



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.06.2010 Bulletin 2010/22

(51) Int Cl.:
G08G 1/087 (2006.01)

(21) Application number: **09174886.3**

(22) Date of filing: **27.02.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **28.02.2005 DK 200500305**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
06710972.8 / 1 859 426

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Remarks:

This application was filed on 03-11-2009 as a divisional application to the application mentioned under INID code 62.

(54) **A method and a traffic light control system for controlling the traffic lights in at least one intersection**

(57) A traffic light control system for controlling the traffic lights (4,5,6) in at least one intersection (10,11,12,...,26) based on the position of a vehicle (1). The system comprises means for periodically determine the position of the vehicle, means for determining a next intersection at which the vehicle (1) will arrive based on the periodically determined position, means for controlling the traffic lights in the next intersection. The control

system further comprises means for determining subsequent intersections, which are the intersections at which the vehicle (1) may arrive after passing the next intersection, and means for controlling the traffic lights in the subsequent intersections. Thereby a system is provided wherein no attention to the system is required from the driver of the vehicle (1). Furthermore a green wave of traffic lights is provided when the route of the emergency vehicle (1) is not known in advance.

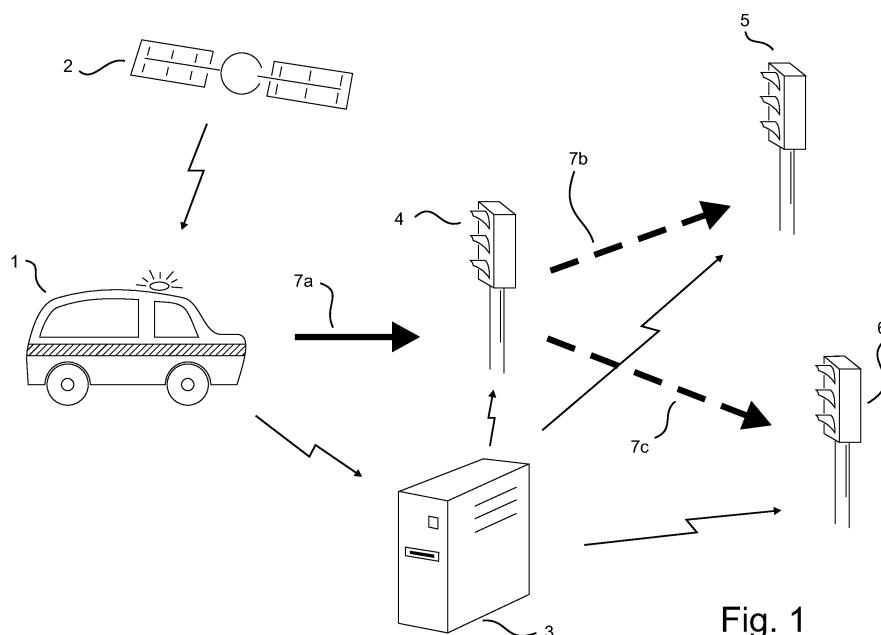


Fig. 1

Description

[0001] The current invention relates to a traffic light control system for controlling the traffic lights in at least one intersection based on the position of a vehicle, comprising means for periodically determining the position of the vehicle, means for determining a next intersection at which the vehicle will arrive based on the periodically determined position and means for controlling the traffic lights in the next intersection.

[0002] When an accident, crime or other event occurs every second it takes for an emergency vehicle to arrive at the scene of the event can be critical. Furthermore, for some emergency vehicles such as ambulances a fatally injured person needs to be transported as quickly as possible from the scene to the hospital.

[0003] As every second counts it is important that the route of the emergency vehicle is as clear and open as possible. Especially in intersections where there is crossing traffic, which demands a lot of attention, important seconds can be lost because the emergency vehicle have to slow down or even stop.

[0004] Furthermore, studies show that the number of accidents in intersections where emergency vehicles are involved are increasing.

[0005] A need therefore exists to be able to control the traffic lights in the intersections as an emergency vehicle approaches so that the flow of the traffic is advantageous to the route of the emergency vehicle.

[0006] Simple systems are known which try to solve this, for example where a transmitter is mounted in an emergency vehicle. As the emergency vehicle approaches an intersection the transmitter transmits a signal to a receiver in the intersection. The receiver is in communication with the traffic lights in the intersection and when a signal is received from an emergency vehicle the traffic lights in the intersection all starts changing to red to stop traffic in the intersection. However, to prevent the traffic lights in multiple intersections from changing the transmitter needs to have limited range and often only works when in line of sight of the relevant intersection. This often causes the traffic lights to change too late and that regular traffic is caught in the intersection as the emergency vehicle arrives. US patent no. 4,443,783 describes such a transmitter in form of unidirectional radio transmitter and respective receiving means in the intersections.

[0007] Another solution to control traffic signals when an emergency vehicle approaches an intersection is described in US patent no. 5,014,052. However the driver of the emergency vehicle needs to have knowledge of the traffic lights and intersections and needs to inform a control center which controls the traffic lights in the intersection of the emergency vehicle's approach and how the vehicle will enter and leave the intersection. This draws the driver's attention away from the traffic and the risks of an accident increases.

[0008] It is therefore desirable to provide a traffic light

control system where the driver do not need to use his attention on the traffic light control system in order to prevent accidents due to lack of concentration on the traffic surrounding the emergency vehicle.

[0009] From the published German patent DE 198 42 912 B4 a system is known wherein processing means are provided in an emergency vehicle. Based on the position information received from a GPS system the processing means calculates a route from the emergency vehicle to an arrival point, such as an accident site or hospital. Via transmittal means the emergency vehicle warns the traffic lights on its route that the vehicle is on the way and tells the traffic lights to start changing to green.

[0010] If the emergency vehicle abandons the route the processing means calculates a new route, on which the new traffic lights are triggered to turn green.

[0011] A green wave is thereby provided for an emergency vehicle. However, in case the route changes situations will occur where the emergency vehicle will arrive at traffic lights which have not had time to change since not enough time have elapsed for the traffic lights to fully switch to green or the traffic lights may not yet have received information to switch as the new route has not been updated.

[0012] Furthermore, providing the processing means in the emergency vehicle will result in an expensive system, as each vehicle will have to be provided with processing means such as a computer and the required software, including extensive electronic map data containing data on the intersections and the roads network etc. Moreover, as each emergency vehicle communicates with the different traffic lights a processing device is furthermore required at each traffic signal in case communication and instructions are received from several emergency vehicles that need to be computed.

[0013] Thus as can be understood a complex network of many computers are needed in order to operate a system as described in DE 198 42 912 B4.

[0014] Furthermore the above invention requires an arrival point to be known. This is not always possible. In case of a police pursuit where the criminal is escaping by for example car an arrival point is not known, as the route is dependant on solely on the criminal. In this case a green wave of traffic lights are important as it will reduce the risk of innocents crossing an intersection where the pursuit passes.

[0015] In one aspect of the present invention is provided a traffic light control system wherein no attention to the system is required from the driver of the vehicle.

[0016] In a second aspect of the present invention is provided a traffic light control system, which is able to provide a green wave of traffic lights when the route of the vehicle is not known in advance.

[0017] In a third aspect of the present invention is provided a traffic light control system, which is cheaper and simple to install than other known system.

[0018] The novel and unique features according to the

invention whereby this is achieved is the fact the control system further comprises

- means for determining subsequent intersections, which are the intersections at which the vehicle may arrive after passing the next intersection, and
- means for controlling the traffic lights in the subsequent intersections.

[0019] Thereby the movement of the emergency vehicle can continuously be monitored and the traffic lights can based on said movement be centrally controlled.

[0020] By using standard components the central control unit can in one embodiment comprise a server having a memory, a storage space, and a processor unit. On the storage space, which could be a hard drive or optical disc such as a CD or DVD rom, a database is stored comprising map data representing roads, traffic lights and intersections in a geographical area. A program is furthermore stored on the storage space, said program is arranged for receiving the periodical position of the vehicle and comparing the position with the map data in the database.

[0021] The database and the program can within the scope of the present invention be stored on separate and in some cases also different types of storage space.

[0022] Advantageously the program is adapted to receive the periodically position data and comparing the received position data with the map data in the database.

[0023] This allows the position of the emergency vehicle to be continuously known in relation to known stationary geographical fixing points represented in the database as map data, such as for example landmarks, buildings, roads, or intersections.

[0024] Advantageously said program can comprise a GIS software program for, based on the current position of said vehicle, determining which intersection is the next intersection the vehicles will arrive at.

[0025] GIS is the abbreviation for Geographical Information System, which is a commonly used platform for analyzing and visualizing spatial data, such as data, which contain geographical data. The function and application of GIS will not be discussed further as it is well known in the art. In the literature "GIS for Everyone" by David Davis, ESRI Press 2003 and "Geographical Information Systems and Science" by Paul Longley, Michael Goodchild, David Maguire, and David Rhind, John Wiley & Sons and ESRI Press 2001, can be mentioned among many sources of information on GIS.

[0026] The GIS software furthermore enables the traffic light control system to determine subsequent intersections at which the vehicle is likely to arrive at after passing the next intersection.

[0027] The determination of subsequent intersections is advantageous especially in urban areas. In urban areas the intersections are closely placed after each other and when only one traffic light is controlled at the time the vehicle will often arrive at the next traffic light before

the traffic light fully has switched to green or maybe before the traffic light have begun switching. Therefore, when subsequent intersections are known the traffic lights in these intersections can start changing in due time before the vehicle arrives and thereby create wave of green lights which follows the vehicle.

[0028] Advantageously the position determining means comprises a GPS receiver provided in the vehicle, for receiving signals from GPS satellites. Thereby the position of the vehicle can be easily and precisely determined by using the Global Positioning System (GPS).

[0029] The Global Positioning System is a system that comprises a number of GPS satellites. The GPS receiver is located on the surface of the earth and receives signals transmitted from a number of GPS satellites. The receiver then calculates the time taken for each satellite signal to reach the GPS receiver, and from the difference in time of reception, determines the location of the GPS receiver.

[0030] In another embodiment of the invention the first and second communication means can advantageously be wireless. This allows the position of the emergency vehicle to be easily transmitted to the central control unit, even when the emergency vehicle is moving.

[0031] Many types of wireless communication exist, such as communication on a regular radio channel, optical communication or by digital means.

[0032] One digital type of wireless communication, which advantageously could be used in one embodiment, is GPRS (General Packet Radio Service). GPRS is commonly used for high-speed data transfer in cellular mobile networks such as GSM (Global System for Mobile Communications) which for example is discussed by Joachim Tisal in "The GSM Network: GPRS Evolution: One Step Towards UMTS", Wiley, John & Sons, Incorporated 2001. Since GPRS is a widespread technology it is easy and cheap to implement.

[0033] As can be understood many different types of traffic light control systems can be realized and configured within the scope of the present invention.

[0034] Common for these systems are that they comprises a method for controlling the traffic lights in at least one intersection based on the position of an vehicle comprising the steps of, periodically determining the position of the vehicle, determining a next intersection at which the vehicle will arrive based on the periodically determined position, controlling the traffic lights in the next intersection, determining subsequent intersections, which are the intersections at which the vehicle may arrive after passing the next intersection, and controlling the traffic lights in the subsequent intersections.

[0035] Thereby a green wave can be provided for the vehicle without the route or the destination of the vehicle needs to be known beforehand.

[0036] To simply and easily determining a next intersection at which the vehicle will arrive based on the periodically determined position, this step can comprise, loading data representing the periodically determined position of the vehicle to an electronic map having the po-

sition of the at least one intersection, determining the direction of the vehicle by comparing consecutive periodically determined positions, and comparing the direction and position of the vehicle with the positions of the at least one intersection.

[0037] Advantageously the step of determining subsequent intersection, which is the intersections at which the vehicle may arrive after passing the next intersection can easily be done by, comparing the direction of the vehicle and the position of the next intersection with the position of the at least one intersection.

[0038] In order to control several vehicles at the same time and be able to resolve conflicts that may arise when the vehicles for example arrives at the same intersection at the same time the control unit can be located remotely from the vehicle.

[0039] The person skilled in the art would understand, that the traffic light control system according to the invention in an alternative embodiment also can be used for ensuring that a one or more traffic lights are turned red. This is especially advantageously if e.g. the police is interested in ensuring that a getaway car does not leave a specific area or has to be manipulated into take a definite route.

[0040] The system according to the invention works in a similar way as described above, but instead of ensuring that the traffic lights turn green, the traffic lights simply turn red ensuring that the vehicle is intercepted by cutting off the vehicles possible escape route.

[0041] When the control system according to the invention ensures, that the traffic lights turn green along a predetermined route and the remaining traffic lights turns red along said route, the getaway car is manipulated into taking a predetermined definite route, chosen e.g. by the police.

[0042] In this embodiment the control system will both ensure, that the getaway car takes a predetermined route, advantageously leading the car into an area chosen by the police where the getaway car can be intercepted without risk to civilians, and also that the normal traffic is cut off along the predetermined route, ensuring that the getaway car does not collide with others, again minimizing the risk for civilians.

[0043] In the following the present invention is described in detail with reference to exemplary illustrated embodiments, where like parts have identical reference numbers.

Fig. 1 shows a simplified view of an embodiment of a traffic light control system according to the present invention,

Fig. 2 shows a part of a road map whereon the route of an emergency vehicle is indicated with a broken line, and

Fig. 3 is a flow chart of a detailed embodiment of a method for controlling traffic lights according to the

present invention.

[0044] In the following, the described embodiments are disclosed with the assumption that the control unit is a central server.

[0045] With reference to figure 1 an emergency vehicle 1, such as an ambulance, is shown. The emergency vehicle 1 periodically receives its position data from GPS satellites 2. Based on the position data a GPS system (not shown) provided in the emergency vehicle 1 determines the speed and direction of the vehicle 1. The vehicle's position, speed and direction are with regular intervals forwarded to a central server 3 that contain software to process the received data. Based on the processing of the received data the central server controls traffic signals 4,5,6.

[0046] The software in the central server includes a digital map. The position data received from the emergency vehicle 1 is compared to the digital map.

[0047] Based on the comparison between the data received from the emergency vehicle 1 and the digital map, the central server 3 determines that the emergency vehicle is heading for the traffic light 4 as shown with solid arrow 7a. The central server takes control of the traffic light 4 and turns it into green to allow the emergency vehicle to pass with minimal risk of crossing traffic.

[0048] The central server compares the map data stored in the central server and the received data, and deduces that from the traffic light 4 there are two possible routes of transport 7b,7c, as shown by the dotted arrows. On these routes 7b,7c the emergency vehicle 1 will arrive at traffic lights 5,6, respectively. Since the central server 3 has no way of knowing which of the routes 7b or 7c the emergency vehicle 1 will take, the central server 3 will take control of both traffic lights 5,6 and turn them both green in favor of the emergency vehicle arriving at fast speed.

[0049] Communication between the different elements of the traffic light control system, i.e. the GPS satellites 2, the emergency vehicle 1, the central server 3 and the traffic lights 4,5,6 is in figure 1 indicated by jagged arrows. This communication will typically be done via wireless communication such as GPRS, but in some cases standard communication wires can also do it.

[0050] The central server is in figure 1 shown as a standard server 3, having a significant amount of memory, storage space such as a hard drive or CD or DVD-ROM, and a processor unit for processing data. However, within the scope of the invention the central control unit can also comprise of several servers which geographically may be placed at different locations and communicate via a common network. In such a setting each server may control different areas of a traffic network and specific protocols may be provided for exchanging data, such as when an emergency vehicle crosses between areas of the traffic network controlled by separate servers within the network. Such data exchange protocols and network configurations are known in the art and will therefore not

be discussed further herein.

[0051] Figure 2 shows a partial view of a fictitious map 8. On the map 8 an exemplary route 9 of an emergency vehicle 1 is shown by the dotted line.

[0052] Each intersection is marked with a reference number and each road leading into or out of the intersection is marked with a letter. In this case, the letter also indicates the compass direction, w being west, n being north, e being east and s being south, of the road compared to the center of the intersection. When looking at the route 9 of the emergency vehicle 1 in figure 2 it can be seen that the emergency vehicle enters intersection 10 from the south and exits the intersection via the east. This situation is indicated as entering intersection 10 via 10s and leaving intersection 10 via 10e. Furthermore when reference is made to, for example the traffic light 10e, it should be understood that it is the traffic light you see when entering the intersection via 10e. Accordingly, a green light on traffic light 10e would allow you to proceed when arriving at intersection 10 from the east.

[0053] When the emergency vehicle arrives at the intersection 10 from the south, the central server has already detected the emergency vehicles arrival and made sure to signal the traffic light 10s to turn green. At the same time the central server informs traffic lights in intersections 11, 12 and 13 that an emergency vehicle may arrive shortly and that traffic lights 11e, 12s and 13w respectively need to turn green. As the emergency vehicle leaves intersection 10 in a direction towards intersection 13, the central server returns traffic lights in intersections 11 and 12 to regular operation but maintains control of intersection 13, keeping the traffic light 13w green.

[0054] Now that the central server knows that the emergency vehicle is heading towards intersection 13 the central server informs intersections 14, 15 and 16 that an emergency vehicle may arrive and that traffic lights 14s, 15w and 16n, need to be turned green.

[0055] In intersection 13 the emergency vehicle turns left and exits the intersection 13 and heads towards intersection 14. The central server thereby returns traffic lights in intersections 15 and 16 to normal operation and alerts intersections 12 and 17 that an emergency vehicle may arrive and that traffic lights 12e and 17s need to be turned green.

[0056] As the emergency vehicle continues its route, as marked by the dotted line, through intersections 12, 18, 19 and 20 the central server will continuously inform the relevant intersections that an emergency vehicle may arrive in the same way as described above. A green wave can therefore be provided for the emergency vehicle in such a way that if the emergency vehicle changes routes, for example because of roadwork, traffic, etc. the system will be able to quickly adapt and continue to be able to provide a green wave for the emergency vehicle.

[0057] A flowchart of a basic process implemented in the central server to control the traffic lights encountered on the route of an emergency vehicle is shown in figure 3.

[0058] To better explain the flowchart it will be de-

scribed together with the route shown in figure 2.

[0059] When an emergency vehicle activates its sirens and responds to an emergency call, a signal is transmitted to the central server and a process is started as indicated by step 30 in figure 3. As the process starts in step 31 the process receives position, speed and direction measurements 32 from the emergency vehicle.

[0060] Based on the data received in step 31 the process determines in step 33 which intersection the emergency vehicle will arrive at next and the direction from which it will arrive at the intersection. Since the emergency vehicle takes the route shown in figure 2, the first intersection would be intersection 10 and the emergency vehicle will arrive from the south. The Next Intersection NI is thereby set to 10s; NI=10s.

[0061] Based on the NI parameter, the process determines the First Wave FW parameter in step 34. The first wave parameter lists the traffic lights that the emergency vehicle could reach following the next intersection NI. Therefore, if the emergency vehicle is heading towards intersection 10 then the traffic lights that the emergency vehicle could reach after leaving intersection 10 are 11e, 12s and 13w; FI=11e, 12s, 13w.

[0062] In step 35 the traffic light indicated by the variable NI is set to green in order to provide a green light for the emergency vehicle when entering the intersection. In the present example the traffic light 10s will be set to green.

[0063] Thereafter, the central server, in step 36, initiates the traffic lights corresponding to the values stored in the parameter FW to change to green. In this way, the traffic lights are given time to change such that when the emergency vehicle arrives at one of the possible traffic lights 11e, 12s or 13w, the light will be green.

[0064] After initiating the first wave the process proceeds to step 37 to update the variables OI and OFW. The Old Intersection OI variable is overwritten with the value in the Next Intersection NI variable; OI=NI; and the variable Old First Wave OFW is loaded with the value in the variable First Wave FW; OFW=FW. The process then proceeds to step 38 where it once again receives the position, speed and direction measurements 32 from the emergency vehicle.

[0065] Based on the new measurements received in step 38 the process determines the next intersection parameter NI in step 39 and the first wave parameter FW in step 40.

[0066] Assuming that the emergency vehicle is still en route to intersection 10, the process will determine that the next intersection is 10s; NI=10s. The FW variable determined in step 40 will also resolve to the previous values FW=11e, 12s, 13w.

[0067] In step 41 the process compares the NI variable with the OI variable; NI=OI?. In this case, these variables are the same, indicating that the emergency vehicle is still heading for the intersection 10. The process will therefore once again return to step 38 and retrieve data from the emergency vehicle.

[0068] This loop will continue to run until the emergency vehicle leaves the intersection specified by OI. In the current example, the emergency vehicle leaves intersection 10 and heads towards intersection 13 as indicated by the route in figure 2.

[0069] When the process determines the next intersection in step 39 the NI variable will receive the value 13w; NI=13w. In step 40 the FW variable will consequently receive the value 14s, 15w, 16n; FW=14s, 15w, 16n.

[0070] Now NI will not be equal to OI, as NI=13w and OI=10s and the process will continue from step 41 to step 42.

[0071] In step 41 the central server will reset the traffic lights in intersections represented by the values in the parameter OFW except for the traffic light towards which the emergency vehicle is heading, which is the traffic light represented by the parameter NI; OFW-NI. By resetting, it should be understood that the central server returns the traffic lights in the intersections to regular operation since the emergency vehicle is no longer heading in that general direction.

[0072] After resetting the old first wave of intersections the process proceeds to step 43 where it initiates the new first wave of intersections corresponding to the values stored in the parameter FW.

[0073] When the central server has completed step 43 the process continues to step 44 where the value in Old Intersection OI is replaced with the value in New Intersection; OI=NI and the values in Old First Wave are replaced with the values in First Wave FW; OFW=FW. The process then returns to step 38 where it receives new data from the emergency vehicle.

[0074] As can be seen, the central server takes control of not only the first intersection that the emergency vehicle is en route to, but also the subsequent intersections, the first wave, at which the emergency vehicle may arrive. It should be understood that depending on the situation a second, third, etc. wave may be defined. For example, in urban areas where the distances between intersections are short, several waves could be relevant. In order to allow the traffic lights in the intersection to properly and safely change in favor of the approaching emergency vehicle the traffic light change is initiated while the emergency vehicle is still several intersections away.

[0075] As an example of a second wave, reference is again made to figure 2. When the emergency vehicle is en route from intersection 12 to intersection 18 the first wave of traffic lights that need to be set green are the traffic lights 17w, 19e and 21s. Now, the second wave would be the intersections after the intersections 17, 19 and 21 with respect to the direction with which the emergency vehicle arrives in the intersection. The intersections after intersection 17 when arriving at traffic light 17w are intersections 14, 25 and 26 and the corresponding traffic lights 14n, 25s and 26w need to start shifting to green. The intersections after intersection 19 when arriving at traffic light 19e are intersections 23, 22 and 20 and the corresponding traffic lights 23e, 22n and 20s

thereby need to start shifting to green. Finally the intersections after intersection 21 when arriving at traffic light 21s are intersections 24 and 25 and the corresponding traffic lights 24s and 25w also need to start shifting to green. So, when the emergency vehicle arrives at traffic light 18s the second wave of traffic lights would be 14n, 25s, 26w, 23e, 22n, 20s, 24s and 25w.

[0076] As can be seen in the second wave the intersection 25 occurs two times, each time with a different approach direction, 25s and 25w respectively. Since it would create a traffic hazard to turn both these traffic lights to green, the central server also contains means to prioritize traffic lights in an intersection. One way of prioritizing would be to give each traffic light in the intersection a priority with respect to each other. For example the traffic light 25n could be set to the highest priority level, 25e to the second highest priority level, 25s to the third highest priority level and finally traffic light 25w would have the lowest priority level. In the case mentioned above the traffic light 25s would have higher priority compared to traffic light 25w resulting in traffic light 25s turning green.

[0077] The skilled person could implement other types of prioritizing such as calculating the distance of the respective routes from the emergency vehicle to the traffic lights. The traffic light on the shortest route would then get the highest priority.

[0078] Many adjustments and alternative embodiments can be imagined within the scope of the invention and the above-described embodiment should only be considered exemplary.

[0079] As an example different times could be calculated for each intersection in the first wave, or in any other waves, at which the traffic lights changes to green within the intersections. The determination of these times could be based on the distance to the intersection from the emergency vehicle, the speed of the emergency vehicle and/or on the time it takes to change the traffic lights in an intersection since some intersection can be larger and more crowded than others and therefore needs more time to change to green.

[0080] It shall be understood that the described system typically will include a large number of emergency vehicles. For each emergency vehicle a process like the one described with reference to figure 3 will be initiated. It is therefore an advantage that the processes are centralized since in doing so conflict issues and general computation can be done in one place and an overview of different situations can be easily generated based on the data gathered in the central control unit.

[0081] In another embodiment the position data can be forwarded directly to the central server where the speed and direction is calculated. This reduces the data transmission and a faster overall response time of the system is thereby achieved.

[0082] The changing sequence can also be different in various traffic light control systems according to the invention and even for individual traffic lights within one

system. This allows the system to take into account special circumstances concerning specific intersection that requires that one type of intersections needs long time to change where others can change in relative short time. Such circumstances can for example be the number of roads leading out of the intersection and the traffic load in the intersection

[0083] In the above description of the present invention the term emergency vehicle is used. The general understanding of the term emergency vehicles would typically be fire engines, ambulances and police cars. However, it should be understood that the traffic light control system also could be implemented with other vehicles, such as cars in a cortege transporting diplomats, royals or other important personas.

Claims

1. A traffic light control system for controlling the traffic lights (4,5,6) in at least one intersection (10,11,12,..., 26) based on the position of a vehicle (1), comprising

- means for periodically determining the position of the vehicle,
- means for determining a next intersection at which the vehicle (1) will arrive based on the periodically determined position,
- means for controlling the traffic lights in the next intersection, **characterized in, that** the control system further comprises
- means for determining subsequent intersections, which are the intersections at which the vehicle (1) may arrive after passing the next intersection, and
- means for controlling the traffic lights in the subsequent intersections.

2. A traffic light control system according to claim 1, **characterized in, that** the means for periodically determine the position of the vehicle comprises a GPS receiver provided in the vehicle (1), for receiving signals from GPS satellites (2).

3. A traffic light control system according to claim 1 or 2, **characterized in, that** the means for determining the next and subsequent intersections, comprises

- a database with map data representing roads, traffic lights and intersections in a geographical area, and
- a program arranged for receiving the periodical position of the vehicle (1) and comparing the position with the map data in the database.

4. A traffic light control system according to claim 3, **characterized in, that** the program comprises a GIS software program for, based on the current position

of said vehicle (1), determining which intersection (10,11,12,...,26) is the next and/or subsequent intersections the vehicle (1) will arrive at.

5. A traffic light control system according to any of the claims 1 - 4, **characterized in, that** the means for controlling the traffic lights in the next and subsequent intersections comprises:

- switching means for switching the status of the traffic lights (4,5,6), and
- controlling means for controlling the switching means based on the periodically determined position of the vehicle (1).

6. A traffic light control system according to claim 5, **characterized in that**, the controlling means comprises,

- a control unit (3),
- a first communication means between the control unit and the switching means, and
- a second communication means between the position determining means and the control unit.

7. A traffic light control system according to claim 6, **characterized in that**, the control unit (3) is located remotely from the vehicle.

8. A traffic light control system according to claim 6 or 7, **characterized in that**, the control unit (3) comprises a server for storing the database with map data, and the program arranged for receiving the periodical position of the vehicle (1) and comparing the position with the map data in the database.

9. A traffic light control system according to claim 8, **characterized in that**, the server comprises means for prioritizing traffic lights in an intersection, such that the preferred or shortest route will get the highest priority.

10. A traffic light control system according to claim 8 or 9, **characterized in that** the server is capable of resetting the traffic lights in an intersection to regular operation after the vehicle has passed said intersection or when the vehicle is no longer heading in the direction of said intersection.

11. A traffic light control system according to any of the claims 1 - 10, **characterized in, that** the controlling of the traffic lights in the intersections is initiated while the vehicle is several intersections away.

12. A traffic light control system according to any of the claims 1 - 11, **characterized in that**, the time before the next and subsequent intersections changes is calculated based on the vehicles distance to the in-

tersection, the speed of the vehicle and/or the time it takes to change the traffic light in the intersection.

13. Use of the traffic light control system according to any of the claims 1 - 12 for providing a green wave of traffic lights for a vehicle. 5
14. Use of the traffic light control system according to any of the claims 1 - 12 for cutting off a vehicles escape route by turning one or more traffic lights red. 10
15. Use of the traffic light control system according to any of the claims 1 - 12 for controlling the traffic lights in intersections for several vehicles on different routes. 15

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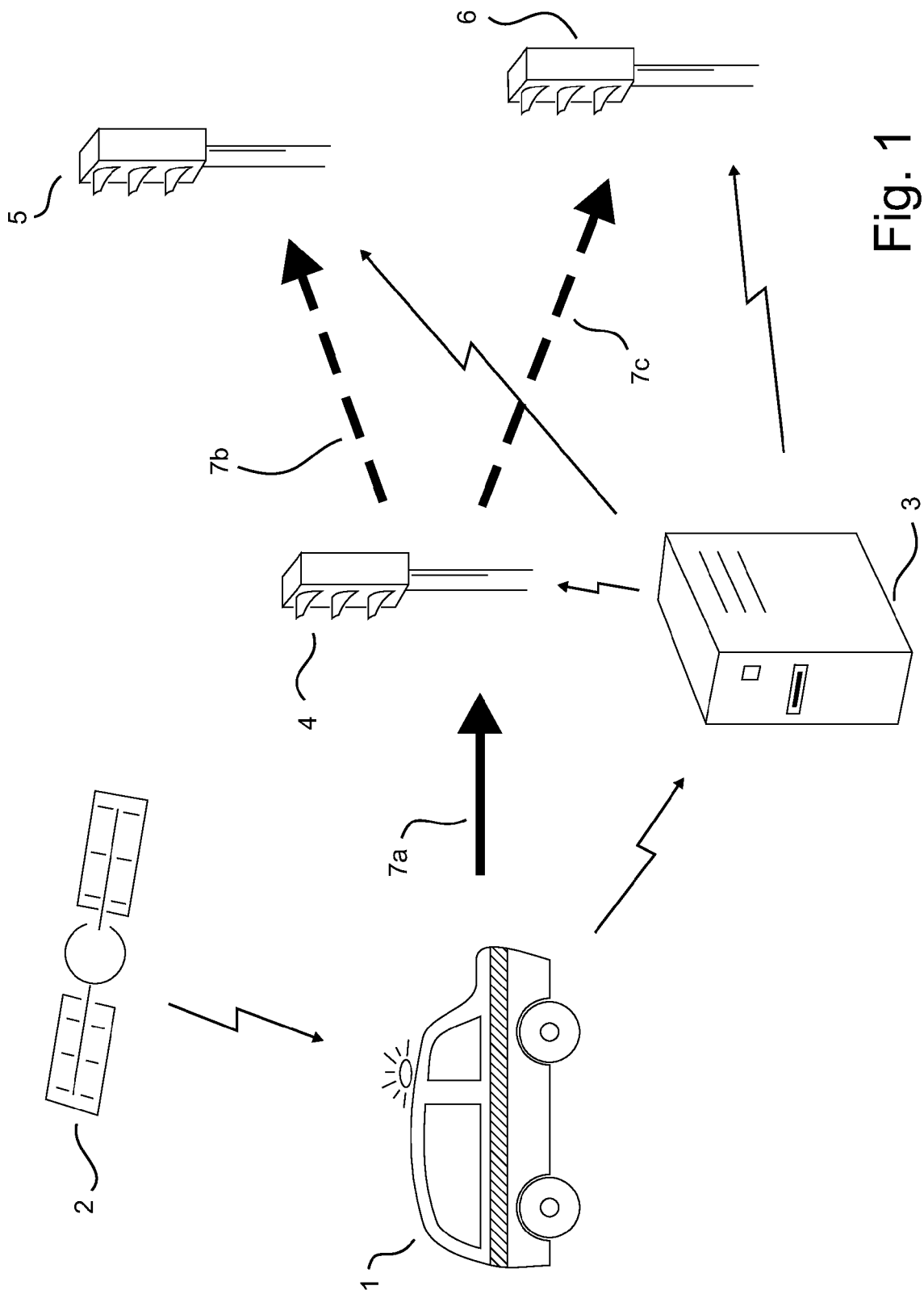


Fig. 1

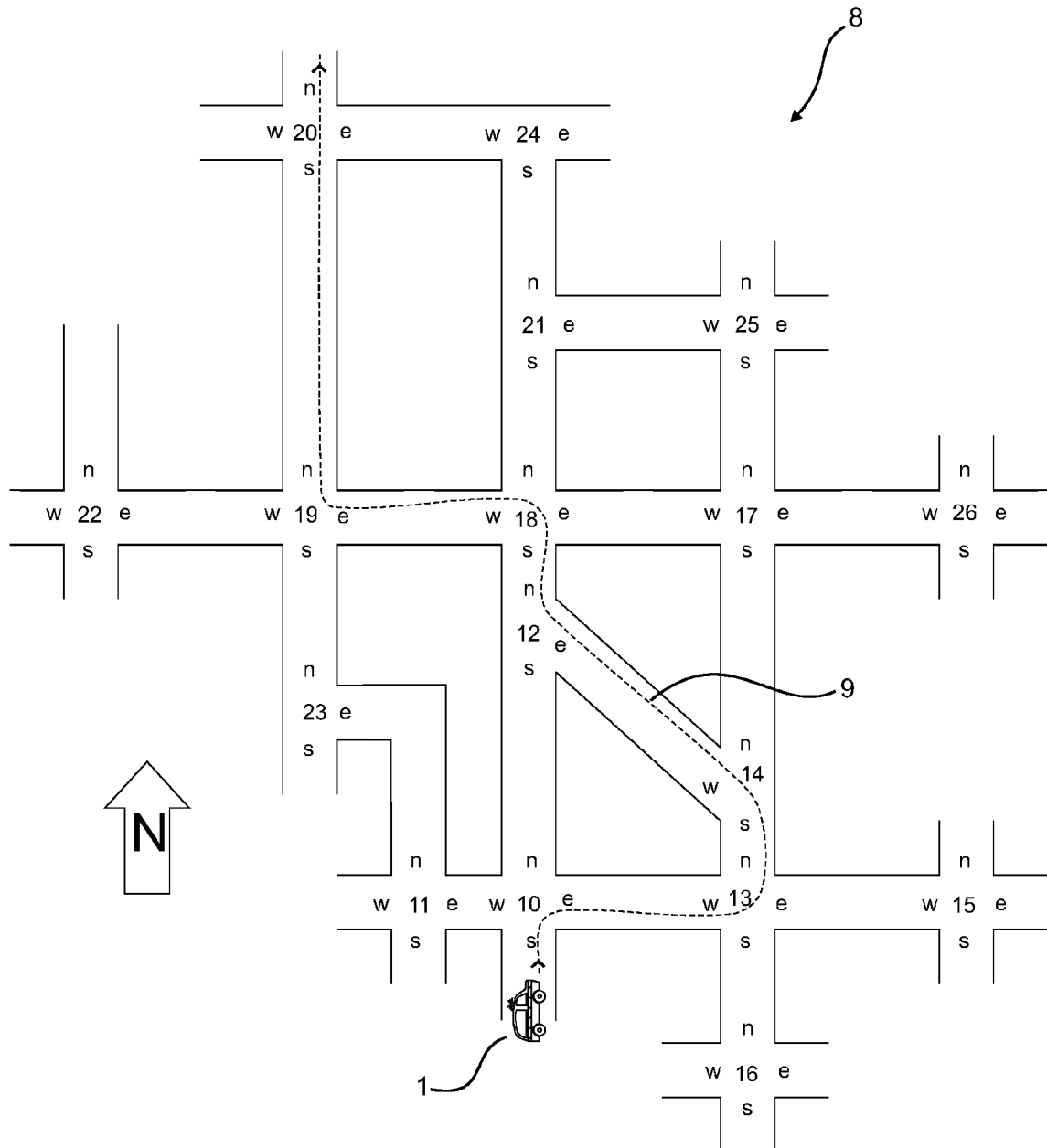


Fig. 2

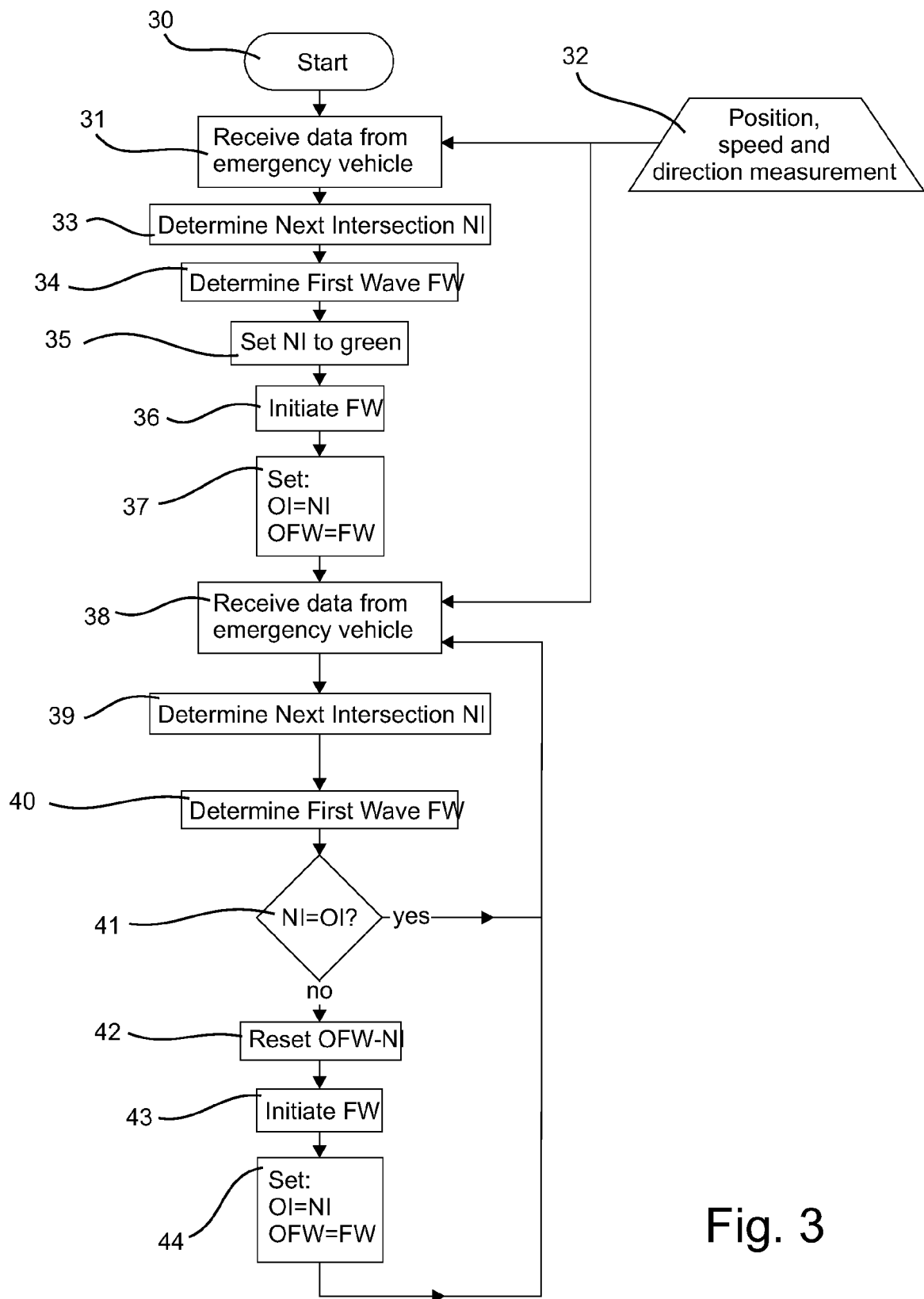


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 09 17 4886

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 700 504 B1 (ASLANDOGAN YUKSEL ALP [US] ET AL) 2 March 2004 (2004-03-02) * figures 1-7 * * column 2, line 10 - line 20 * * column 4, line 34 - line 55 * * column 8, line 10 - line 65 * * column 9, line 10 - line 40 *	1-15	INV. G08G1/087
X	DE 195 08 043 C1 (DUNSE PETER [DE]) 29 August 1996 (1996-08-29) * column 3, line 40 - line 55 * * column 4, line 20 - line 30 * * claims 1-5 *	1	
X	DE 196 01 024 A1 (PIPA GORDON [DE]) 17 July 1997 (1997-07-17) * column 1, line 20 - line 68 * * column 2, line 1 - line 25 * * column 2, line 60 - line 65 * * claims 1-7 *	1	
X	US 6 064 319 A (MATTA DAVID M [US]) 16 May 2000 (2000-05-16) * column 2, line 10 - line 20 * * column 2, line 45 - line 67 * * column 3, line 1 - line 50 * * column 4, line 10 - line 60 * * claim 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) G08G
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Place of search Munich		Date of completion of the search 22 April 2010	Examiner Coffa, Andrew
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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