

CERTIFICATE OF TRANSLATION ACCURACY

I am a professional reviewer and coordinator specializing in translating some European and Asian languages to English and vice versa.

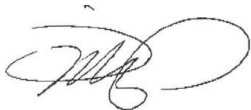
I served as Chief Examiner of the certified court interpreter test for the State of California and as a translator and interpreter for various federal agencies through the U.S. Department of State of for more than a decade. I served as an instructor at the University of California at Berkeley and the Middlebury Institute of International Studies at Monterey (MIIS).

I have more than 30 years of experience translating thousands of technical, legal, and business submitted to, among others, in-country judicial authorities, various U.S. federal courts, the U.S. International Trade Commission (ITC), and the USPTO Patent Trial and Appeal Board (PTAB).

I certify that the following patent application “**DE 197 51 741 A1**” translated from German to the English language is a true, correct, and complete translation of the corresponding source text to the best of my knowledge and ability.

I certify under penalty of perjury that the foregoing is true and correct.

Executed this 26th day of January 2024 in the Contra Costa County of the State of California.



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(19) FEDERAL REPUBLIC OF
GERMANY



GERMANY
PATENT
OFFICE

(12) **Patent Application**
Publication Gazette
(10) **DE 197 51 741 A1**

(21) File Ref. No: 197 51 741.2
(22) Filed: Nov. 21, 1997
(43) Published: May 28, 1998

(51) Int. Cl.⁶ :
G 01 C 21/00
G 07 C 5/08
G 08 G 1/0962
//G05D 1/00

DE 197 51 741 A1

(66) Internal Priority Data:

196 284.4 Nov. 21, 1996

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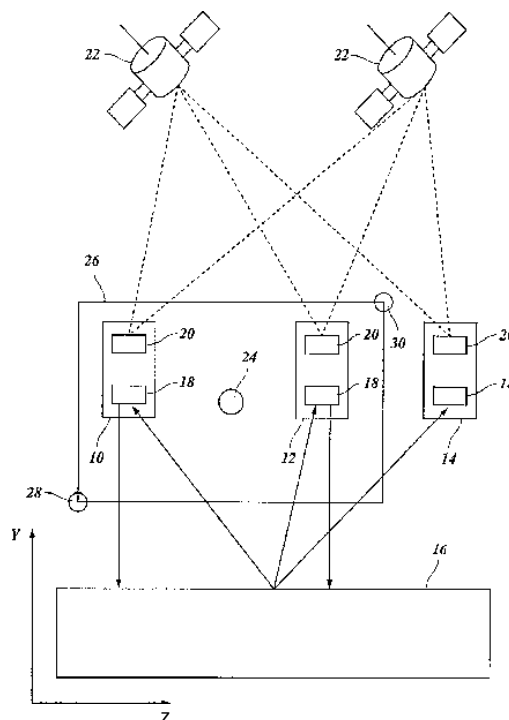
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The following information is taken from the documents submitted by the applicant

Request for examination according to § 44 PatG has been
filed

(54) FLEET DISPOSITION PROCEDURE

(57) Method for dispatching a fleet of mobile units (10, 12, 14), each of which has a position detection device (20) for detecting its own position and is connected to a control center (16) via a remote data transmission network, characterized in that the control center (16) sends coordinate data specifying a selected area (26) to all the units (10, 12, 14), in each unit the own position is then automatically compared with the coordinate data and the units transmit their position to the control centre if the own position lies within the selected area.



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The invention relates to a method for dispatching a fleet of mobile units, each of which has a position detection device for detecting its own position and is connected to a control center via a remote data transmission network.

Such a scheduling procedure is used, for example, by cab companies, courier services and similar companies and is intended to distribute orders, in which the mobile units (e.g. vehicles) have to travel to a specific destination, to the units in the fleet in such a way that the travel distances and times are minimized. The necessary data exchange between the control center and the vehicles should be automated as far as possible so that the drivers are relieved and can concentrate better on the road traffic.

For automatic position detection, the vehicles can be equipped with a Global Positioning System (GPS), for example, with which the respective geographical position of the vehicle can be determined with satellite-based accuracy to within a few meters. A radio data network can be used for remote data transmission.

Appropriate dispatching presupposes that the control center is informed about the current positions of the vehicles in the fleet, so that a decision can be made on this basis as to which vehicle is given the order to travel to a particular destination. The procurement of information could be organized, for example, in such a way that all vehicles report their current position to the control center on demand or that the vehicles report their position at certain intervals of time of their own accord. However, in a fleet of several hundred vehicles, for example, both methods would have the disadvantage that considerable amounts of data would have to be transmitted via the radio data network. Since only a limited number of frequencies or channels are available for radio data transmission, the capacity limit of the network would very soon be reached.

A traffic information system for motor vehicles is known from DE 195 24 949 A1, in which the driver of a motor vehicle who learns of an obstacle, for example an accident, reports a message about the location of the obstacle to a control center, whereupon the control center forwards the coordinate data of the obstacle to all road users. The on-board computers of the vehicles receiving this data then compare their own position with the location of the obstacle and decide whether a corresponding warning needs to be displayed to the driver. With this system, however, there is no need for the other road users to report their own position to the control center, so that the problem of overloading the data network does not arise here.

EP 0 300 200 A2 proposes a fleet dispatching method in which each mobile unit is assigned a specific identification code. In order to record the positions of all units without the large number of responses leading to an overload of the data network, the control center transmits a range signal which specifies a certain range of identification codes. A response is then only received from those units whose identification code lies within the specified range. The disadvantage of this method is that the selection of units from which the control center receives feedback is independent of the current location of these units. Before the control center can determine which unit is actually most conveniently located in relation to the respective destination, it must therefore, in principle, go through a large number of successive requests to scan the

entirety of the identification codes.

The task of the invention is to provide methods which permit fleet scheduling with as little human intervention as possible on the part of the mobile units and in which, despite a reduction in the amount of data to be transmitted via the remote data transmission network, the unit which is most conveniently located in relation to the destination can be identified quickly and reliably.

This task is solved by the methods specified in independent claims 1 and 2.

Advantageous further developments and embodiments of the invention are shown in the sub-claims.

In the method according to claim 1, the control center sends coordinate data specifying a selected area to all units. Each unit then automatically compares its own position with the coordinate data, and the units report their position to the control center if their own position is within the selected area.

If, for example, a cab company receives an order to pick up a passenger at a certain destination, the immediate vicinity of the destination is defined as the selected area in the control center and the corresponding coordinate data is sent via the radio data network so that it can be received by all vehicles in the cab fleet. A terminal device is installed in each vehicle, which automatically compares its own position with the coordinate data when the coordinate data is received and decides whether or not the vehicle is within the selected area. Only if the vehicle is within the selected area is its position reported to the control center. In this way, the control center only receives position data from a relatively small number of vehicles that are close to the destination. The other vehicles, which would not be able to complete the job anyway, do not need to report their position to the control center, so that the radio data network is not unnecessarily overloaded. Based on the relatively small amount of position data, the vehicle that is best positioned in relation to the destination can be selected at the control center with little processing effort. The driver of this vehicle then receives the order to drive to the destination via a radio data display, for example. Up to this point, none of the cab drivers need to be involved in the entire dispatching process, so that the drivers' attention is not unnecessarily diverted.

In the method according to claim 2, in the simplest case the control center only sends the coordinates of the destination to all units. Each unit then compares its own position with the position of the destination and, depending on the distance between its own position and the destination, determines a delay time for feedback to the control center. This delay time increases monotonically for all vehicles according to the same law with the distance from the destination. As a result, the feedback messages from the various units are not sent at the same time, but are spread out over time. This avoids overloading the data network.

The feedback can contain the vehicle's own position, but can also simply consist of an identification signal for the unit in question, as the control center can recognize which unit is closest to the destination based on the order in which the feedback is received.

In a particularly practical embodiment, the feedback, which

can usually be heard by all other units, causes the other units to stop counting the delay time and no longer send any feedback themselves. In this way, the control center only receives a single response to each request from the unit closest to the destination.

In the simplest case, the delay time is proportional to a distance parameter that represents a measure of the distance of the respective unit from the target location. This distance parameter can, for example, be the airline distance between the own position and the destination. However, the distance parameter can also be formed by the distance in road kilometers determined by a route calculation program or the calculated travel time to the destination.

Alternatively, the procedure can be organized in such a way that the mobile unit which is the first or only one to send the confirmation immediately executes the order for the destination in question without receiving a special order confirmation from the control center. In this case, it is only necessary to ensure that several confirmations cannot take place at the same time because the units concerned happen to be at the same distance from the destination. This can be achieved, for example, by periodically assigning each unit a specific time window for confirmation. The time windows can be synchronized via a common time standard, for example the signal from a radio clock or a signal from a GPS satellite.

The methods according to claims 1 and 2 can also be appropriately combined with each other. In this case, only those units which are not too far away from the target location, i.e. which are located within the selected area, start counting the delay time.

Any suitable coordinate system can be used to specify the selected area. This coordinate system can be defined locally, for example only for a specific city or a specific region. Alternatively, it can also be a global coordinate system. For example, the selected area can be specified by the coordinates of two points that form two diagonally opposite corners of a rectangle. Equivalent to this is the specification of two values for the longitude and two values for the latitude with the proviso that the selected area is the area enclosed between these longitude and latitude values. However, it is also possible, for example, to define the selected area as a circular area around a target point and to specify it by the coordinates of the target point and the radius of the circle. The selected area can also be an ellipse, for example. In this case, the area is specified by the corner points of a rectangle into which the ellipse is inscribed. All these coding methods for specifying the selected area have the advantage that only a small amount of data needs to be sent. Rectangular or elliptical selected areas also have the advantage that geographical or traffic conditions can be taken into account. If, for example, a usable highway runs in a north-south direction near the destination, an elongated area in a north-south direction will be selected so that vehicles that are relatively far away from the destination but can still reach it quickly due to the good traffic connections are also included in the dispatching.

According to an expedient further development of the invention, the selected area is varied dynamically depending on the number of position reports received. For example, if

there is no vehicle within the selected area and consequently no position report is received, the selected area is successively enlarged until at least one position report is received. If the selected area is enlarged immediately after a previous request, only a scaling factor needs to be sent by the control center. The terminals can then calculate the shape and position of the new selected area themselves using the previously received coordinate data and the scaling factor. In this way, the amount of data is further reduced.

On the other hand, if a large number of position reports are received in response to a request, this means that the vehicle density in the region concerned is very high. If a new request is then made later in the same region, but for a different destination, the size of the selected area is reduced as appropriate.

It is understood that the fleet of mobile units within the meaning of the present application only includes those units that are actually ready and suitable for the job in question. Units which are already occupied with the completion of another order are excluded from the procedure from the outset. Together with the request, the control center can also transmit certain order parameters, such as the required minimum loading capacity of the vehicle. Vehicles that do not meet these parameters are then also excluded from the process.

In the following, a preferred embodiment of the invention is explained in more detail with reference to the drawing.

It shows:

Fig. 1 a schematic diagram illustrating a first embodiment of the method according to the invention; and

Fig. 2 a schematic diagram illustrating a second embodiment.

A fleet of mobile units is represented in **Fig. 1** by three vehicles **10, 12, 14**, which communicate with a control center **16** via a radio data transmission network. For this purpose, each vehicle has a radio data terminal **18** which maintains the radio connection with the control center and is designed in the usual way to show messages sent by the control center **16** on a display that can be read by the driver. The terminal **18** also fulfills functions within the framework of the dispatching procedure.

Furthermore, a position detection device **20** is installed in each vehicle, which is in radio contact with several GPS satellites **22** (Global Positioning System). Using the known position data of the satellites and the measured signal propagation times, the position detection device **20** calculates the current position of the vehicle **10, 12, 14** in a coordinate system with the axes X and Y.

When the control center **16** receives an order to send a vehicle of the fleet to a specific destination **24**, a selected area **26** in the vicinity of the destination **24** is defined in the control center **16**. This is done either by an operator or automatically with the aid of a computer in which a map of the region is stored and into which the coordinates of the destination **24** are entered. In the example shown, the selected area **26** is a rectangle whose sides are parallel to the X and Y axes of the coordinate system. This rectangle can be specified in compact form by entering the coordinates of two corner points **28** and **30**, which are on the same diagonal of the rectangle.

The selected area **26** is determined taking into account the traffic connections of the destination **24** and the expected vehicle density of the fleet in the vicinity of the destination.

The control center **16** then transmits a request on a channel of the radio data network on which the terminal devices **18** of ⁵ all vehicles in the fleet receive, which also contains the coordinates of the corner points **28** and **30** of the selected area **26** in compressed form. In response to this request, the terminal **18** in each vehicle checks whether the vehicle is located within ¹⁰ the selected area **26** or not. If necessary, the vehicle position is updated for this purpose with the aid of the GPS satellites **22**.

For the majority of the vehicles in the fleet, represented by vehicle **14** in the example shown, the check shows that the vehicle is outside the selected area **26**. In this case, no further ¹⁵ reaction takes place in the terminal **18**. If, on the other hand, the check shows that the vehicle is located within the selected area, as is the case with vehicles **10** and **12** in the example shown, the terminal **18** reports the current vehicle position to ²⁰ the control center **16** via the radio data network. The control center **16** thus receives position data of all the vehicles in the fleet which are located within the selected area, and uses this position data to select the vehicle for the order which is most conveniently located in relation to the destination **24**. ²⁵

The number of feedback messages received at the control center is also a measure of the current vehicle density in the vicinity of the destination **24** and can be taken into account in a subsequent order for a new destination in the vicinity in order ³⁰ to dimension the size of the selected area **26** so that the number of feedback messages is not too large.

If there are no vehicles in the fleet in the initially selected area **26** and the control center **16** therefore receives no ³⁵ feedback, a follow-up request is sent immediately after the request, with which a scaling factor is transmitted to the terminal devices **18**. In each terminal **18**, the selected area **26** is then enlarged mathematically, with the center point unchanged, according to the scaling factor, and the check as to ⁴⁰ whether the own vehicle is located within the selected area is repeated for the enlarged area. If necessary, this process is repeated until at least one vehicle of the fleet is located within the selected area.

In this way, the vehicle in the fleet that is best positioned to ⁴⁵ carry out the job can be identified quickly and reliably with minimal radio traffic in the radio data network. The drivers of vehicles **10**, **12**, **14** do not need to be involved in this process. Only when the vehicle selected for the order has been ⁵⁰ identified does the driver of this vehicle receive the request to drive to the destination **24** via the display of the terminal **18**.

The control center **16** does not have to be stationary, but can also be a mobile unit itself. For example, the terminals **18** of ⁵⁵ the vehicles can be designed in such a way that they can take over the function of the control center **16** if necessary.

The position detection devices **20** do not necessarily have to work with the GPS system, but can also detect or monitor the position of the vehicle in other ways, for example by ⁶⁰ integrating the distances traveled, with direction detection by a magnetic compass and/or a gyro device.

A further embodiment of the invention is explained below with reference to **Fig. 2**.

The selected area **32** here is a circle with a certain radius around the target location **24**. The central unit **16** specifies the selected area by indicating the coordinates of the target location **24** and the radius of the circle. The units **10**, **12** and **14** then check their own position using the GPS system (not shown in **Fig. 2**) and calculate their distance to the target location **24**. If this distance is greater than the specified radius, as in the example shown for unit **14**, the request from the control center is ignored. For units **10**, **12** located within the selected area **32**, the request from the control center triggers the counting of a delay time proportional to the calculated distance from the destination. In the example shown, the unit **10** is closest to the destination **24**, so that the delay time expires earliest there. When the delay time expires, the unit **10** sends a message which is received both by the control center **16** and by all the other units **12**, **14** in the fleet. The control center **16** thus recognizes that unit **10** is closest to the destination and will carry out the order. If necessary, the control center will then send a special order confirmation to unit **10**. If two messages from two different units happen to arrive at the same time, the control center makes the selection.

In the case of unit **12**, which is further away from destination **24** than unit **10**, the message sent by unit **10** acts as a blocking signal which causes the counting of the delay time in unit **12** to be aborted, so that unit **12** no longer sends a message. This ensures that the central unit **16** receives at most a single response to each request. If the central unit does not receive any feedback at all, the selected area **32** is increased, as in the first embodiment example, in this case by increasing the radius.

What is claimed is:

1. A method of dispatching a fleet of mobile units (**10**, **12**, **14**) each having a position detection device (**20**) for detecting its own position and being in communication with a control center (**16**) via a remote data transmission network, wherein the control center (**16**) transmits coordinate data specifying a selected area (**26**; **32**) to all units (**10**, **12**, **14**), in each unit the own position is then automatically compared with the coordinate data and the units report their position to the control center if the own position lies within the selected area.
2. Method for dispatching a fleet of mobile units (**10**, **12**, **14**), each of which has a position detection device (**20**) for detecting its own position and is connected to a control center (**16**) via a remote data transmission network, the control center (**16**) transmitting coordinate data of a specific destination (**24**) to all units (**10**, **12**, **14**) and each unit then automatically comparing its own position with the coordinate data of the destination, wherein each unit, after receiving the coordinate data, determines a delay time for a feedback signal to the control center and starts counting this delay time, and in that the delay time increases monotonically with the distance of the unit concerned from the target location (**24**) according to a law which is the same for all units.

3. Method according to claim 2, characterized in that the feedback signal first transmitted by one of the units **(10, 12, 14)** or an inhibit signal transmitted by the central unit **(16)** in response to this feedback signal suppresses the transmission of further feedback signals by the remaining 5 units.

4. The method according to claims 1 and 2 or claims 1 and 3, wherein the selected area **(32)** is circular and is specified by the coordinate data of the target location and the radius of the circle.

5. Method according to claim 1 or 2, wherein the selected area **(26)** is a quadrangular area which is specified by two X and two Y coordinates in a Cartesian coordinate system or by two values each for the geographical longitude and geographical latitude.

6. Method according to claim 1, 4 or 5, characterized in that, if no position report is received from the mobile units, the request is repeated with an enlarged selected area **(26; 32)**.

7. Method according to any of the preceding claims, wherein the position of the mobile units is determined by the position detection devices **(20)** with the aid of a satellite-based global position detection system.

2 Page(s) of Drawings

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FIGURE TO SUMMARIZE

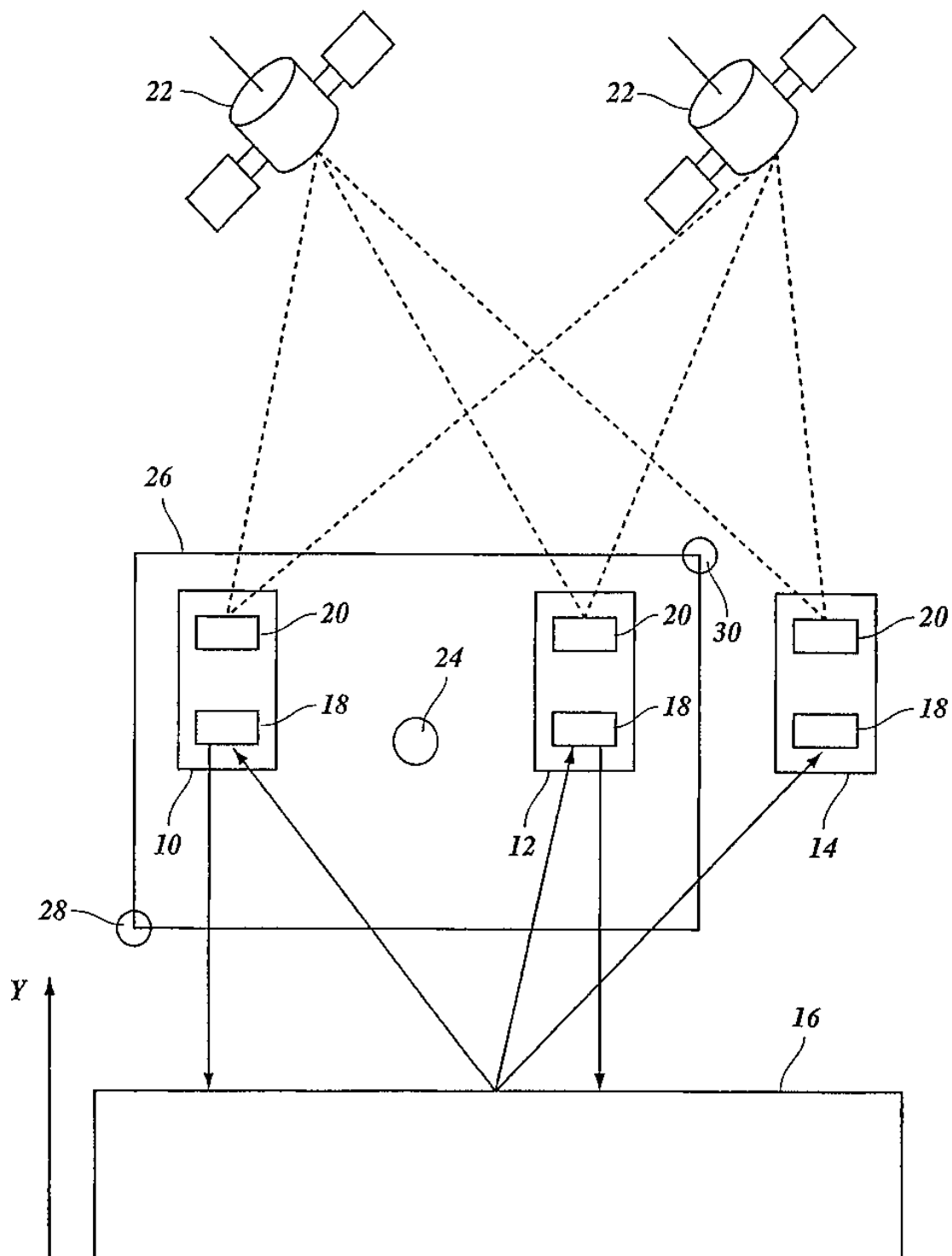
Fig. 1

Fig. 2