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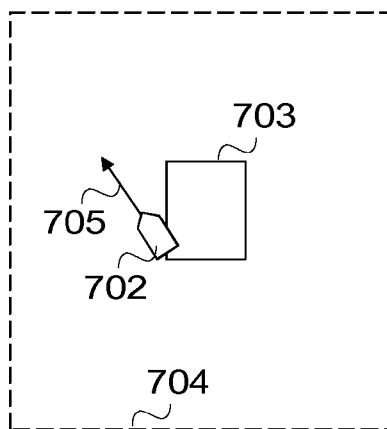


FIG. 7C

(57) Abstract: A mobile user apparatus that is supposed to move synchronously with a master apparatus displays a target area indicating where the mobile user apparatus should be and a relative position of the mobile user apparatus to the target area.

DISPLAYING A RELATIVE POSITION

FIELD

The present invention relates to a relative position between at least two mobile user apparatuses.

5 BACKGROUND ART

One way to collect mechanically oil on sea surface is to use three vessels in a formation in which a middle vessel comprises an oil collecting tank and is connected by a first boom to a vessel on a right hand side and by a second boom to a vessel on a left hand side so that the booms and the middle
10 vessel together form a "V" configuration which guides the oil to the oil collecting tank. However, in order the "V" configuration to remain operational, each of the other two vessels has to maintain its relative position to the middle vessel rather stable so that the angle of the boom remains proper and/or the boom remains tight enough so that it cannot bend. Typically this requires
15 specific equipment requiring expert (trained) users, such as automatic vehicle location (AVL). Alternatively voice or message communication may be used to instruct steering of the vessels on the right hand side and on the left hand side so that they are able to synchronize with the movements of the middle vessel. A problem with that is that part of the instructions may be misunderstood or
20 lost, because of noise, for example.

SUMMARY

An object of the invention is to provide an intuitive information facilitating maintaining the relative position between two apparatuses stable. The object of the invention is achieved by methods, an apparatus, a computer
25 program product and a system which are characterized by what is stated in the independent claims. The preferred embodiments of the invention are disclosed in the dependent claims.

An aspect of the invention includes displaying a target area and relative position to the target area in a mobile user apparatus. An advantage is
30 that thanks to the intuitive information, remaining synchronized is easier.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, exemplary embodiments will be described in greater detail with reference to accompanying drawings, in which

Figure 1 shows simplified architecture of a system and block
5 diagrams of some apparatuses according to an exemplary embodiment;

Figure 2 shows a simplified block diagram of a further exemplary apparatus;

Figure 3 is a block diagram illustrating the “V” configuration.

Figures 4, 5 and 6 are flow charts illustrating different exemplary
10 functionalities;

Figures 7A, 7B, 7C and 7D illustrate different display views in a mobile user apparatus configured to act as a slave;

Figures 8A, 8B and 8C illustrate different display views in a mobile user apparatus configured to act as a master; and

15 Figure 9 is a block diagram of an exemplary mobile user apparatus.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

The following embodiments are exemplary. Although the specification may refer to “an”, “one”, or “some” embodiment(s) in several locations, this does not necessarily mean that each such reference is to the
20 same embodiment(s), or that the feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide other embodiments.

The present invention is applicable to any situation needing a rather stable relative position between two or more moving vehicles, vessels, , or
25 persons, or any physical elements it suffices that such a moving “thing” may be equipped with a mobile (portable) apparatus, examples of which are illustrated with Figures 1 and 2.

A general architecture of an exemplary system 100 is illustrated in Figure 1. Figure 1 is a simplified system architecture only showing some
30 elements and functional entities, all being logical units whose implementation may differ from what is shown. The connections shown in Figure 1 are logical connections; the actual physical connections may be different. It is apparent to a person skilled in the art that the system may also comprise other functions and structures that are not illustrated.

The exemplary system 100 of Figure 1 comprises one or more first mobile user apparatuses 101 (only one shown in Figure 1) configured to be a slave mobile user apparatus and one second mobile user apparatus 102 configured to be a master mobile user apparatus, connectable in the illustrated example via one or more network nodes 103 to each other.

The slave mobile user apparatus 101 comprises a slave unit 111, a GPS unit 112 operatively connected to the slave unit 111, a display 114 operatively connected to the slave unit 111, and at least a receiver unit 113, operatively connected to the slave unit.

The master mobile user apparatus 102 comprises a master unit 121, GPS unit 122 operatively connected to the master unit 121, and at least a transmitter 123, operatively connected to the master unit. The master mobile user apparatus may also comprise a display.

In the illustrated example the system further comprises the one or more network nodes 103. The network node 103 may be a network node, like a base station (BS) providing a core network access, like access to one of the following networks: Terrestrial Trunked Radio Access (TETRA) network, TETRAPOL network, DMR (digital mobile radio) network, a PAMR network (Public Access Mobile Radio), and a 3rd or 4th, or beyond, generation mobile network, like LTE (Long Term Evolution), LTE public-safety broadband network, WiMAX (Worldwide Interoperability for Microwave Access), WLAN (Wireless Local Area Network), like WiFi, etc. The network node 103 may also be a repeater, or a router, or a radio base station providing local service without access to a core network, like a TETRA base station in a fall-back mode. By means of such a repeater the distance between the master apparatus and the slave apparatus may be increased.

In another exemplary system there is no network node 103 and the mobile user apparatuses may use direct mode communication or form an ad hoc network in which information may be flooded from the master mobile user apparatus to the slave mobile user apparatus(es). In other words, they may communicate directly with each other.

Figure 2 shows a simplified block diagram of a further exemplary mobile user apparatus that may be set to operate either as a slave mobile user apparatus or as a master mobile user apparatus. For that purpose the mobile user apparatus 200 comprises a GPS unit 206, a slave unit 201 operatively connected to the GPS unit, a master unit 202 operatively connected to the

GPS unit, a setting unit 203 operatively connected to the slave unit 201 and the master unit 202, a display 204 operatively connected to the slave unit 201 and the master unit 202 and a transceiver unit 205 operatively connected to the slave unit 201 and the master unit 202.

5 Functionality of the different units will be described in more detail below with Figures 4, 5 and 6.

It is apparent to a person skilled in the art that the mobile user apparatuses described above with Figure 1 or Figure 2 may also comprise other units and interfaces.

10 The mobile user apparatus refers to a portable computing device (apparatus), and it may also be referred to as a user terminal. Such computing devices (apparatuses) include wireless mobile communication devices operating with or without a subscriber identification module (SIM) in hardware or in software, including, but not limited to, the following types of devices:
15 mobile phone, smart-phone, personal digital assistant (PDA), handset, laptop computer, and/or touch screen computer, e-reading device, tablet, a dedicated GPS device, game console with display, notebook, multimedia device, a handheld radio terminal, and a so called fixed radio apparatus in a vehicle, like a car or a vessel.

20 In other words, a commercial off-the-shelf (COTS) mobile user apparatus may be used after its configuration is tailored for the specific purpose described below. At the simplest, the configuration tailoring may be performed by downloading required program instructions, for example a corresponding applet or widget, to the COTS mobile user apparatus. For
25 example, a TETRA hand portable radio with four-way navigation keys, an embedded GPS unit, and a large enough display that provides all the necessary information in clear format, with a specific night vision display color scheme providing enhanced visibility and user safety when working in the dark may be tailored to comprise the slave unit.

30 Advantages provided by the use of COTS mobile user apparatuses include that they do not need separate power feed thanks to batteries in user apparatuses; they are small and hence require only a small footprint in a vessel/vehicle; and some of them have advanced displaying functionality, like zoom levels which improve visibility.

35 A further advantage provided by the use of COTS mobile user apparatuses is that when oil on a sea surface needs to be collected, any kind

of a vessel, like a fishing vessel or a pleasure boat, may be used as the right/left hand side vessels without any extra training or additional equipment or any need of the steering person in the right/left hand side vessel to understand the language used in the vessel collecting the oil or to be a professional navigator; it suffices that either a mobile user apparatus in the vessel is tailored to act as a slave, or they are provided with such a mobile user apparatus.

Figure 3 is a block diagram illustrating the basic "V" configuration used for oil collection.

The fleet forming the "V" configuration 300 comprises an oil collecting vessel 301 in the middle and two "side" vessels 302, 302'. Both side vessels have to maintain their relative position to the middle vessel rather stable. Therefore the mobile user apparatus in the middle vessel is the master mobile user apparatus, called below simply master. In other words, master means the one to whose movement the other one(s) synchronize(s) its/their movements, and a slave means the one synchronizing its movement.

When a slave 302, 302' stays within a target area 303, 303' the relative position of the slave 302, 302' to the position of the master remains stable. The position and size of the target area 303, 303' may be defined in several ways, it suffices to define information by means of which the distance from the master to the target area, and the size of the target area may be determined. The distance is determined using at least a reference point 311 of the master and a target area definition point 321, 321'. The target definition point 321, 321' may locate in the slave 302, 302' as is in the illustrated example, or it may locate within the target area, like in a corner of the target area, or somewhere else, depending on the way how the target area is calculated.

Figure 3 illustrates two different exemplary ways to define the information by means of which the distance from the master to the target area, and the size of the target area may be determined. The information may comprise a distance D1 between the reference point 311 and the target area definition point 321 and an angle A1 defining the deviation from assumed movement direction of the master, and the side lengths L1, L2 of the target area. The information may utilize a Cartesian coordinate system in a plane and comprise x and y coordinates defining coordinates for the target area definition point 321' when the reference point 311 is in the origin, and target area

margins x-m, y-m. The side lengths and the target area margins are used as examples of target area size indicators, without restricting the target area size indicators to them.

5 It should be appreciated that instead of the illustrated rectangle, the target area may be of any shape, for example a circle or an ellipse. Further, the target area may comprise nested target areas, for example a waiting area and an operating area within the waiting area.

10 Figure 4 illustrates a functionality of a slave unit according to an exemplary implementation. The functionality is described using different exemplary display views of Figures 7A-7D to illustrate the outcome of the functionality, i.e. they illustrate different display views in a mobile user apparatus configured to act as a slave. In the example it is assumed that position information includes in addition to the actual position also information on movement direction. However, in other implementations the information on
15 the movement direction may be received/sent separately from the actual position, or no information on the movement direction is received/sent.

To initialize the slave for the specific situation, the slave is provided in step 401 with first information indicating an optimal distance to the master, i.e. a target position of the slave, and the size of the target area. The first
20 information may be inputted to the slave via a user input, and/or a setting unit may be used for providing the first information, or some part of the first information, like the size indicators, may be preset to a memory of the slave, or sent from the master over the air. Then a size of the target area and an initial position of the target area is calculated in step 402.

25 In the starting situation, position information of the master is received in step 403, and the position of the target area is calculated in step 404 using the initial position and the received position information of the master. Further, the target area is displayed in step 405 on a display (a graphical user interface) so that the target area is shown in a predetermined
30 location on the display. An example of the predetermined location is that the target area is centered on the display.

Then position information of the slave is determined in step 406. The position information may be determined by a GPS unit, or corresponding position unit, and outputted as an input to the slave unit (i.e. the slave unit
35 receives the position information), or the position unit may be integrated with

the slave unit. The position information of the slave is sent to the master in step 407.

Using the position information of the slave and the position information of the target area, a relative position of the slave to the target area is calculated in step 408, and a relative movement direction of the slave to the movement direction of the master is also calculated in step 408. The slave in its relative position with the relative movement direction is displayed in step 409.

Figure 7A illustrates what is shown on the display 704 in a starting situation (and after that with a steady state movement of the slave and apparatus): the slave 702 is in the target area 703 and a relative movement direction 705 indicates up thereby indicating that the movement direction is the same as the movement direction of the master. Other information, like speed or bearing or some text information may be shown on the display as well. However that is not illustrated in the examples. Further, in another implementation the relative movement direction is not shown.

In the illustrated example, updating is performed automatically in response to receiving new position information from the master, and/or in response to determining new position information of the slave, and/or in response to receiving an instruction from the master. The slave may be configured to determine the position information continuously, periodically with a constant time period or with a varying time period, and/or in response to receiving a request for the position information or command to determine the position information, for example. The time period may vary according to the current speed and/or according to detected steering movements, for example.

When new position information from the master is received (step 410) the position of the target area is updated in step 411, the relative position and the relative movement direction of the slave is updated in step 411 and the display is updated correspondingly in step 411. In other words, the position of the target area, the relative position and the relative movement direction of the slave are recalculated using the received position information from the master and the newest determined position information of the slave. Further, the updating of the display may not be visible to the user of the slave. For example, if the master and the slave have not been moving, or are moving with a steady state movement, the updating of the display is not visible to the user of the slave.

When new position information of the slave is determined (step 412) the position information is sent to the master in step 413, the relative position and the relative movement direction of the slave is updated in step 413 and the display is updated correspondingly in step 413. In other words, the relative position and the relative movement direction of the slave are recalculated using the determined position information of the slave and the newest received position information from the master. Further, as explained above, the updating of the display may not be visible.

In the illustrated example it is checked in step 414, whether or not the slave is still within the target area, and if not, an alarm is generated in step 415 on the slave's user interface. The alarm may be a beep, a repeating beep, changing color of the target area and/or flashing color of the target area, for example.

When an instruction from the master is received (step 416), a corresponding indication is displayed in step 417. Further, a corresponding tone or beep may be outputted.

Figure 7B illustrates what is shown on the display 704 when the master has provided by means of the master unit an indication of a movement change to start to turn to right while the slave is still in the steady state movement: an arrow 706 pointing to the right is shown on the display. Other instructions (indications of movement changes) may include "turn to left", displayed by an arrow pointing to the left, "slow down" displayed by an arrow pointing downwards and "speed up" displayed by an arrow pointing upwards. However, it should be appreciated that the instructions may also be delivered using one-to-one voice call, or a group voice call or using messaging, like SDS messages in TETRA, and/or other indicators than arrows may be used to indicate the intended and indicated movement change. In a further implementation no instructions are given but it is relied that the user of the slave reacts to what is shown on the display.

When an end command is received (step 418), the displaying is stopped in step 419. Otherwise the updating is repeated.

Figure 7C illustrates what is shown on the display 704 when the master has turned to the right and the slave did not react fast enough. The slave 702 has drifted to the left due to a late start of turn but is still barely on the target area 703. Since the relative movement direction 705 points to the left and the aim is that it points upwards, a user is indicated to turn to right just by

noticing the relative movement direction 705. Naturally, an additional arrow (like the arrow 706 illustrated in Figure 7B) or corresponding information may be displayed. Further the user is indicated to increase the speed so that the slave reaches the position in the center of the target area.

5 Figure 7D illustrates what is shown on the display 704 when the master has turned to the left and the slave did not react fast enough. In this example the slave 702 is outside the target area 703. Since the relative movement direction 705 points to the right and the aim is that it points upwards, a user is indicated to turn to left. Further the user is indicated to
10 increase the speed so that the slave reaches the position in the center of the target area.

Hence, in the illustrated example, the target area is shown as stable on the display but the displayed position of the slave may change. An advantage provided by that is that it is very intuitive to the person trying to
15 maintain the vessel (or any other "thing", including himself/herself) within the target area so that a change of direction or speed is immediately obvious, as is illustrated with Figures 7C and 7D. No training is needed. That is especially useful when a sudden need for searching for a person lost in woods arises since then more people are able to use the apparatus, and therefore the
20 search group may be bigger and still is able to maintain its formation/configuration synchronized a longer period compared to use of mere vision and/or voice. Each stop because of "reformation" causes a delay that may have severe consequences. The same applies when oil is collected on the sea surface; each stop reduces the efficiency of the oil collection. Further,
25 compared to using mere voice and messaging, misunderstandings and mishearing are avoided.

However, it should be appreciated that in another example the displayed position of the target area changes on the display whereas the slave is shown as stable on the display.

30 In other implementations, the updating may be performed periodically and/or in response to receiving a user request for updating and/or in response to receiving a command to update from the master. In the implementations the newest position information of the master and the slave is used in the updating, and/or before updating position information is requested
35 from the master and/or position information of the slave is determined.

Figure 5 illustrates a functionality of a master unit according to an exemplary implementation. In the illustrated example the master unit is configured to display target areas and relative positions of slaves. The functionality is described using different exemplary display views of Figures 8A-8C to illustrate the outcome of the functionality, i.e. they illustrate different display views in a mobile user apparatus configured to act as a master. In the example it is assumed that position information includes in addition to the actual position also information on movement direction. However, in other implementations the information on the movement direction may be received/sent separately from the actual position, or no information on the movement direction is received/sent.

To synchronize the master with the initialization of the one or more slaves, the master is provided in step 501 with first information indicating an optimal distance (a target position) to the master and the size of the target area for each slave. Each slave may have different optimal distance and or/the size of the target area, or the optimal distances and/or the target areas of two or more slaves may be of the same size. The first information may be inputted to the master via a user input, and/or a setting unit may be used for providing the first information from a memory of the master, or some part of the first information, like the size indicators may be preset to a memory of the master, for example. Then a size of the target area and an initial position of the target area is calculated in step 502 for each slave.

In the starting situation, position information of the master is determined in step 503. The position information may be determined by a GPS unit, or corresponding position unit, and outputted as an input to the master unit (i.e. the master unit receives the position information), or the position unit may be integrated with the master unit. The position information of the master is sent to each slave in step 504. Further, for each slave the position of the target area is calculated in step 505 using the initial position and the determined position information of the master, and the position of the master and the target area(s) is(are) displayed in step 506 on a display (a graphical user interface) so that the master is shown in a predetermined location on the display, thereby defining locations where the target area(s) is(are) shown. An example of the predetermined location is that the master is centered on the bottom of the display.

In the illustrated example it is assumed, for the sake of clarity, that position information from each slave is received in step 507.

Using the position information of the slave and the position information of the target area, a relative position of the slave to the target area is calculated in step 508 for each slave, and a relative movement direction of the slave to the movement direction of the master is calculated in step 508 for each slave. Each slave in its relative position with the relative movement direction is displayed in step 509.

Figure 8A illustrates what is shown on the display 804 in a starting situation (and after that with a steady state movement of the master and the slaves): the slaves 802, 802' are in corresponding target areas 803, 803' and relative movement directions 805, 805' indicates up thereby indicating that the movement direction is the same as the movement direction of the master. Further, in the illustrated example, additional information 807 facilitating steering of the fleet is shown on the display. In the illustrated example, the additional information comprises speed and bearing, both received from the GPS unit, for example, are shown. It should be appreciated that other information may be shown on the display as well, or it may be that no additional information is shown. Further, in another implementation the relative movement directions are not shown.

In the illustrated example, updating is performed automatically in response to determining new position information of the master, and/or in response to receiving new position information from the slave, and in the illustrated example, in response to receiving an instruction from the user via a user interface. For example, four buttons in the mobile user apparatus configured to be a master may be used for instructions/commands: one for turning left, one for turning right, one for speeding up and one for slowing down. The buttons may be in the keyboard of the mobile user apparatus, or provided on a touch screen of the user apparatus. It should be appreciated that any other means to input instructions may be used. The master may be configured to determine the position information continuously, periodically with a constant time period or with a varying time period, and/or in response to receiving a request for the position information or command to determine the position information, for example. The time period may vary according to the current speed and/or according to detected steering movements, for example.

When new position information from the master is determined (step 510) the position information is sent to each slave in step 511, the position of each target area is updated in step 511, the relative position and the relative movement direction of each slave is updated in step 511 and the display is updated correspondingly in step 511. In other words, the position of the target area, the relative position and the relative movement direction of each slave are recalculated using the determined position information from the master and the newest received position information of the slave. Further, the updating of the display may not be visible to the user of the master. For example, if the master and none of the slaves have not been moving, or are moving with a steady state movement, the updating of the display is not visible to the user of the master.

When new position information of a slave is received (step 512) the relative position and the relative movement direction of the slave is updated in step 513 and the display is updated correspondingly in step 513. In other words, the relative position and the relative movement direction of the slave are recalculated using the received position information of the slave and the newest determined position information from the master. Further, as explained above, the updating of the display may not be visible to the user of the master.

Further, in the illustrated example it is checked, for each slave, in step 514, whether or the slave is still within its target area, and if not, an alarm is generated in step 515. The alarm may be a beep, a repeating beep, changing color of the target area and/or flashing color of the target area, for example.

When an input of an instruction is received via a user interface (step 516), the instruction is sent to each slave in step 517 and corresponding indication(s) is(are) displayed in step 517.

Figure 8B illustrates what is shown on the display 804 when the master has instructed via the user interface an indication of a movement change to start to turn to right while the slaves are still in the steady state movement: an arrow 806, 806' associated with each slave, each pointing to the right is shown on the display. Other instructions (indications of movement changes) may include "turn to left", displayed by an arrow pointing to the left, "slow down" displayed by an arrow pointing downwards and "speed up" displayed by an arrow pointing upwards. In another implementation, the arrow will be associated with the master on the display. However, it should be

appreciated that the instructions (the indications of the movement changes) may be delivered using a group voice call or using messaging and/or other indicators than arrows may be used to indicate the intended and indicated movement change. In a further implementation no instructions are given but it is relied that the user of the slave reacts to what is shown on the display.

When an end command is received (step 518), the displaying is stopped in step 519. Otherwise the updating is repeated.

Figure 8C illustrates what is shown on the display 804 when the master has turned to the right and the slaves did not react fast enough. The slave 802 has drifted to the left due to a late start of turn but is still, although barely, on the target area 803. The other slave 802' has been dropped from its target area 803', it is too much left due to being late to start turn to the right. In the illustrated example, the target area 803' background is changed to indicate that the slave 802' is not any more in the target area 803'. The user of the master may then wait for a certain time to see whether or not the slaves return to their target areas, and if not decide what other measures the user can do.

In other implementations, the updating may be performed periodically and/or in response to receiving a user request for updating. In the implementations the newest position information of the master and the slave is used in the updating, and/or before updating position information is requested from the slaves and/or position information of the master is determined.

It should be appreciated that at the simplest the master unit is configured to determine its position and sending the position information. Nothing needs to be displayed in the master since the master cannot force the slaves to be synchronized. However, for example when a group of hunters are hunting together, it is very helpful for the leader of the hunters to see that each hunter is in his/her target area before a permission to shoot is given, for example.

Figure 6 illustrates a functionality of a setting unit in a mobile user apparatus comprising both a master unit and a slave unit. In the illustrated example it is assumed that the units are preinstalled or previously loaded to the mobile user apparatus and are selectable as a "synchronizing aid" applet (application), and that each time the applet is started, a selection has to be made. When it is detected in step 601 that the "synchronizing aid" applet is activated in step 601, the user is prompted in step 602 to select whether or not the mobile user apparatus is intended to be used as a master or a slave. If the

mobile user apparatus is to be a slave (step 603), the slave unit is activated in step 604 and the slave unit functionality will be performed. If the mobile user apparatus is not to be a slave (step 603), it will be a master, and the master unit is activated in step 605 and the master unit functionality may be performed.

This is a very useful feature for example when a hunting group gathers together and one of the members is selected to be the leader. After that it suffices that the members set their mobile user apparatuses correspondingly.

As is evident from Figures 7A to 8C, there is no need to have map information; one is able to navigate, at least as a slave, by merely trying to stay within the target area. However, it should be appreciated that a map (or map information) may be displayed simultaneously, preferably underlying the other displayed information.

Figure 9 is a simplified block diagram illustrating some units for a mobile user apparatus 900 configured to be a slave or a master or selectable either a master or a slave, i.e. an apparatus providing at least the slave unit and/or the master unit and/or one or more units configured to implement at least some of the functionalities described above. In the illustrated example, the apparatus comprises one or more user interfaces (U-IF(s)) 901 at least for displaying a relative location and a target area, one or more interfaces (IF) 901' for receiving and transmitting information, a processor 902 configured to implement at least some functionality described above with a corresponding algorithm/algorithms 903, and memory 904 usable for storing a program code required at least for the implemented functionality and the algorithms and for temporarily storing initial position of a target area. The memory 904 is also usable for storing other information, like one or more size indicators of a target area. Further, in the illustrated example the apparatus comprises a position element 905 for determining the geographical position of the apparatus.

In other words, a mobile user apparatus configured to provide the slave and/or the master, or an apparatus configured to provide one or more corresponding functionalities, is a computing device that may be any apparatus or device or equipment configured to perform one or more of corresponding functionalities described with an embodiment/example/implementation, and it may be configured to perform functionalities from different embodiments/examples/implementations. The

unit(s) described with an apparatus may be separate units, even located in another physical apparatus, the distributed physical apparatuses forming one logical apparatus providing the functionality, or integrated to another unit in the same apparatus.

5 The techniques described herein may be implemented by various means so that an apparatus implementing one or more functions of a corresponding apparatus described with an embodiment/example/implementation comprises not only prior art means, but also means for implementing the one or more functions of a corresponding apparatus
10 described with an embodiment and it may comprise separate means for each separate function, or means may be configured to perform two or more functions. For example, the slave unit(s), and/or the master unit(s) and/or algorithms, may be software and/or software-hardware and/or hardware and/or firmware components (recorded indelibly on a medium such as read-only-
15 memory or embodied in hard-wired computer circuitry) or combinations thereof. Software codes may be stored in any suitable, processor/computer-readable data storage medium(s) or memory unit(s) or article(s) of manufacture and executed by one or more processors/computers, hardware (one or more apparatuses), firmware (one or more apparatuses), software (one
20 or more modules), or combinations thereof. For a firmware or software, implementation can be through modules (e.g., procedures, functions, and so on) that perform the functions described herein. Software codes may be stored in any suitable, processor/computer-readable data storage medium(s) or memory unit(s) or article(s) of manufacture and executed by one or more
25 processors/computers.

 A mobile user apparatus configured to provide the slave, and/or an apparatus configured to provide the master, and/or an apparatus configured to provide one or more corresponding functionalities, may generally include a processor, controller, control unit, micro-controller, or the like connected to a
30 memory and to various interfaces of the apparatus. Generally the processor is a central processing unit, but the processor may be an additional operation processor. Each or some or one of the units and/or algorithms and/or calculation mechanisms described herein may be configured as a computer or a processor, or a microprocessor, such as a single-chip computer element, or
35 as a chipset, including at least a memory for providing storage area used for arithmetic operation and an operation processor for executing the arithmetic

operation. Each or some or one of the units and/or algorithms and/or calculation mechanisms described above may comprise one or more computer processors, application-specific integrated circuits (ASIC), digital signal processors (DSP), digital signal processing devices (DSPD), programmable logic devices (PLD), field-programmable gate arrays (FPGA), and/or other hardware components that have been programmed in such a way to carry out one or more functions or calculations of one or more embodiments. In other words, each or some or one of the units and/or the algorithms and/or the calculation mechanisms described above may be an element that comprises one or more arithmetic logic units, a number of special registers and control circuits.

Further, an apparatus implementing functionality or some functionality according to an embodiment/example/implementation of an apparatus configured to provide the slave, and/or an apparatus configured to provide the master, or an apparatus configured to provide one or more corresponding functionalities, may generally include volatile and/or non-volatile memory, for example EEPROM, ROM, PROM, RAM, DRAM, SRAM, double floating-gate field effect transistor, firmware, programmable logic, etc. and typically store content, data, or the like. The memory or memories may be of any type (different from each other), have any possible storage structure and, if required, being managed by any database management system. The memory may also store computer program code such as software applications (for example, for one or more of the units/algorithms/calculation mechanisms) or operating systems, information, data, content, or the like for the processor to perform steps associated with operation of the apparatus in accordance with examples/embodiments. The memory, or part of it, may be, for example, random access memory, a hard drive, or other fixed data memory or storage device implemented within the processor/apparatus or external to the processor/apparatus in which case it can be communicatively coupled to the processor/network node via various means as is known in the art. An example of an external memory includes a removable memory detachably connected to the apparatus.

A mobile user apparatus configured to provide the slave, and/or an apparatus configured to provide the master, and/or an apparatus configured to provide one or more corresponding functionalities includes one or more user

interfaces for receiving user inputs and/or outputting information to the user, such as a graphical user interface providing a display.

A mobile user apparatus configured to provide the slave, and/or an apparatus configured to provide the master, and/or an apparatus configured to provide one or more corresponding functionalities includes a positioning unit. Different examples of a positioning element include an embedded standalone GPS (Global Positioning System) module that is configured to receive a GPS signal and calculate the position of the apparatus, a module providing hybrid positioning system using other signals when GPS signals are adequate, a module using mobile network base station signals to determine the position, or assisted GPS using the mobile network base station signals and GPS signals and a connection, such as USB or Bluetooth, to an external GPS module or mobile positioning system.

An apparatus implementing functionality or some functionality according to an embodiment/example/implementation of an apparatus configured to provide the slave, and/or an apparatus configured to provide the master, or an apparatus configured to provide one or more corresponding functionalities, may generally comprise different interface units, such as one or more receiving units for receiving position information, user data, control information, requests and responses, for example, and one or more sending units for sending position information, user data, control information, responses and requests, for example. The receiving unit and the transmitting unit each provides an interface in an apparatus, the interface including a transmitter and/or a receiver or any other means for receiving and/or transmitting information, and performing necessary functions so that the position information, control information, etc. can be received and/or sent. The receiving and sending units may comprise a set of antennas, the number of which is not limited to any particular number.

Further, an apparatus implementing functionality or some functionality according to an embodiment/example/implementation of an apparatus configured to provide the slave, and/or an apparatus configured to provide the master, or an apparatus configured to provide one or more corresponding functionalities, may comprise other units.

The steps and related functions described above in Figures 4 and 5 are in no absolute chronological order, and some of the steps may be performed simultaneously or in an order differing from the given one. For

example position information of the master and the slave may be received simultaneously, and hence processed simultaneously. Other functions can also be executed between the steps or within the steps. For example, if a request for position information is received, the position information may be determined
5 and sent to the requesting apparatus, or the newest determined position information is sent. Another example includes maintaining position information history and using it, or at least the newest and its preceding position for deducing a movement direction. Some of the steps or part of the steps can also be left out or replaced by a corresponding step or part of the step. For
10 example, sending/receiving the position information of the slave may be omitted, and/or steps relating to whether or not the slave is in the target area, and/or steps relating to receiving/sending and displaying instructions on the view and/or calculating and displaying relative movement directions may be omitted.

15 Although in the above all examples are illustrated assuming that all slaves and the master are mobile user apparatuses. However, there is no need for the master apparatus to be a mobile user apparatus; it may be any equipment configured to send its position to the slaves while it is moving.

It should be appreciated that the slave mobile user apparatuses
20 and/or the master apparatuses may be of different type; it suffices that they are able to transmit and/or receive position information between themselves.

It will be obvious to a person skilled in the art that, as technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described
25 above but may vary within the scope of the claims.

CLAIMS

1. A method comprising:
 - providing a mobile user apparatus with first information indicating a target position of the mobile user apparatus relative to a position of a mobile master apparatus, and one or more target area size indicators;
 - receiving a second information indicating a position of the mobile master apparatus;
 - calculating from the first information and from the received second information a target area for the mobile user apparatus and a position of the target area;
 - determining a position of the mobile user apparatus;
 - calculating a relative position of the mobile user apparatus to the position of the target area; and
 - displaying the target area and the relative position of the mobile user apparatus.
2. A method as claimed in claim 1, further comprising
 - in response to receiving new second information, recalculating the position of the target area and the relative position of the mobile user apparatus; and
 - updating the displaying of the relative position of the mobile user apparatus correspondingly.
3. A method as claimed in claim 1 or 2, further comprising:
 - in response to a new position of the mobile user apparatus, recalculating the relative position of the mobile user apparatus; and
 - updating the displaying of the relative position of the mobile user apparatus correspondingly.
4. A method as claimed in claim 1, 2 or 3, further comprising:
 - in response to receiving an update command, recalculating the relative position of the mobile user apparatus using newest received second information and newest position of the mobile user apparatus; and
 - updating the displaying of the relative position of the mobile user apparatus correspondingly.
5. A method as claimed in any of the preceding claims, further comprising:
 - receiving movement direction of the mobile master apparatus;

receiving a movement direction of the mobile user apparatus;
determining a relative movement direction of the mobile user
apparatus relative to the movement direction of the master apparatus;
displaying the relative movement direction;
5 performing updating in response to receiving a new movement
direction; and
updating the displaying of the relative position correspondingly.

6. A method as claimed in any of the preceding claims, further
comprising:

10 receiving an indication of movement change from the mobile master
apparatus; and
displaying an indicator corresponding to the indicated movement
change.

7. A method as claimed in any of the preceding claims, further
15 comprising:
checking, whether the position of the mobile user apparatus is within
the target area; and
if not, generating an alarm.

8. A method as claimed in any of the preceding claims, further
20 comprising displaying the target area so that its center is in a specific point on
a graphical user interface.

9. A method as claimed in any of the preceding claims, further
comprising sending the position of the mobile user apparatus to the mobile
master apparatus.

25 10. A method comprising:
providing a mobile apparatus with a first information indicating a
target position of a mobile slave user apparatus relative to a position of the
mobile apparatus, and one or more target area size indicators;
determining a position of the mobile apparatus;
30 sending the position to the slave mobile user apparatus;
calculating from the first information, using the position of the mobile
apparatus, a target area for the mobile slave user apparatus and a position of
the target area;
receiving a second information indicating a position of the mobile
35 slave user apparatus;
calculating a relative position of the mobile slave user apparatus to

the position of the target area; and

displaying the target area, the position of the mobile apparatus and the relative position of the mobile user apparatus.

11. A method as claimed in claim 10, further comprising:

5 in response to a new position of the mobile apparatus, recalculating the position of the target area and the relative position of the mobile slave user apparatus; and

updating the displaying of the relative position of the mobile slave user apparatus correspondingly.

10 12. A method as claimed in claim 11, further comprising sending the new position to the mobile slave user apparatus.

13. A method as claimed in claim 10, 11 or 12, further comprising:

in response to receiving a new second information, recalculating the relative position of the mobile slave user apparatus; and

15 updating the displaying of the relative position of the mobile slave user apparatus correspondingly.

14. A method as claimed in any of claims 10 to 13, further comprising displaying the position of the mobile apparatus in a specific point on a graphical user interface.

20 15. An apparatus comprising means for performing a method as claimed in any one of claims 1 to 14.

16. An apparatus as claimed in claim 15, wherein the apparatus comprises a global positioning system unit for determining the position of the apparatus.

25 17. A computer program product comprising computer program code configured to perform a method as claimed in any one of claims 1 to 14 when executed on an apparatus.

18. A system comprising

30 at least one mobile user apparatus comprising means for performing a method as claimed in any of claims 1 to 9; and

a mobile apparatus configured to act as a master mobile apparatus and comprising means for determining its position and means for sending the position to the at least one mobile user apparatus.

35 19. A system as claimed in claim 18, wherein the mobile apparatus comprises further means for performing a method as claimed in any of claims 10 to 14.

20. A system as claimed in claim 18 or 19, wherein the mobile user apparatus is a commercial off-the-shelf apparatus that is further configured to comprise the means for performing a method as claimed in any of claims 1 to 9.

5 21. A system as claimed in claim 18, 19 or 20, wherein the at least one mobile user apparatus and the mobile apparatus are configured to communicate position information using direct mode communication or to form an ad hoc network to communicate position information.

10 22. A system as claimed in claim 18, 19, or 20, the system further comprising at least one network node between the at least one mobile user apparatus and the mobile apparatus..

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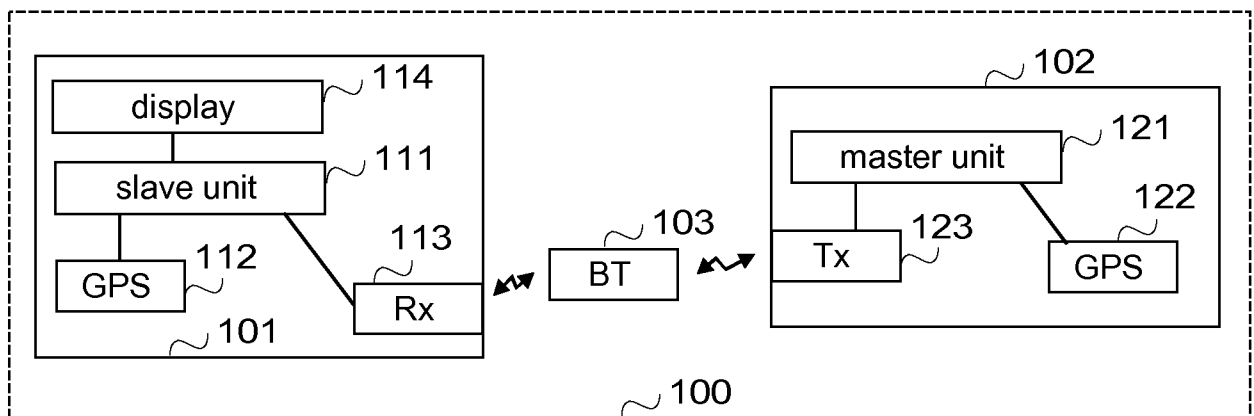


FIG. 1

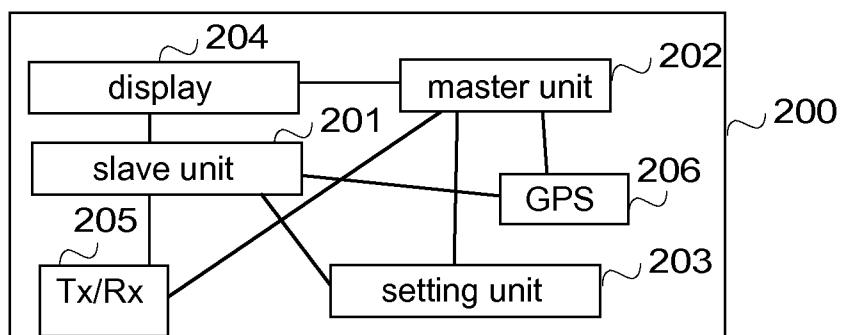


FIG. 2

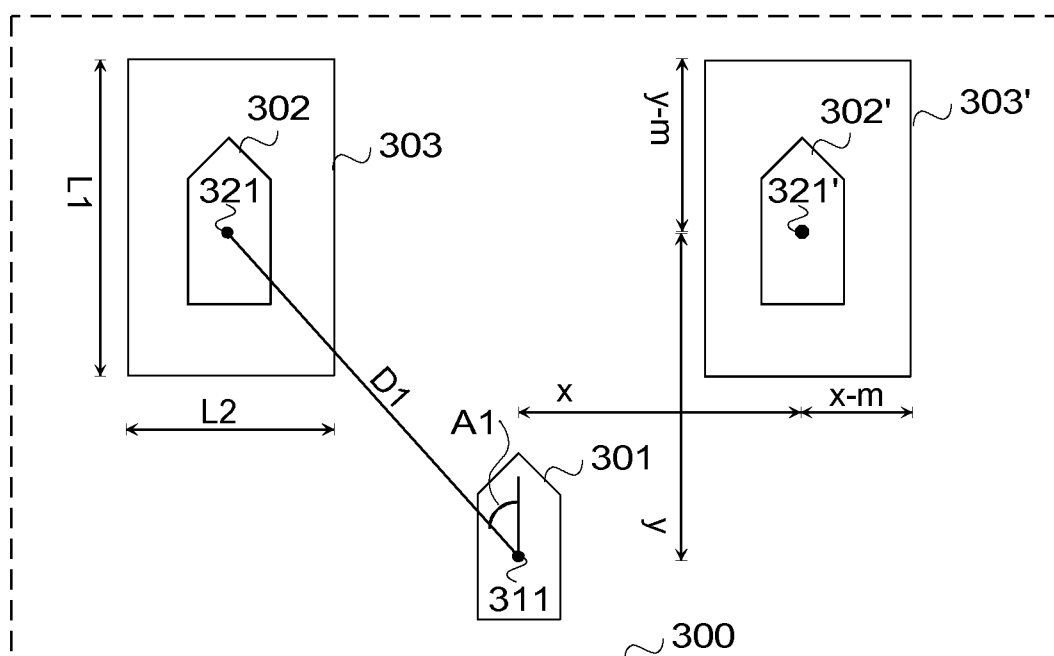


FIG. 3

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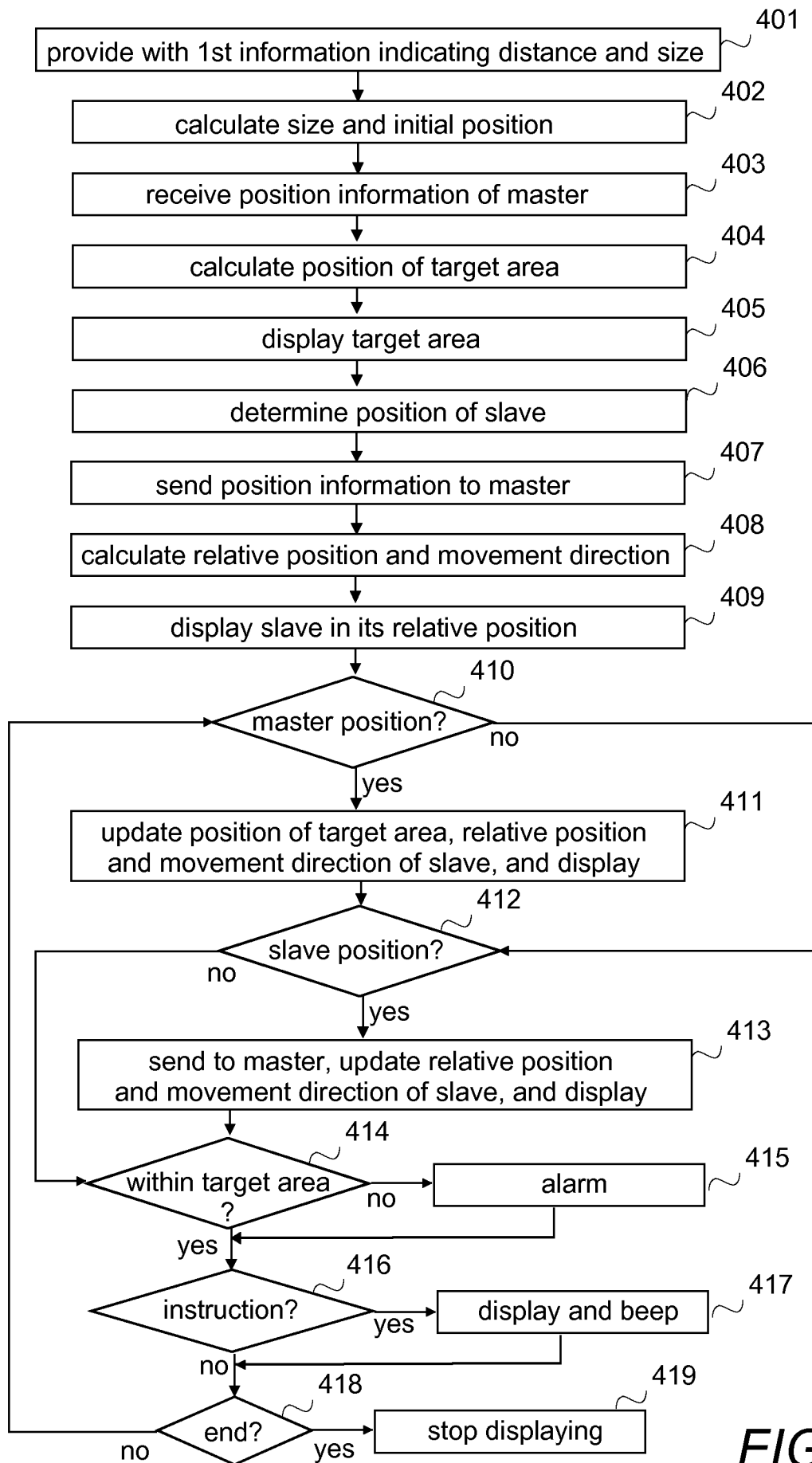


FIG.4

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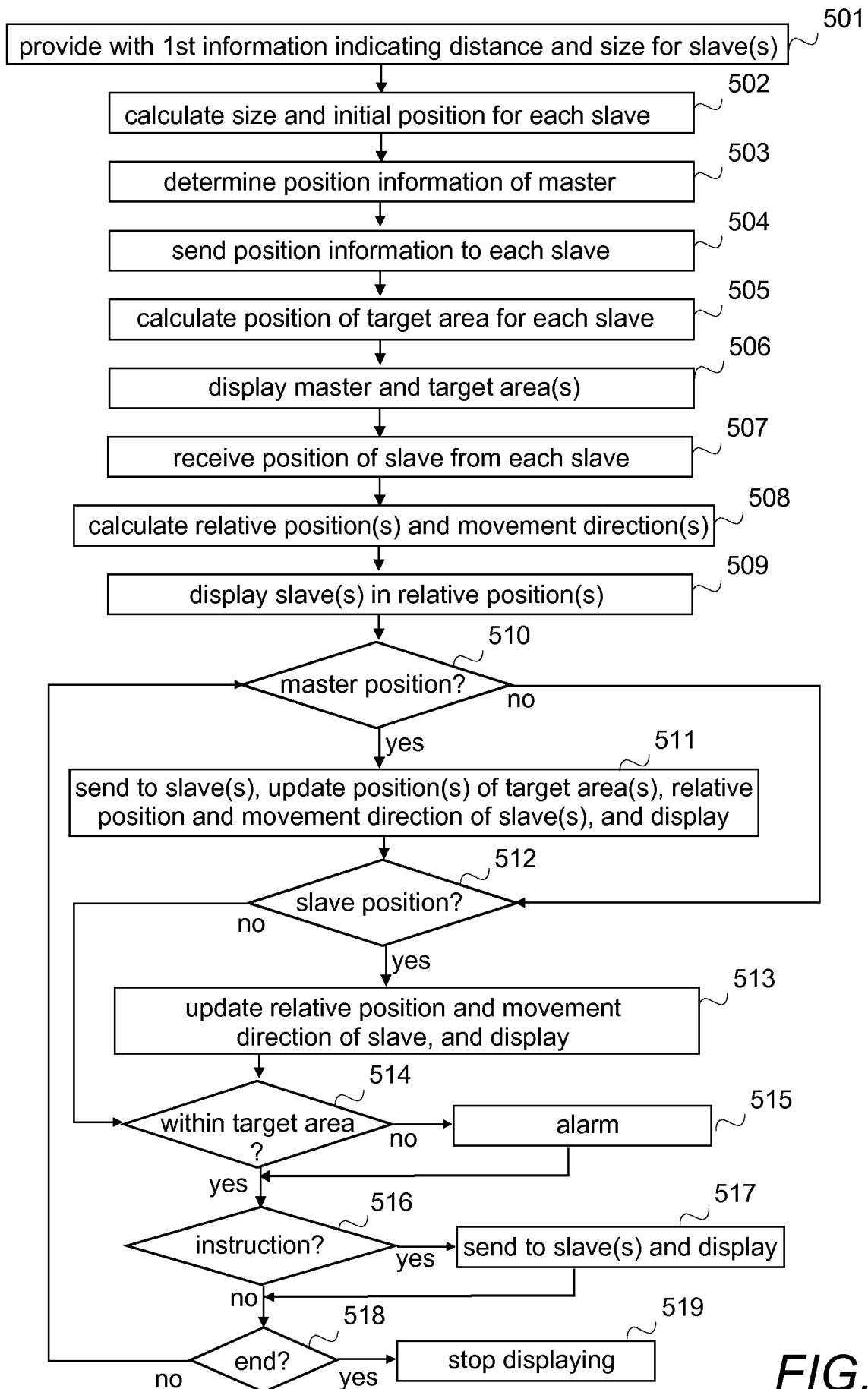
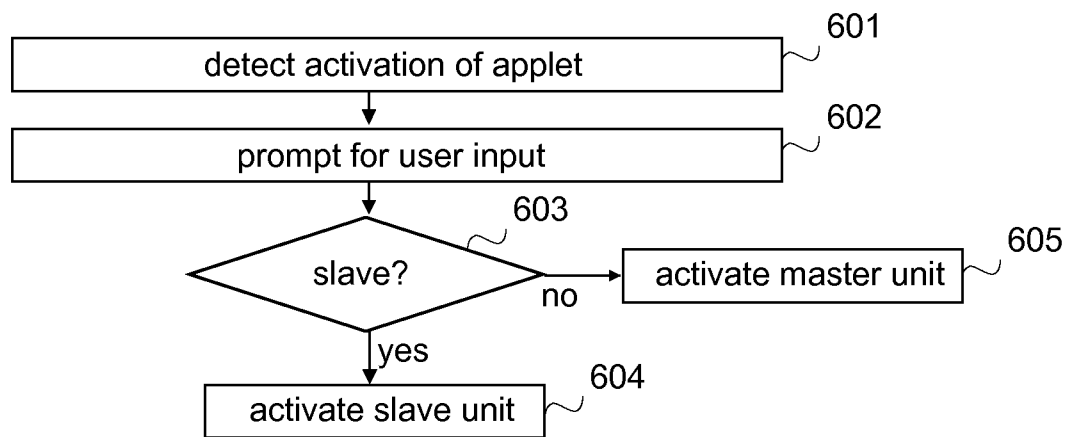
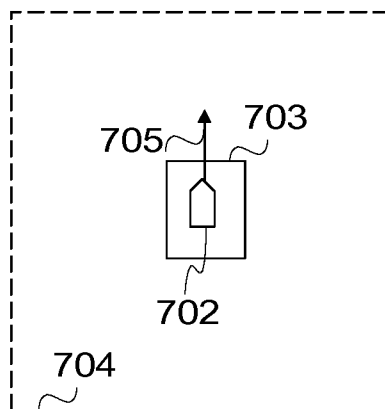
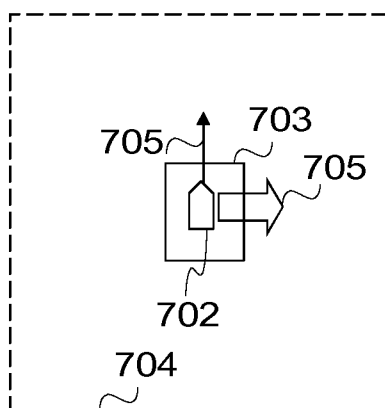


FIG.5

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**FIG. 6****FIG. 7A****FIG. 7B**

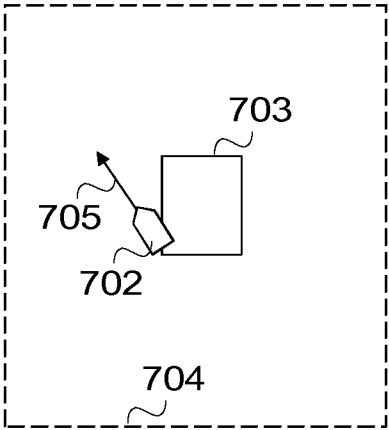


FIG. 7C

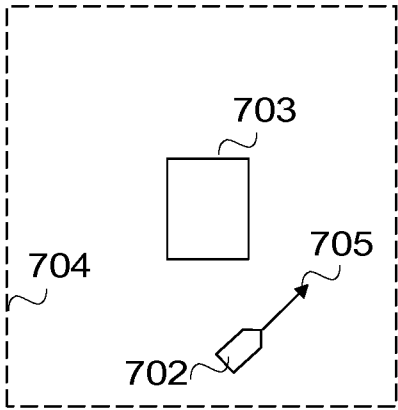


FIG. 7D

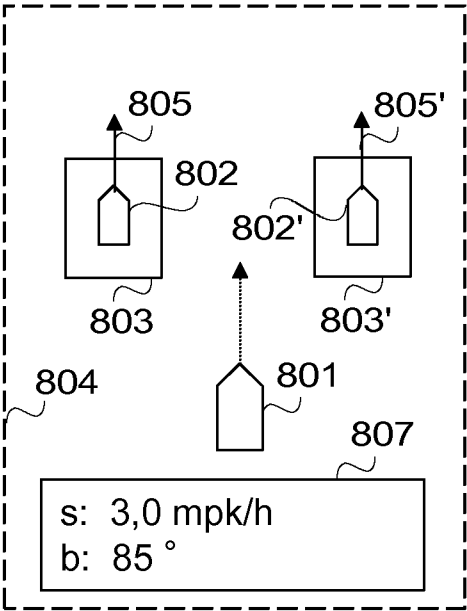


FIG. 8A

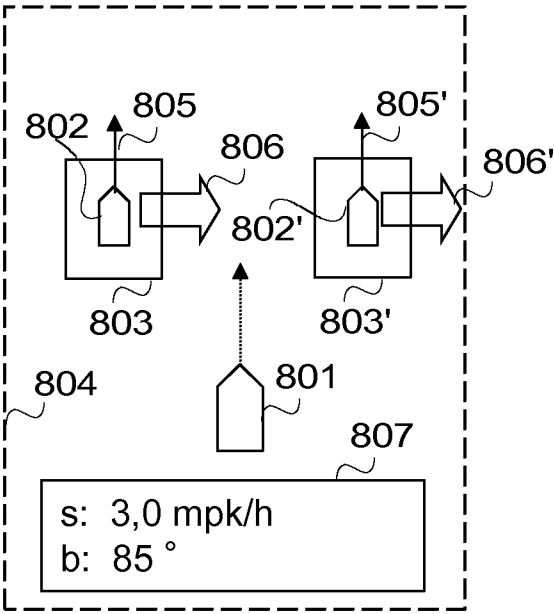


FIG. 8B

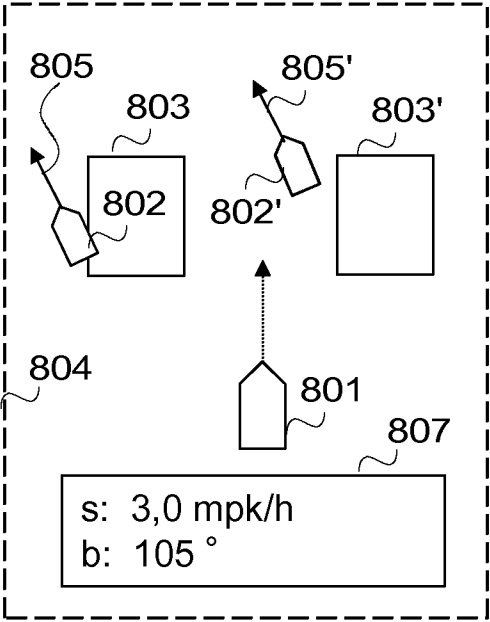


FIG. 8C

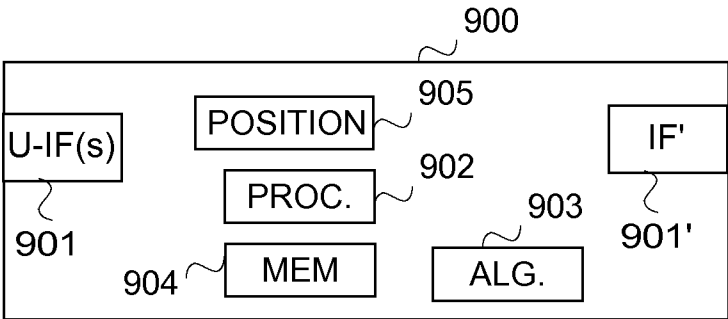


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/068065

A. CLASSIFICATION OF SUBJECT MATTER

INV. G01S5/02 G01S19/51
ADD. H04W4/02 H04W64/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01S H04W H04L

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

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

EPO-Internal, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/101205 A1 (INTEL CORP [US]; MIAN MUBASHIR [US]; WOUHAYBI RITA H [US]; MO STANLEY) 4 July 2013 (2013-07-04) page 6, line 13 - line 29; figure 1 page 9, line 17 - page 10, line 6; figure 4 page 10, line 26 - page 11, line 20; figure 5 page 13, line 12 - page 14, line 9; figures 7,8 -----	1-22
X	US 2010/017126 A1 (HOLCMAN ALEJANDRO R [US] ET AL) 21 January 2010 (2010-01-21) paragraph [0017] - paragraph [0025]; figure 1 paragraph [0044] ----- -/--	1,7,10, 15-20



Further documents are listed in the continuation of Box C.



See patent family annex.

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

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"&" document member of the same patent family

Date of the actual completion of the international search

28 April 2014

Date of mailing of the international search report

09/05/2014

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Authorized officer

Grimaldo, Michele

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/068065

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 7 805 146 B1 (BEYER JR MALCOLM K [US]) 28 September 2010 (2010-09-28) column 1, line 63 - column 3, line 7 -----	1-22

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Information on patent family members

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