maximally allowed environmental influence caused by
- 30 the motor vehicle between two consecutive visits to the workshop.
3. The planning entity (100) according to any one of claims 1 or 2, wherein the main processing module (130) is configured to:
- derive at least one boundary condition from the client request (CR),
- 35 implement an iterative optimizing algorithm with respect to

- a target function, which is to be maximized while fulfilling said at least one boundary condition, thus returning a valid solution to an optimization problem; and
generate the maintenance program (MP) based on said solution.
- 5
4. The planning entity (100) according to claim 3, wherein the optimizing algorithm is an Anytime algorithm arranged to return a valid solution at each iteration completed by the optimizing algorithm.
- 10
5. The planning entity (100) according to claim 4, wherein the Anytime algorithm is arranged to, at each iteration completed by the optimizing algorithm, return the best solution so far.
6. The planning entity (100) according to any one of the preceding claims, comprising an auxiliary processing module (120) configured to derive a respective maintenance interval (M-INT1, M-INT2, ..., M-INTn) for at least one maintenance instance (MI1, MI2, ..., MI_n) in respect of the motor vehicle, the maintenance program (MP) describing recommended visits to a workshop, which maintenance program (MP) is based on said at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn), and the utilization data (UD) comprises a predefined set of condition factors (d1, d2, ..., dx).
- 15
- 20
7. The planning entity (100) according to claim 6, wherein the auxiliary processing module (120) is configured to compute the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) on the further basis of at least one weight factor (w1, w2, ..., wx) associated to each condition factor in the predefined set of condition factors (d1, d2, ..., dx), the weight factor reflecting how the condition factor to which it is associated influences the wear of at least one component being the subject of a given maintenance instance (MI1, MI2, ..., MI_n).
- 25
- 30
8. The planning entity (100) according to claim 7, wherein the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn)

is expressed in terms of at least one of an operating time for the motor vehicle and a distance driven by the motor vehicle, and the auxiliary processing module (130) is configured to compute the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) based on the condition factors (d1, d2, ..., dx) such that the maintenance interval (M-INT1, M-INT2, ..., M-INTn) is either decreased or increased from a nominal value depending on whether the data reflected by a particular condition factor is expected to intensify or reduce the wear of a component being the subject of the maintenance instance (MI1, MI2, ..., MIn).

9. The planning entity (100) according to claim 8, wherein the auxiliary processing module (130) is configured to compute the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) on the further basis of the at least one weight factor (w1, w2, ..., wx) such that the influence of a particular condition factor on a given maintenance instance (MI1, MI2, ..., MIn) is either raised or lowered depending on whether the condition factor is deemed to be relatively important or relatively unimportant for the wear of the component being the subject of the maintenance instance (MI1, MI2, ..., MIn).

10. The planning entity according to any one of the claims 4 to 9, wherein the condition factors (d1, d2, ..., dx) express at least one of: a weight of the motor vehicle, a driver's driving behavior, topographic data, traffic conditions, road conditions and climate conditions in an environment where the motor vehicle has been operated during the data collection period.

11. A method of scheduling a motor vehicle's maintenance visits to a workshop, the method comprising:
receiving utilization data (UD) representing how the motor vehicle has been used during a data collection period,
generating, based on the utilization data (UD), a maintenance program (MP) describing recommended visits to a workshop in terms of a series of time instances (T1, T2, ..., Ty) to each of which is associated a set of maintenance instances (MI1, MI2, ..., MIn) to execute at that time instance (T1, T2, ...,

- Ty), and
presenting the maintenance program (MP),
characterized by
receiving a client request (CR) that contains at least one
5 parameter specifying information relating to a desired maintenance strategy for the motor vehicle, which information is uncorrelated to the utilization data (UD), and
generating the maintenance program (MP) on the further basis of the client request (CR).
- 10 12. The method according to claim 11, wherein the at least one parameter specifies one of:
a desired uptime for the motor vehicle between two consecutive visits to the workshop, and
a maximally allowed environmental influence caused by
15 the motor vehicle between two consecutive visits to the workshop.
13. The method according to any one of claims 11 or 12, comprising:
deriving at least one boundary condition from the client request (CR),
20 executing an iterative optimizing algorithm with respect to a target function, which is to be maximized while fulfilling said at least one boundary condition, thus returning a valid solution to an optimization problem; and
25 generating the maintenance program (MP) based on said solution.
14. The method according to claim 13, wherein a valid solution is returned at each iteration completed by the optimizing algorithm.
- 30 15. The method according to any one of claims 11 to 14, comprising:
deriving a respective maintenance interval (M-INT1, M-INT2, ..., M-INTn) for at least one maintenance instance (MI1, MI2, ..., MIn) in respect of the motor vehicle, the maintenance

program (MP) describing recommended visits to a workshop, which maintenance program (MP) is based on said at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn), and the utilization data (UD) comprises a predefined set of condition factors (d1, d2, ..., dx).

16. The method according to claim 15, comprising computing the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) on the further basis of at least one weight factor (w1, w2, ..., wx) associated to each condition factor in the predefined set of condition factors (d1, d2, ..., dx), the weight factor reflecting how the condition factor to which it is associated influences the wear of at least one component being the subject of a given maintenance instance (MI1, MI2, ..., MI_n).

17. The method according to claim 16, wherein the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) is expressed in terms of at least one of an operating time for the motor vehicle and a distance driven by the motor vehicle, and the method comprising computing the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) based on the condition factors (d1, d2, ..., dx) such that the maintenance interval (M-INT1, M-INT2, ..., M-INTn) is either decreased or increased from a nominal value depending on whether the data reflected by a particular condition factor is expected to intensify or reduce the wear of a component being the subject of the maintenance instance (MI1, MI2, ..., MI_n).

18. The method according to claim 17, comprising computing the at least one maintenance interval (M-INT1, M-INT2, ..., M-INTn) on the further basis of the at least one weight factor (w1, w2, ..., wx) such that the influence of a particular condition factor on a given maintenance instance (MI1, MI2, ..., MI_n) is either raised or lowered depending on whether the condition factor is deemed to be relatively important or relatively unimportant for the wear of the component being the subject of the maintenance instance (MI1, MI2, ..., MI_n).

19. The method according to any one of the claims 15 to 18, wherein the condition factors (d1, d2, ..., dx) express at least one of: a weight of the motor vehicle, a driver's driving behavior, topographic data, traffic conditions, road conditions and climate conditions in an environment where the motor vehicle has been operated during the data collection period.

20. A computer program loadable into the internal memory of a computer, comprising software for controlling the steps of any of the claims 11 to 19 when said program is run on the computer.

21. A computer program product (160), having a program recorded thereon, where the program is to make a computer control the steps of any of the claims 11 to 19.

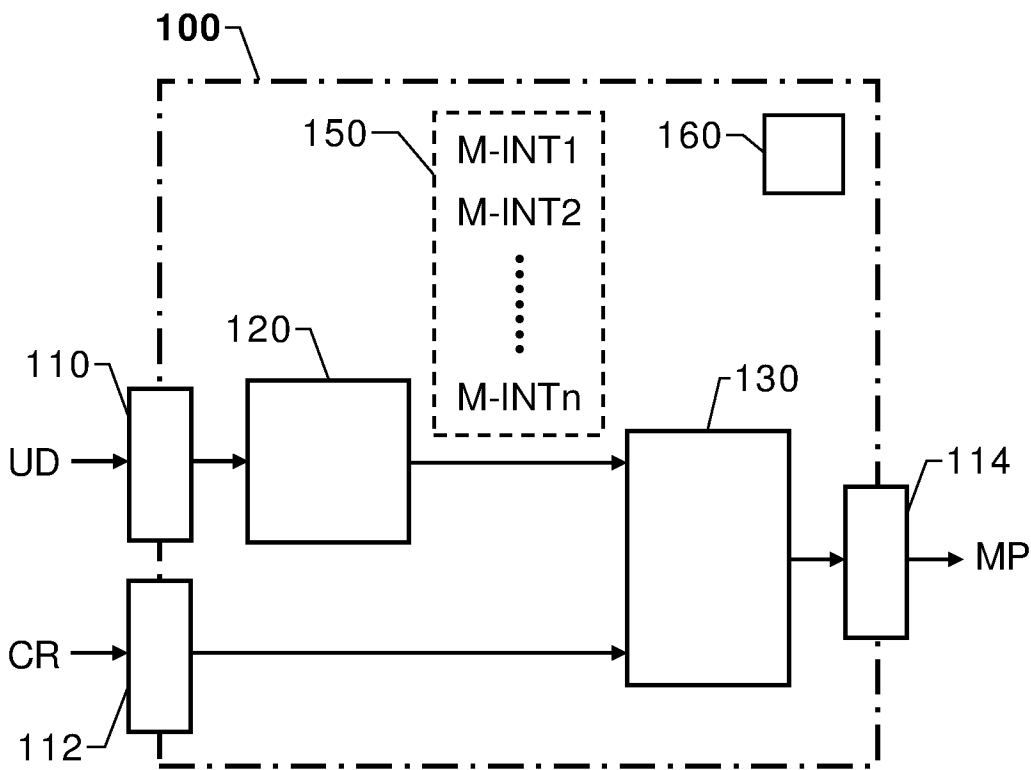


Fig. 1

	T1	T2	T3		T(y-1)	Ty
MI1		X				X
MI2					X	
MI3			X			
⋮	⋮	⋮	⋮		⋮	⋮
⋮			X			
⋮		X				X
⋮					X	
MI n	X					

Fig. 2

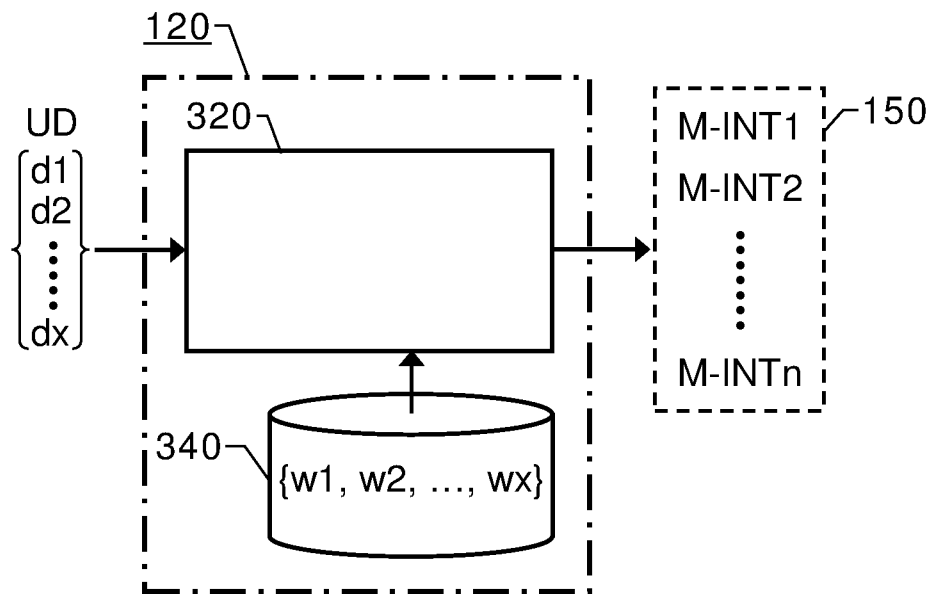


Fig. 3

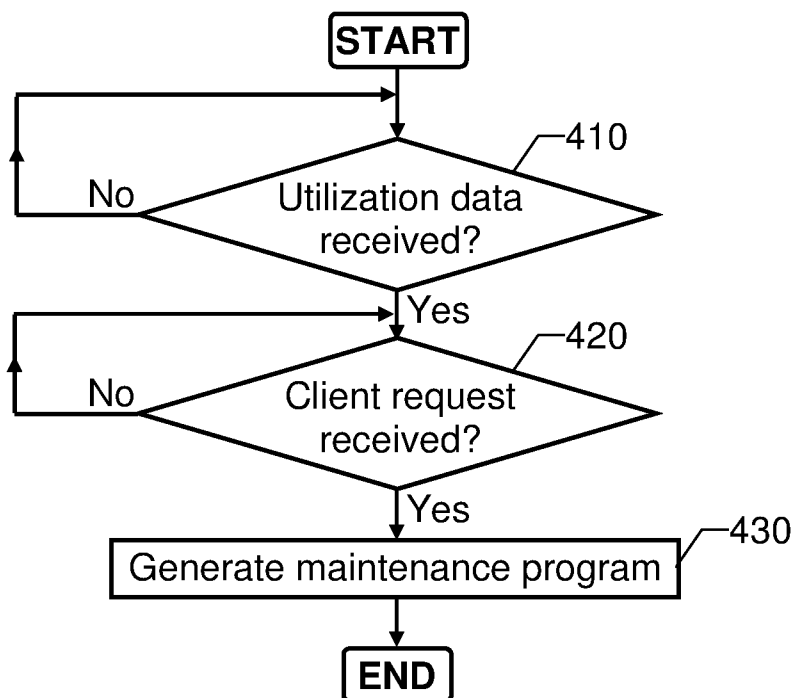


Fig. 4