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(54) **APPARATUS AND METHOD FOR ANALYZING EXTENT OF MARINE VESSEL**

(57) Apparatus and method for analyzing extent of marine vessel. The method included: obtaining (1302) automatic identification system (AIS) data transmitted by a marine vessel, the AIS data comprising in a static part of the AIS data user-inputted overall dimensions of the marine vessel and a user-inputted reference for a position of the marine vessel; obtaining (1306), in addition to the AIS data, complementary data related to the marine vessel, the complementary data comprising information related to an extent of the marine vessel; and evaluating (1310) the AIS data in view of the complementary data in order to generate correction data related to the extent of the marine vessel.

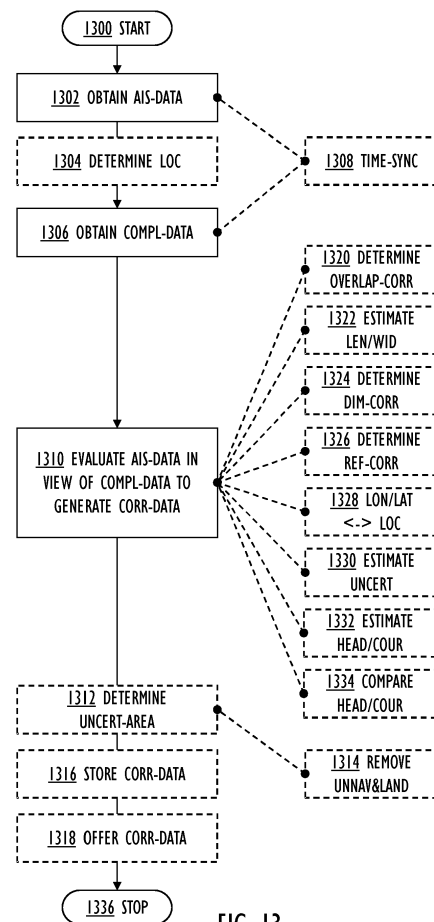


FIG. 13

Description

FIELD

[0001] Various embodiments relate to an apparatus for analyzing an extent of a marine vessel, and to a method for analyzing an extent of a marine vessel.

BACKGROUND

[0002] The automatic identification system (AIS) is used to broadcast data from ship to ship. The AIS data includes information related to the ship position: the current position and heading, the length and width of the ship, and the reference of the position, among other things. However, some of the AIS data (the length and width of the ship and the reference for the position) is entered manually, which causes a large uncertainty of the ship extent. The length and width of the ship can be double-checked against other databases, such as Lloyds register, however, the reference for the position cannot be easily checked. For an autonomous operation, any manoeuvre should be based on the worst-case scenario. A large uncertainty in the extent of the other ship means that the planned paths will be longer and in a tight manoeuvring space such as a harbour, it may not even be possible to find a feasible path. For instance, for a ship with a length of 200 meters, the uncertainty may be a circle with a diameter of over 400 meters, and this uncertainty is thus potentially large enough to block entry into many ports.

BRIEF DESCRIPTION

[0003] According to an aspect, there is provided subject matter of independent claims. Dependent claims define some embodiments.

[0004] One or more examples of implementations are set forth in more detail in the accompanying drawings and the description of embodiments.

LIST OF DRAWINGS

[0005] Some embodiments will now be described with reference to the accompanying drawings, in which

FIG. 1 and FIG. 2 illustrate embodiments of an apparatus for analyzing an extent of a marine vessel; FIG. 3 illustrate an embodiment of AIS data; FIG. 4, FIG. 5, FIG. 6, FIG. 7, FIG. 8, FIG. 9A, FIG. 9B, FIG. 10A, FIG. 10B, FIG. 11A, FIG. 11B, FIG. 12A and FIG. 12B illustrate a reference of a position and an uncertainty related to an extent of a marine vessel; and FIG. 13 is a flow-chart illustrating embodiments of a method for analyzing an extent of a marine vessel.

DESCRIPTION OF EMBODIMENTS

[0006] The following embodiments are only examples. Although the specification may refer to "an" embodiment in several locations, this does not necessarily mean that each such reference is to the 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. Furthermore, words "comprising" and "including" should be understood as not limiting the described embodiments to consist of only those features that have been mentioned and such embodiments may contain also features/structures that have not been specifically mentioned.

[0007] Reference numbers, both in the description of the embodiments and in the claims, serve to illustrate the embodiments with reference to the drawings, without limiting it to these examples only.

[0008] The embodiments and features, if any, disclosed in the following description that do not fall under the scope of the independent claims are to be interpreted as examples useful for understanding various embodiments of the invention.

[0009] Let us study simultaneously FIG. 1 and FIG. 2, which illustrate embodiments of an apparatus 100 for analyzing an extent of a marine vessel 200, and FIG. 13, which illustrates embodiments of a method for analyzing an extent of a marine vessel 200. The method may be implemented as an algorithm programmed as computer program code 106 executed by the apparatus 100 as a special purpose computer.

[0010] The apparatus 100 comprises two interfaces 108, 110. These may be separate interfaces 108, 110 as shown in FIG. 1, but, alternatively, they may also utilize the same communication hardware and/or software as well.

[0011] The AIS interface 108 is to obtain AIS data 112 transmitted by the marine vessel 200. The AIS data 112 comprises in a static part of the AIS data user-inputted overall dimensions of the marine vessel 200 and a user-inputted reference 210 for a position of the marine vessel 200. Recommendation ITU-R M.1371-5, 02/2014, "Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band" defines the overall dimensions for the AIS data 112 as shown in FIG. 4:

- A (9 bits) may contain values 0-511 meters (wherein 511 = 511 meters or greater);
- B (9 bits) may contain values 0-511 meters (wherein 511 = 511 meters or greater);
- C (6 bits) may contain values 0-63 meters (wherein 63 = 63 meters or greater); and
- D (6 bits) may contain values 0-63 meters (wherein 63 = 63 meters or greater).

[0012] FIG. 3 illustrates an embodiment of AIS data display: a map 300 showing a plurality of marine vessels

as triangles, and a specific selected marine vessel 302, whose name and type 304 are shown together with an image 306 of the marine vessel. Further AIS data 308 is shown in the bottom. Basically, the AIS data 112 contains static data: identification (IMO = International Maritime Organization), name of ship, type of ship, vendor ID, call sign (MMSI = Maritime mobile service identity), dimensions of ship and reference for position, and dynamic data: ship's position with accuracy indication and integrity status, time, course over ground (COG), speed over ground (SOG), true heading. Position information includes position accuracy, longitude, latitude, precision, type of electronic position fixing device, time stamp. Additional data is also transmitted such as voyage specific data: estimated time of arrival, maximum present static draught, destination.

[0013] The complementary interface 110 is to obtain complementary data 114 related to the marine vessel 200 in addition to the AIS data 112. The complementary data 114 comprises information related to an extent of the marine vessel 200. The complementary data 114 may be obtained from one or more sensors 140, and, additionally, from another data source such as a database 142.

[0014] The apparatus 100 comprises one or more memories 104 including computer program code 106.

[0015] The apparatus also comprises one or more processors 102 to execute the computer program code 106 to cause the apparatus 100 to perform the algorithm/method for analyzing the extent of the marine vessel 200.

[0016] The term 'processor' 102 refers to a device that is capable of processing data. Depending on the processing power needed, the apparatus 100 may comprise several processors 102 such as parallel processors, a multicore processor, or a computing environment that simultaneously utilizes resources from several physical computer units (sometimes these are referred as cloud, fog or virtualized computing environments). When designing the implementation of the processor 102, a person skilled in the art will consider the requirements set for the size and power consumption of the apparatus 100, the necessary processing capacity, production costs, and production volumes, for example.

[0017] The term 'memory' 104 refers to a device that is capable of storing data run-time (= working memory) or permanently (= non-volatile memory). The working memory and the non-volatile memory may be implemented by a random-access memory (RAM), dynamic RAM (DRAM), static RAM (SRAM), a flash memory, a solid state disk (SSD), PROM (programmable read-only memory), a suitable semiconductor, or any other means of implementing an electrical computer memory.

[0018] A non-exhaustive list of implementation techniques for the processor 102 and the memory 104 includes, but is not limited to: logic components, standard integrated circuits, application-specific integrated circuits (ASIC), system-on-a-chip (SoC), application-specific

standard products (ASSP), microprocessors, microcontrollers, digital signal processors, special-purpose computer chips, field-programmable gate arrays (FPGA), and other suitable electronics structures.

[0019] The computer program code 106 may be implemented by software. In an embodiment, the software may be written by a suitable programming language, and the resulting executable code may be stored in the memory 104 and executed by the processor 102.

[0020] An embodiment provides a computer-readable medium 120 storing the computer program code 106, which, when loaded into the one or more processors 102 and executed by one or more processors 102, causes the one or more processors 102 to perform the algorithm/method, which will be explained with reference to FIG. 13. The computer-readable medium 120 may comprise at least the following: any entity or device capable of carrying the computer program code 106 to the one or more processors 102, a record medium, a computer memory, a read-only memory, an electrical carrier signal, a telecommunications signal, and a software distribution medium. In some jurisdictions, depending on the legislation and the patent practice, the computer-readable medium 120 may not be the telecommunications signal.

In an embodiment, the computer-readable medium 120 may be a computer-readable storage medium. In an embodiment, the computer-readable medium 120 may be a non-transitory computer-readable storage medium.

[0021] The computer program code 106 implements the algorithm for analyzing the extent of the marine vessel 200. The computer program code 106 may be coded as a computer program (or software) using a programming language, which may be a high-level programming language, such as C, C++, or Java, or a low-level programming language, such as a machine language, or an assembler, for example. The computer program code 106 may be in source code form, object code form, executable file, or in some intermediate form. There are many ways to structure the computer program code 106: the operations may be divided into modules, sub-routines, methods, classes, objects, applets, macros, etc., depending on the software design methodology and the programming language used. In modern programming environments, there are software libraries, i.e. compilations of ready-made functions, which may be utilized by the computer program code 106 for performing a wide variety of standard operations. In addition, an operating system (such as a general-purpose operating system) may provide the computer program code 106 with system services.

[0022] In an embodiment, the one or more processors 102 may be implemented as one or more microprocessors implementing functions of a central processing unit (CPU) on an integrated circuit. The CPU is a logic machine executing the computer program code 106. The CPU may comprise a set of registers, an arithmetic logic unit (ALU), and a control unit (CU). The control unit is controlled by a sequence of the computer program code

106 transferred to the CPU from the (working) memory 104. The control unit may contain a number of microinstructions for basic operations. The implementation of the microinstructions may vary, depending on the CPU design.

[0023] The apparatus 100 may be a stand-alone apparatus 100 as shown in FIG. 1, i.e., the apparatus 100 is a separate unit, distinct from an AIS transceiver 130 and sensors 140. However, in an embodiment, at least a part of the structure of the apparatus 100 may be more or less integrated with another apparatus. In another embodiment, the apparatus 100 is a networked server apparatus accessible through a communication network 240. The networked server apparatus 100 may be a networked computer server, which interoperates with a plurality of marine vessels 230, 250, according to a client-server architecture, a cloud computing architecture, a peer-to-peer system, or another applicable computing architecture. The apparatus 100 may be associated with a service provider. The service provider may maintain electronic service provided by the apparatus 100. In the embodiment of FIG. 1, the apparatus 100 is onboard another marine vessel 230, but the apparatus 100 may also be onshore 220. A distributed embodiment is also feasible, wherein a part of the functionality of the apparatus 100 is onboard the other marine vessel 230 and a part of the functionality of the apparatus 100 is onshore 220 (as a standalone apparatus or a networked server apparatus).

[0024] The communication network 240 may be implemented with a suitable cellular communication technology such as GSM, GPRS, EGPRS, WCDMA, UMTS, 3GPP, IMT, LTE, LTE-A, 3G, 4G, 5G etc., and/or with a suitable non-cellular communication technology such as Bluetooth, Bluetooth Low Energy, Wi-Fi, WLAN, Zigbee, etc, and/or with a suitable wired communication technology such as Ethernet, the Internet, etc.

[0025] Let us now study the algorithm/method with reference to FIG. 13.

[0026] The method starts in 1300 and ends in 1336. Note that the method may run as long as required (after the start-up of the apparatus 100 until switching off) by looping from an operation 1310 (or 1312, or 1316, or 1318) back to an operation 1302.

[0027] The operations are not strictly in chronological order in FIG. 13, and some of the operations may be performed simultaneously or in an order differing from the given ones. Other functions may also be executed between the operations or within the operations and other data exchanged between the operations. Some of the operations or part of the operations may also be left out or replaced by a corresponding operation or part of the operation. It should be noted that no special order of operations is required, except where necessary due to the logical requirements for the processing order.

[0028] In 1302, the AIS data 112 transmitted by the marine vessel 200 is obtained.

[0029] In 1306, the complementary data 114 related to the marine vessel 200 is obtained in addition to the

AIS data 112. In general, the complementary data 114 may be any data, besides the AIS data 112, which indicates the extent of the marine vessel 200.

[0030] In an embodiment illustrated in FIG. 2, the complementary data 114 comprises sensor data indicating an actual extent of the marine vessel 200 obtained from one or more sensors 140, 140A, 140B.

[0031] The sensors 140, 140A, 140B may utilize various technologies of the seafaring, including, but not limited to: a radar system (using radio waves to determine a range, angle, or velocity of an object, operating in various radio frequency ranges, such as a coastal marine system, a marine radar system, a short range radar, or a long range radar, for example), a lidar system (measuring distance to an object by illuminating the object with a pulsed laser light, and measuring the reflected pulses with a sensor), a sonar system (such as a passive sonar listening for the sound made by marine vessels, or an active sonar emitting pulses of sounds and listening for echoes), an ultrasound detection system, an acoustic detection system, a digital imaging sensor (such as a video camera, a near infrared camera, an infrared camera, a forward looking infrared camera, or a hyperspectral camera, for example), or another technology enabling an estimation or measurement of the extent of the marine vessel 200.

[0032] In an embodiment illustrated also in FIG. 9A, and FIG. 9B, the one or more sensors 140A are onboard one or more other marine vessels 230. A part 900 of the marine vessel 200 may be detected by the onboard sensor 140A in FIG. 9A, and after that the uncertainty 118 is considerably reduced as shown in FIG. 9B.

[0033] In an embodiment illustrated also in FIG. 11A and FIG. 11B, the one or more sensors 140B are onshore 220. A part 1100 of the marine vessel 200 may be detected by the onshore sensor 140B in FIG. 11A, and after that the uncertainty 118 is considerably reduced as shown in FIG. 11B. Besides being placed onboard and offshore, the one or more sensors 140C may be placed offshore on a suitable platform 1100 such as on a buoy or another navigation mark, as shown in FIG. 11B.

[0034] In 1310, the AIS data 112 is evaluated in view of the complementary data 114 in order to generate correction data 116 related to the extent of the marine vessel 200. In an embodiment, the extent of the marine vessel 200 defines the space occupied by the marine vessel 200. In an embodiment, the extent may be defined by the outline of the marine vessel, or the overall dimensions such as the length and width of the marine vessel 200.

[0035] In this way, the complementary data 114 is used to decrease the uncertainty of the AIS data 112 or to verify the accuracy of the AIS data 112. Depending on the accuracy of the complementary data 114, the uncertainty may be decreased dramatically and stored in a database for future use. For an autonomous operation, any manoeuvre should be based on the worst-case scenario. A large uncertainty in the position of the other ship 200 means that the planned path will be longer, and in a

tight manoeuvring space such as a harbour, it may not even be possible to find a feasible path. Use of the correction data 116 makes autonomous planning feasible and the planned paths may be made shorter with the use of the correction data 116.

[0036] In an embodiment, generating the correction data 116 comprises determining 1320 a correction, which transfers an AIS-based extent of the marine vessel 200 based on the AIS data 112 to overlap with an estimated extent of the marine vessel 200 based on the complementary data 114. In this way, the outline of the marine vessel 200 defined by the AIS data 112 overlaps with the outline of the marine vessel 200 defined by the complementary data 114.

[0037] In an embodiment, generating the correction data 116 comprises estimating 1322 a length and/or a width of the marine vessel 200 based on the extent of the marine vessel 200 in the complementary data 114, and determining 1324 a correction for the user-inputted overall dimensions of the marine vessel 200 in the static part of the AIS data 112 based on the estimated length and/or the width of the marine vessel 200. As the user-inputted overall dimensions of the marine vessel 200 are entered manually, they may contain errors.

[0038] In an embodiment, generating the correction data 116 comprises determining 1326 a correction for the user-inputted reference 210 for the position of the marine vessel 200 in the static part of the AIS data 112 based on the information related to the extent of the marine vessel 200 in the complementary data 114. FIG. 5 illustrates that the manually entered reference 210 for the position may be erroneous, causing that the extent 500, 502, 504, 506, 508 of the marine vessel 200 may vary considerably, causing an uncertainty 118 related to the extent of the marine vessel 200. FIG. 6 illustrates that if there is additionally some error in the heading of the marine vessel 200, the uncertainty 118 may become even bigger. FIG. 7 illustrates an extreme case: if the heading of the marine vessel 200 cannot be trusted at all, the uncertainty 118 is the biggest. Theoretically, the uncertainty 118 may be depicted by the circle with the "maximum radius", i.e., the greatest diagonal 400 of the marine vessel 200.

[0039] In an embodiment, generating the correction data 116 comprises estimating 1332 an estimated true heading and/or an estimated course over ground of the marine vessel 200 based on the complementary data 114, and generating the correction data 116 is based on a comparison 1334 between the estimated true heading and an AIS-based true heading in a dynamic part of the AIS data 112, and/or based on a comparison 1334 between the estimated course over ground and an AIS-based course over ground in the dynamic part of the AIS data 112. In this way, the possible error in the heading of the AIS data 112 may also be decreased.

[0040] FIG. 8 illustrates the problem related to the uncertainty: the other marine vessel 800 proceeds along the route 802 towards the port of Helsinki. Two marine

vessels 200A, 200B lie at anchor, and, due to their uncertainty 118A, 118B, it is difficult for the mariner of the other marine vessel 800 to plan how to dock. For example, it is impossible to know on which side to pass 804, 806 islands 808.

[0041] In an embodiment, evaluating 1310 the AIS data 112 in view of the complementary data 114 takes 1328 into account a longitude and a latitude of the marine vessel 200 in a dynamic part of the AIS data 112 as compared to an estimated location based on the complementary data 114. This may be useful, especially if the complementary data 114 contains an estimated position of the marine vessel 200.

[0042] In an embodiment, the AIS data 112 and the complementary data 114 are synchronized 1308 to relate to the same moment in time. In this way, the quality of the correction data 116 may be ensured and/or increased. Especially, the longitude and latitude of the marine vessel 200 in the dynamic part of the AIS data 112 and the complementary data 114 used for estimating the estimated location may be synchronized to relate to the same moment in time.

[0043] In an embodiment, generating the correction data 116 comprises estimating 1330 an uncertainty 118 related to the extent of the marine vessel 200. The uncertainty 118 may be expressed by suitable means, such as by a certain range, a certain ratio, a certain safety margin, etc.

[0044] In an embodiment, the apparatus 100 is further caused to determine 1304 a location of the marine vessel 200 based on a longitude and a latitude of the marine vessel 200 in a dynamic part of the AIS data 112, and determine 1312 an uncertainty area 118 around the location of the marine vessel 200 based on the correction data 116. The uncertainty area 118 may be a rectangle as shown in FIG. 5 and FIG. 6, or a circle as shown in FIG. 7.

[0045] In an embodiment, the complementary data 114 comprises data indicating unnavigable waters or shore, and determining 1312 the uncertainty area 118 comprises removing 1314 such portions from the uncertainty area 118, which are geographically located in the unnavigable waters or shore in the determined location of the marine vessel 200. This is illustrated in FIG. 10A and FIG. 10B: as the marine vessel 200 is in the vicinity of the shore 220, a portion 1000 of the shore 220 may be removed from the uncertainty area 118 as shown in FIG. 10B. Another embodiment is illustrated in FIG. 12A and FIG. 12B: as the marine vessel 200 is in a strait surrounded by shore 220A, 220B, portions 1000A, 1000B of the shore 220A, 220B may be removed from the uncertainty area 118 as shown in FIG. 12B. The information related to the unnavigable waters or shore may be obtained from sea chart data, for example.

[0046] In an embodiment illustrated in FIG. 2, the apparatus 100 is further caused to store 1316 the correction data 116, and offer 1318 the correction data for 116 use by a plurality of other marine vessels 250, marine oper-

ators and onshore users. FIG. 2 illustrates also various other embodiments. One or more sensors 140B are onshore 220, and one or more sensors 140A are onboard the other marine vessel 230. The apparatus 100 may be onboard the same other marine vessel 230 that also carries the one or more sensors 140A, but they may also be onboard different marine vessels. The sea chart data and other relevant complementary data 114C may be obtained from an onboard database 142A, or from 114D a database 142B accessible through the communication network 240. The AIS data 112A may be communicated from the marine vessel 200 to the other marine vessel 130 using AIS transceivers 208, 130. An AIS server 132 may also distribute the AIS data 112B obtained by a satellite network from the marine vessel 200. The correction data 116A may be offered by a networked correction server 242, and the correction data 116B may be obtained by a client marine vessel 250 with an appropriate correction client 254. The networked correction server 242 may be integrated with an onshore apparatus 100, or even with an onboard apparatus 100, depending on the implementation. The client marine vessel 250 may also comprise an AIS transceiver 252 to receive the AIS data 112 transmitted by the marine vessel 200, or the AIS data may also be obtained from the AIS server 132. The client marine vessel 250 may also store the correction data 116 for future use.

[0047] Even though the invention has been described with reference to one or more embodiments according to the accompanying drawings, it is clear that the invention is not restricted thereto but can be modified in several ways within the scope of the appended claims. All words and expressions should be interpreted broadly, and they are intended to illustrate, not to restrict, the embodiments. It will be obvious to a person skilled in the art that, as technology advances, the inventive concept can be implemented in various ways.

Claims

1. An apparatus (100) for analyzing an extent of a marine vessel, comprising:

one or more processors (102); and
 one or more memories (104) including computer program code (106),
 the one or more memories (104) and the computer program code (106) are configured to, with the one or more processors (102), cause the apparatus (100) at least to perform:

obtaining (1302) automatic identification system (AIS) data (112) transmitted by a marine vessel (200), the AIS data (112) comprising in a static part of the AIS data user-inputted overall dimensions of the marine vessel (200) and a user-inputted refer-

ence (210) for a position of the marine vessel (200);

obtaining (1306), in addition to the AIS data (112), complementary data (114) related to the marine vessel (200), the complementary data (114) comprising information related to an extent of the marine vessel (200); and
 evaluating (1310) the AIS data (112) in view of the complementary data (114) in order to generate correction data (116) related to the extent of the marine vessel (200).

2. The apparatus of claim 1, wherein generating the correction data (116) comprises determining (1320) a correction, which transfers an AIS-based extent of the marine vessel (200) based on the AIS data (112) to overlap with an estimated extent of the marine vessel (200) based on the complementary data (114).
3. The apparatus of any preceding claim, wherein generating the correction data (116) comprises estimating (1322) a length and/or a width of the marine vessel (200) based on the extent of the marine vessel (200) in the complimentary data (114), and determining (1324) a correction for the user-inputted overall dimensions of the marine vessel (200) in the static part of the AIS data (112) based on the estimated length and/or the width of the marine vessel (200).
4. The apparatus of any preceding claim, wherein generating the correction data (116) comprises determining (1326) a correction for the user-inputted reference (210) for the position of the marine vessel (200) in the static part of the AIS data (112) based on the information related to the extent of the marine vessel (200) in the complementary data (114).
5. The apparatus of any preceding claim, wherein evaluating (1310) the AIS data (112) in view of the complementary data (114) takes (1328) into account a longitude and a latitude of the marine vessel (200) in a dynamic part of the AIS data (112) as compared to an estimated location based on the complementary data (114).
6. The apparatus of any preceding claim, wherein the AIS data (112) and the complementary data (114) are synchronized (1308) to relate to the same moment in time.
7. The apparatus of any preceding claim, wherein generating the correction data (116) comprises estimating (1330) an uncertainty (118) related to the extent of the marine vessel (200).
8. The apparatus of any preceding claim, wherein the apparatus (100) is further caused to:

- determining (1304) a location of the marine vessel (200) based on a longitude and a latitude of the marine vessel (200) in a dynamic part of the AIS data (112); and
determining (1312) an uncertainty area (118) around the location of the marine vessel (200) based on the correction data (116). 5
9. The apparatus of claim 8, wherein the complementary data (114) comprises data indicating unnavigable waters or shore, and determining (1312) the uncertainty area (118) comprises removing (1314) such portions from the uncertainty area (118), which are geographically located in the unnavigable waters or shore in the determined location of the marine vessel (200). 10 15
10. The apparatus of any preceding claim, wherein generating the correction data (116) comprises estimating (1332) an estimated true heading and/or an estimated course over ground of the marine vessel (200) based on the complimentary data (114), and generating the correction data (116) is based on a comparison (1334) between the estimated true heading and an AIS-based true heading in a dynamic part of the AIS data (112), and/or based on a comparison (1334) between the estimated course over ground and an AIS-based course over ground in the dynamic part of the AIS data (112). 20 25 30
11. The apparatus of any preceding claim, wherein the complementary data (114) comprises sensor data indicating an actual extent of the marine vessel (200) obtained from one or more sensors (140). 35
12. The apparatus of claim 11, wherein the one or more sensors (140A) are onboard one or more other marine vessels (230). 40
13. The apparatus of claim 11 or 12, wherein the one or more sensors (140B) are onshore (220) and/or on an offshore platform (1100). 45
14. The apparatus of any preceding claim, wherein the apparatus (100) is further caused to:
storing (1316) the correction data (116); and
offering (1318) the correction data (116) for use by a plurality of other marine vessels (250), marine operators and onshore users. 50
15. A method for analyzing an extent of a marine vessel, comprising:
obtaining (1302) automatic identification system (AIS) data transmitted by a marine vessel, the AIS data comprising in a static part of the AIS data user-inputted overall dimensions of the ma-

rine vessel and a user-inputted reference for a position of the marine vessel;
obtaining (1306), in addition to the AIS data, complementary data related to the marine vessel, the complementary data comprising information related to an extent of the marine vessel; and
evaluating (1310) the AIS data in view of the complementary data in order to generate correction data related to the extent of the marine vessel.

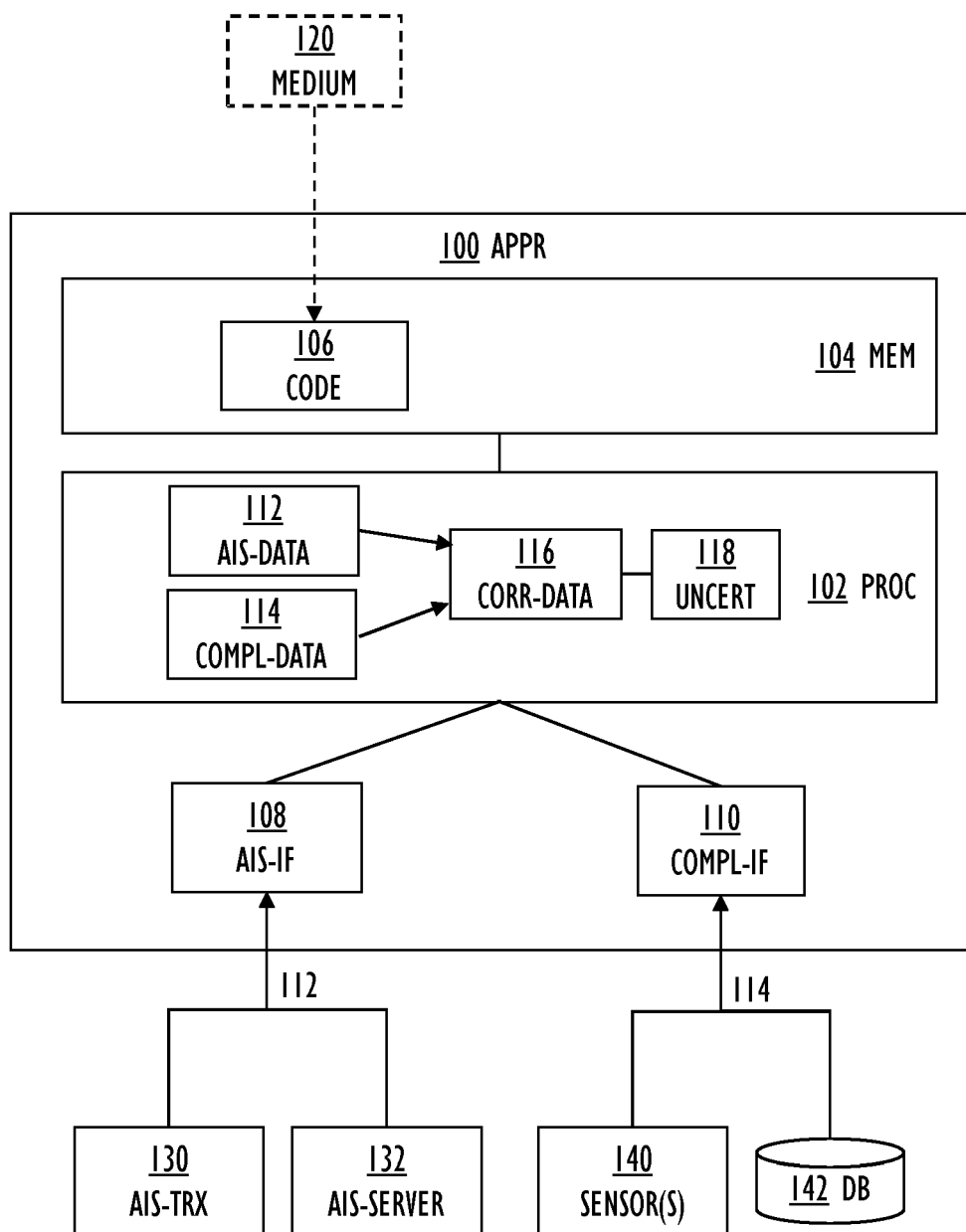


FIG. 1

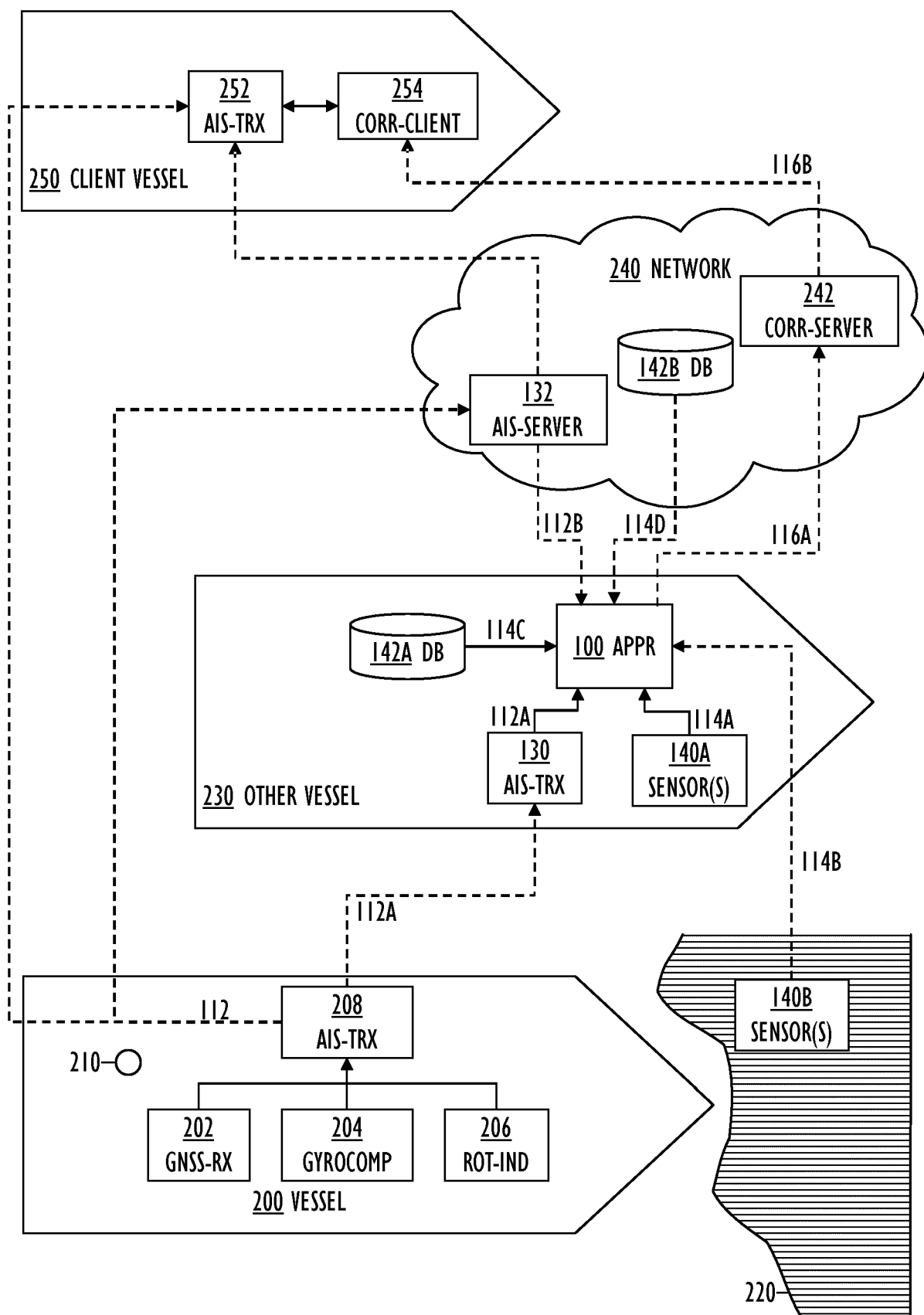


FIG. 2

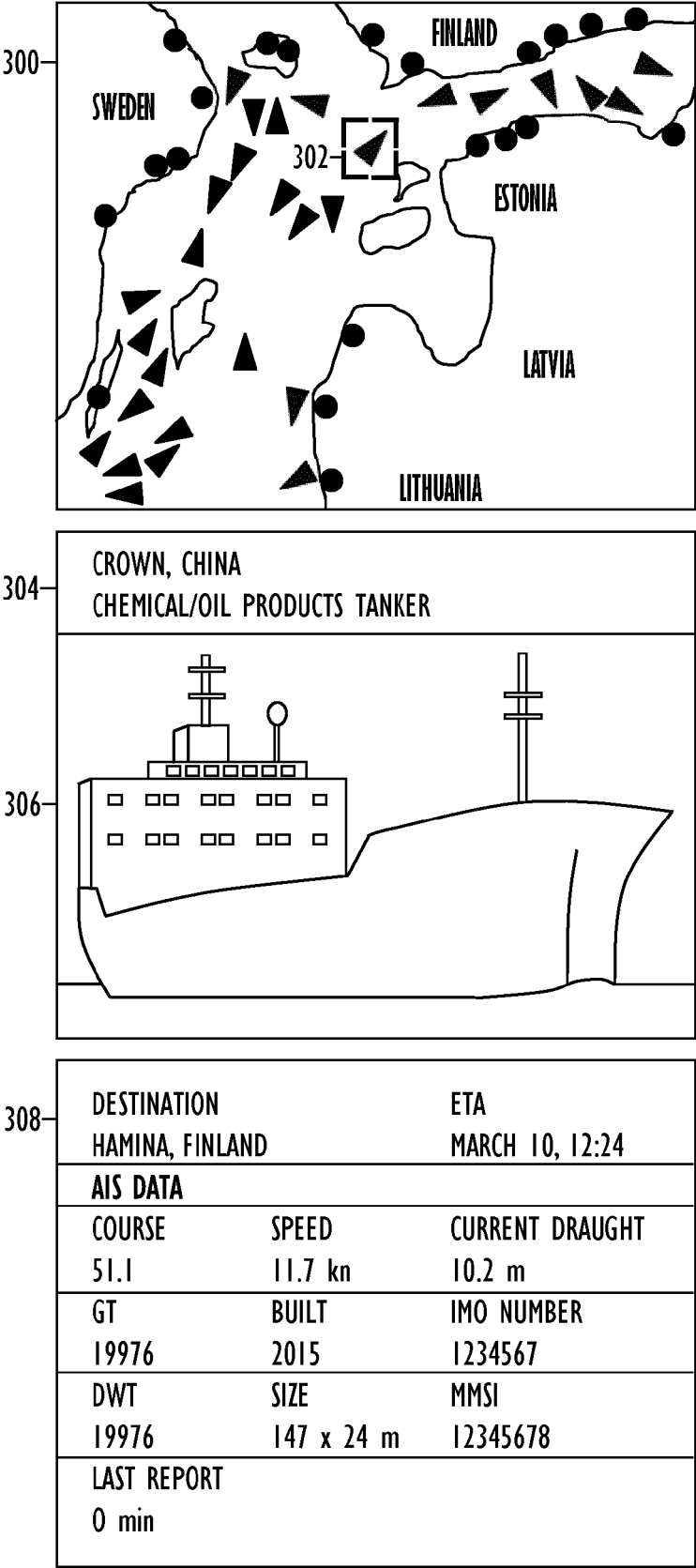


FIG. 3

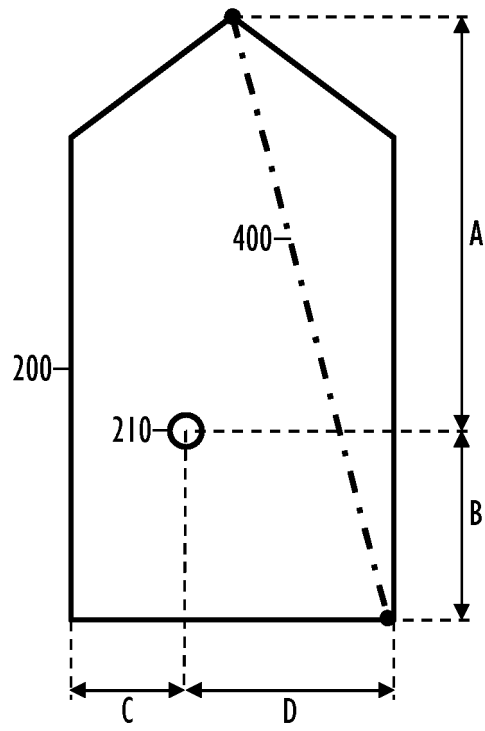


FIG. 4

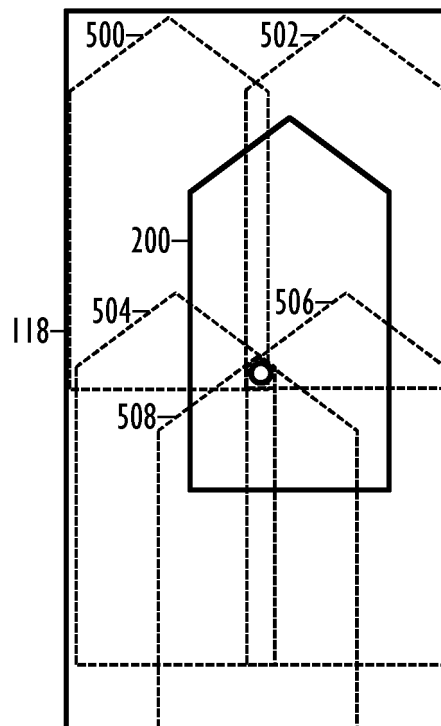


FIG. 5

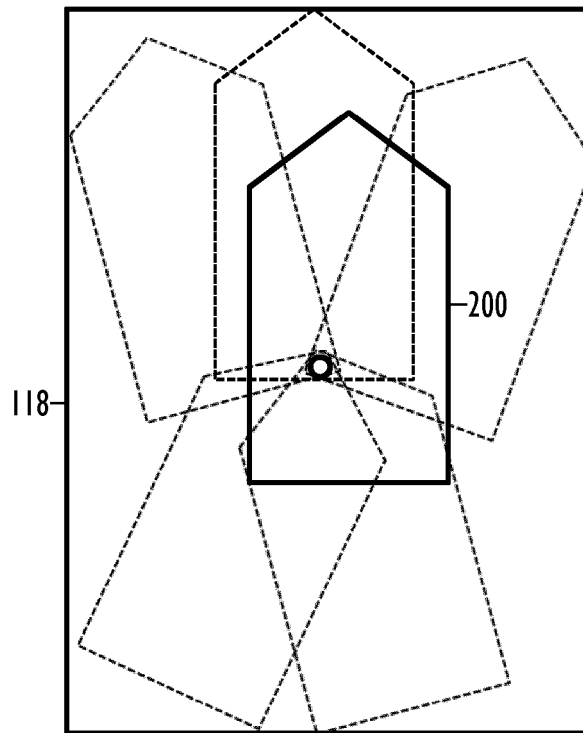


FIG. 6

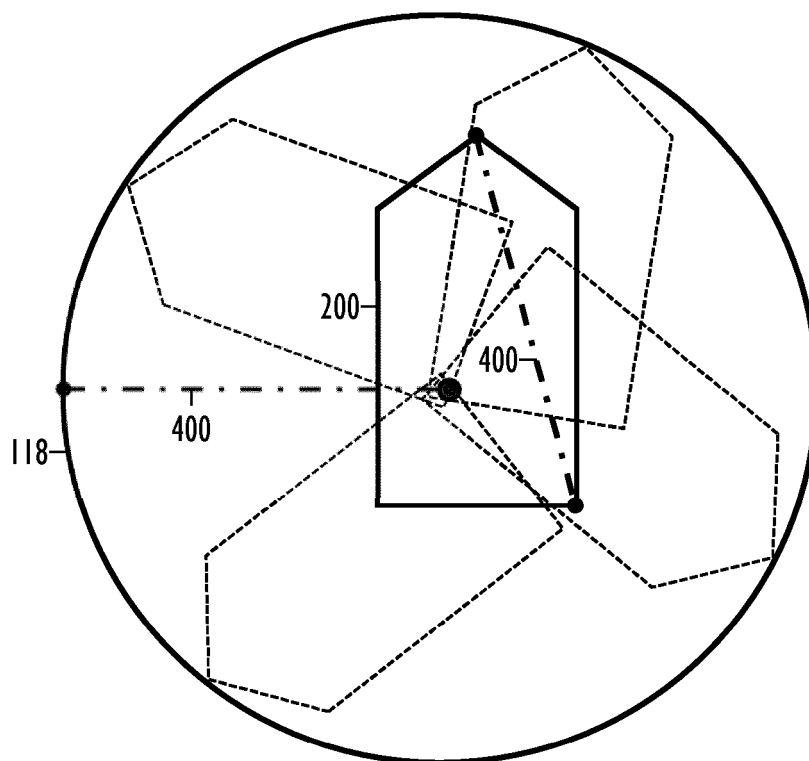


FIG. 7

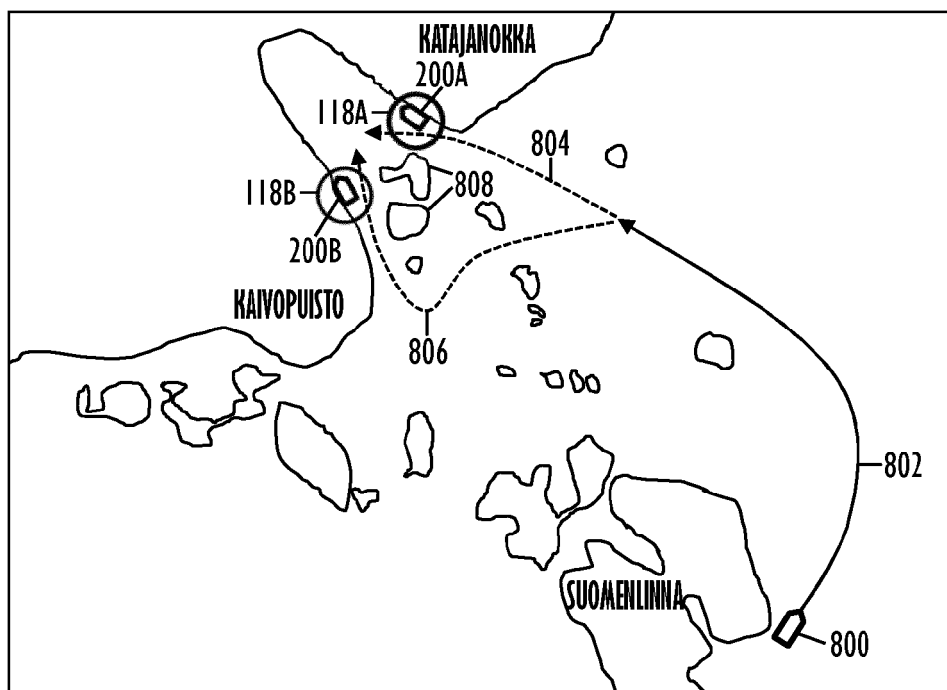


FIG. 8

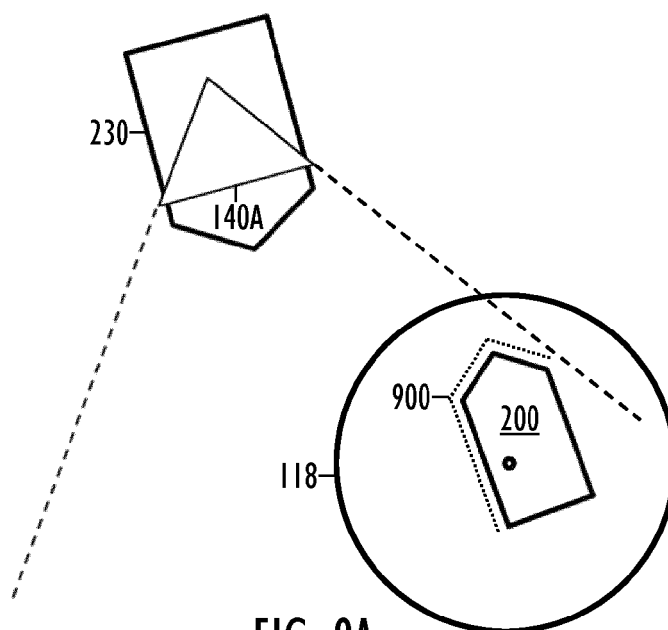


FIG. 9A

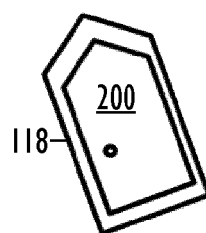


FIG. 9B

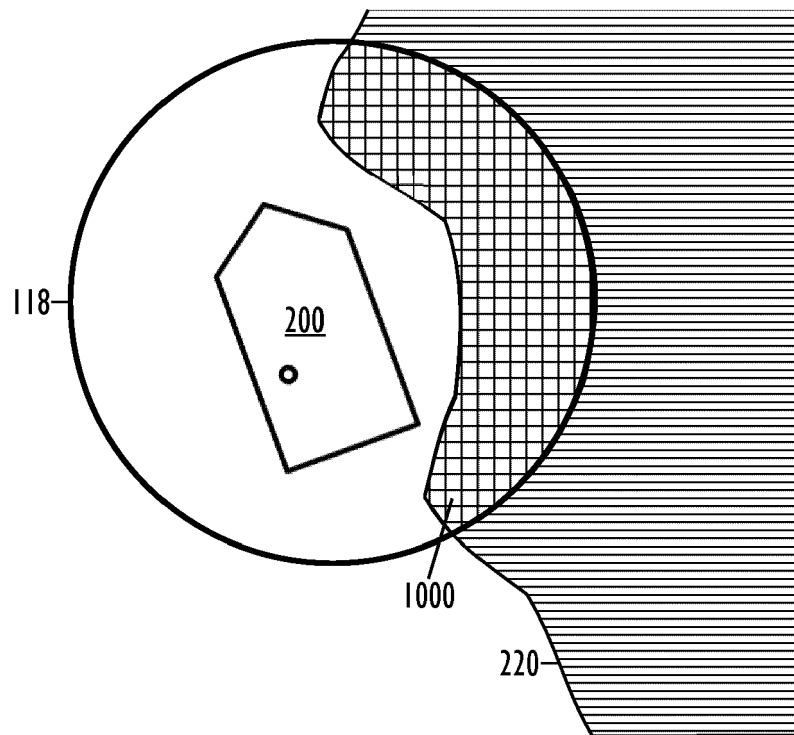


FIG. 10A

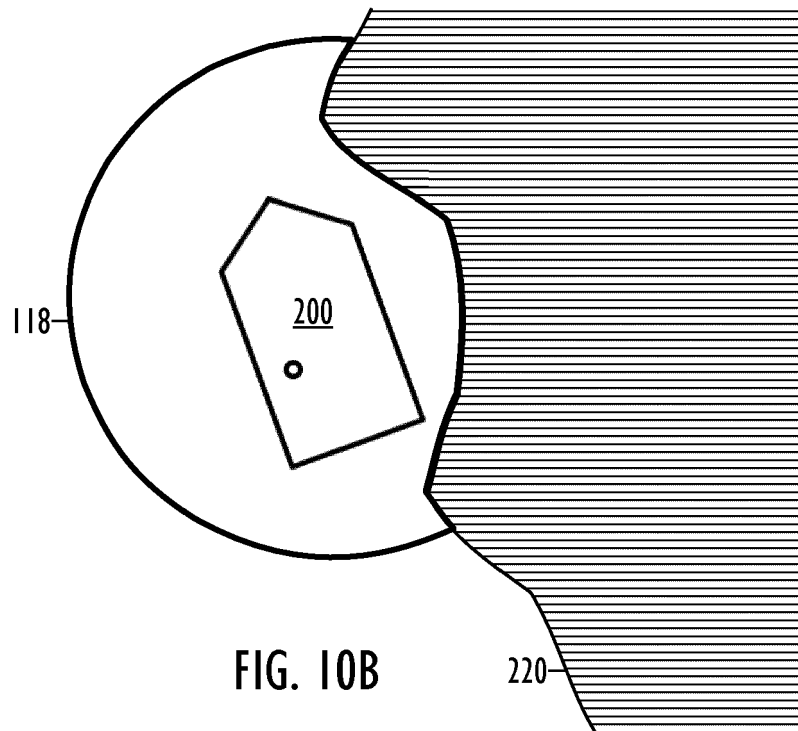


FIG. 10B

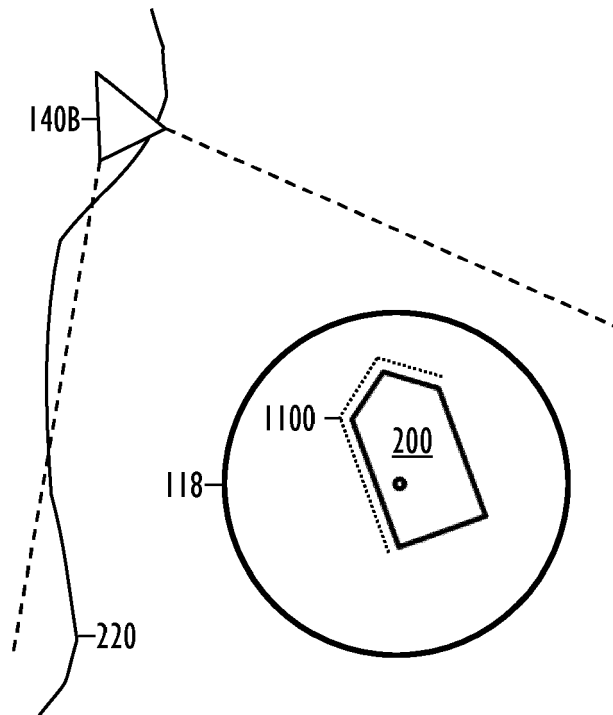


FIG. 11A

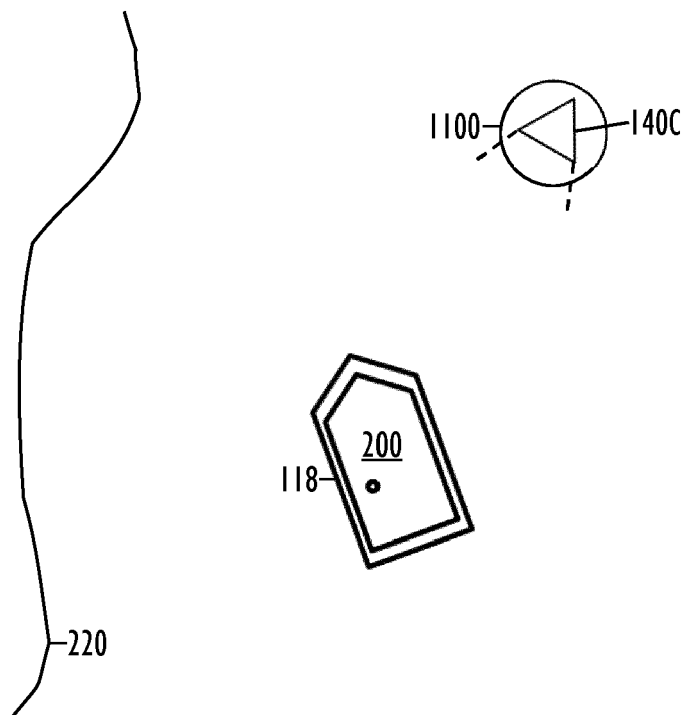


FIG. 11B

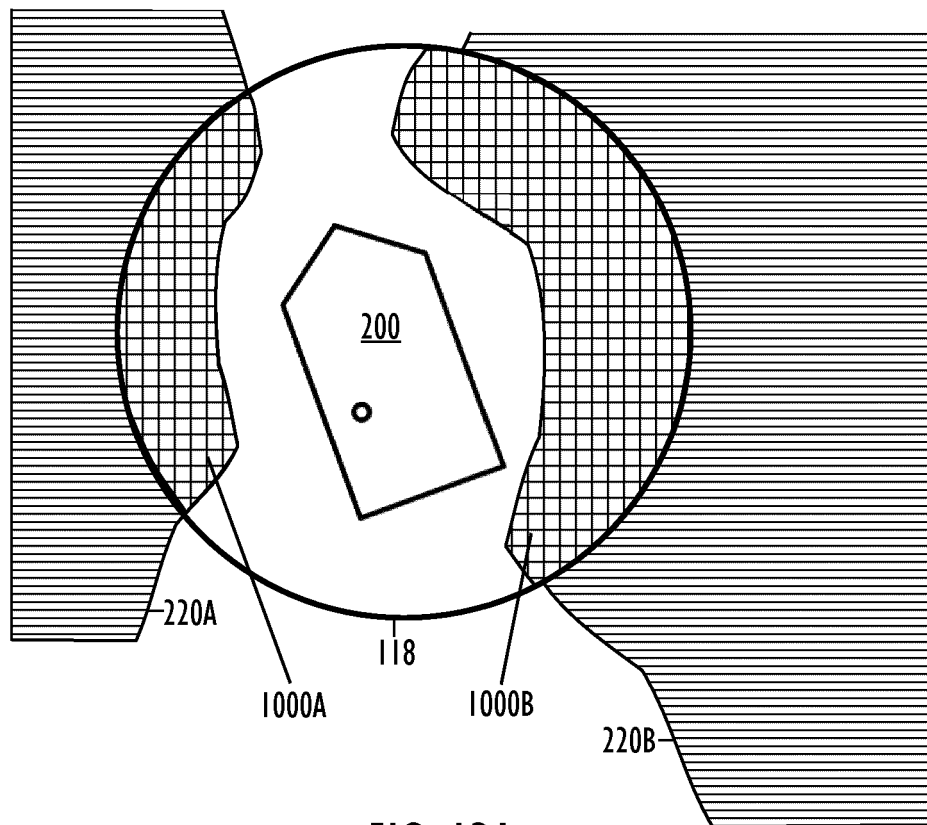


FIG. 12A

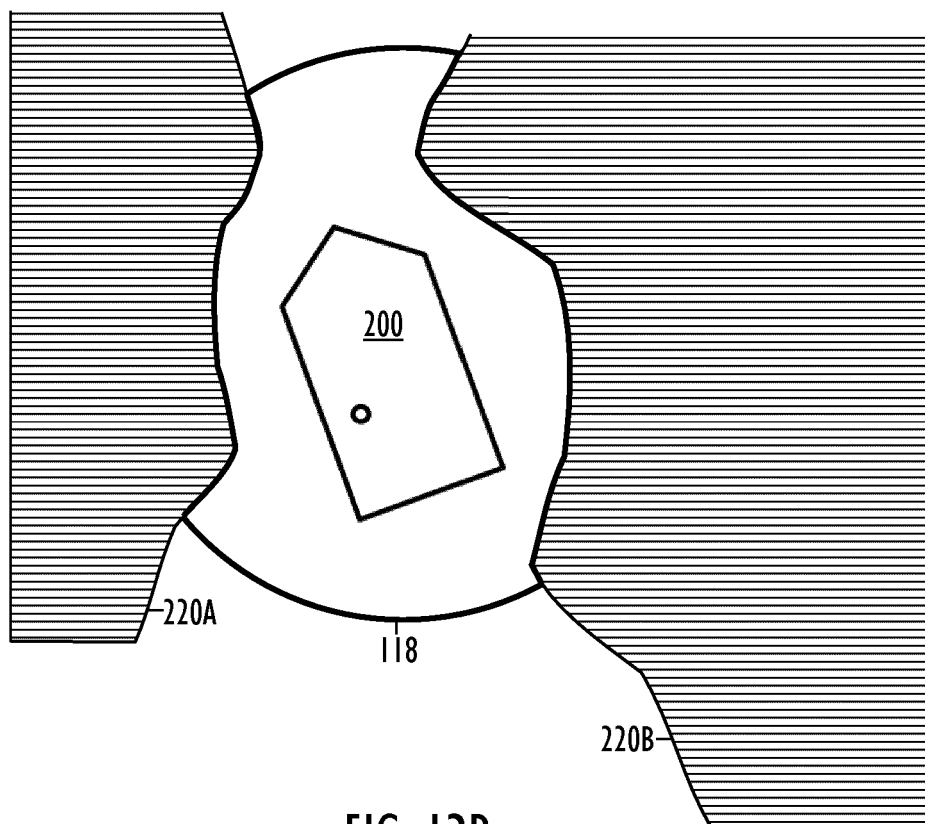


FIG. 12B

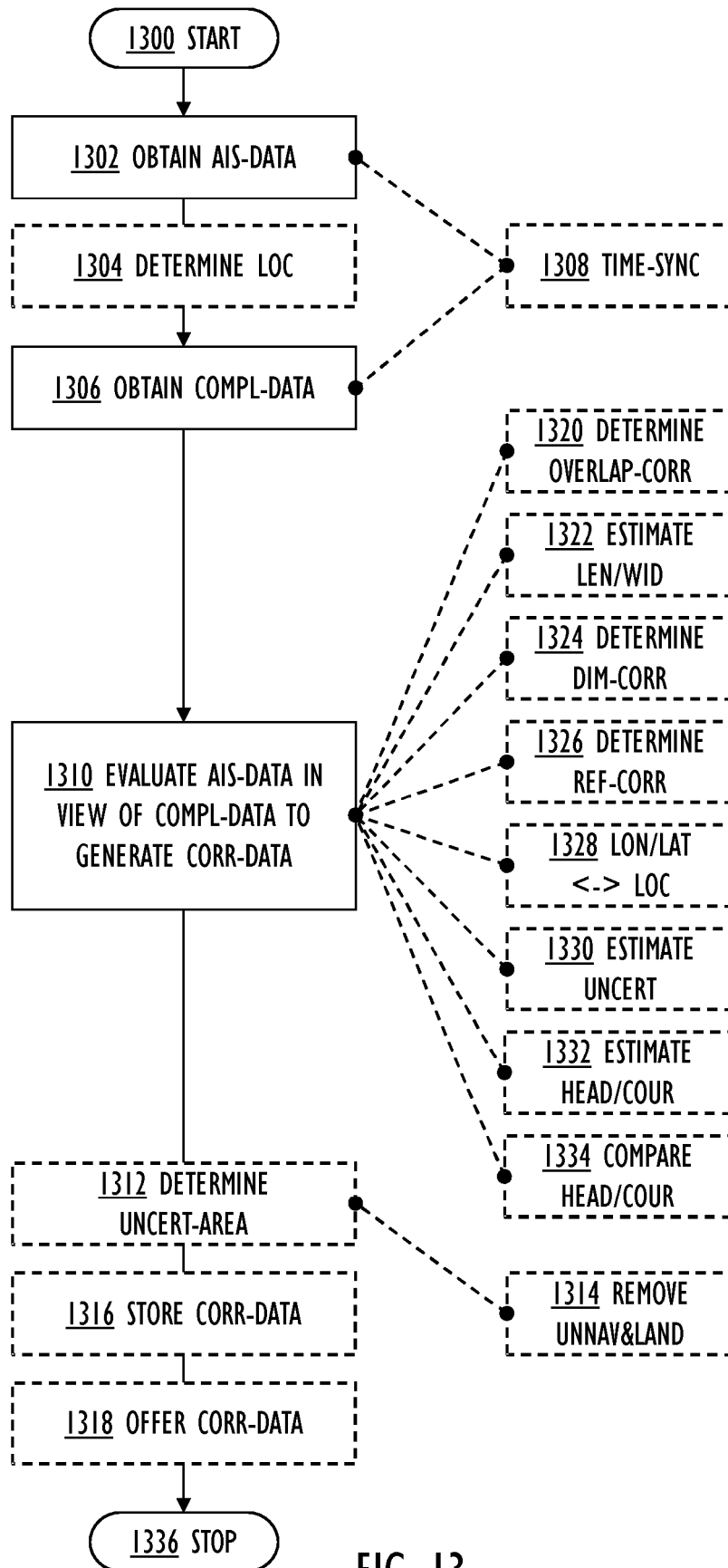


FIG. 13



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X	WO 2008/099646 A1 (MITSUI SHIPBUILDING ENG [JP]; YAMAMOTO TOSHIKI [JP] ET AL.) 21 August 2008 (2008-08-21) * paragraph [0070] - paragraph [0072] *	1-15	
X	CHENG LIANG ET AL: "Using big data to track marine oil transportation along the 21st-century Maritime Silk Road", SCIENCE CHINA TECHNOLOGICAL SCIENCES, SCIENCE CHINA PRESS, HEIDELBERG, vol. 62, no. 4, 10 December 2018 (2018-12-10), pages 677-686, XP036750988, ISSN: 1674-7321, DOI: 10.1007/S11431-018-9335-1 [retrieved on 2018-12-10] *parts 4.1, 5.1.1*	1-15	TECHNICAL FIELDS SEARCHED (IPC) G08G
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Place of search The Hague		Date of completion of the search 28 September 2020	Examiner Nanos, Alexander
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