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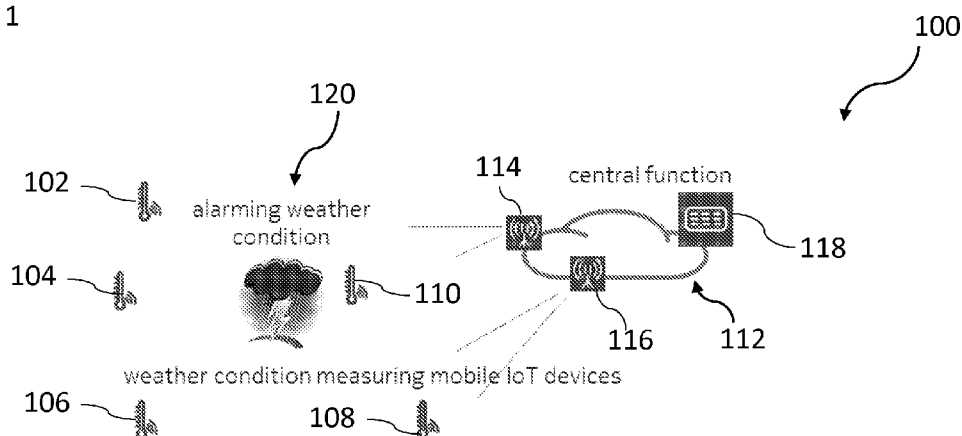
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(54) Title: APPARATUS, METHOD AND COMPUTER PROGRAM FOR DETERMINING ENVIRONMENTAL CONDITIONS

Figure 1



(57) Abstract: An apparatus (118) comprising at least one processor, and at least one memory including computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to: receive information from a first device (102, 104, 106, 108, 110), the information indicative of an environmental condition (120) at a location of the first device; in response to receiving the information from the first device, send a request for environmental condition information to one or more devices (102, 104, 106, 108, 110); and process environmental condition information received in response to the request; and generate an output based on the processed information.

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APPARATUS, METHOD AND COMPUTER PROGRAM FOR DETERMINING ENVIRONMENTAL CONDITIONS

Field of invention

5 The present application relates to apparatus, methods and computer programs for determining environmental conditions, such as the weather.

Background

10 It is known to use suitable apparatus to measure environmental conditions such as wind speed, temperature, rainfall etc. in order to record and/or predict weather conditions. Such predictions may be presented in the format of a weather forecast, for example. In known systems, weather data collection and analysis systems forecast disasters based on a relatively thin grid of measurement points.

15 Summary

 In a first aspect there is provided: an apparatus comprising at least one processor, and at least one memory including computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to: receive information from a first device, the information indicative of an environmental condition at a
20 location of the first device; in response to receiving the information from the first device, send a request for environmental condition information to one or more devices; and process environmental condition information received in response to the request; and generate an output based on the processed information.

 In a second aspect there is provided an apparatus comprising: means for receiving
25 information from a first device, the information indicative of an environmental condition at a location of the first device; in response to receiving the information from the first device, means for sending a request for environmental condition information to one or more devices; and means for processing environmental condition information received in response to the request; and means for generating an output based on the processed information.

30 According to some embodiments, the apparatus stores location information of the one or more devices.

According to some embodiments, the apparatus is configured to determine a group comprising the one or more devices.

5 According to some embodiments, the apparatus is configured to determine the group based upon a distance of the one or more devices from the first device.

According to some embodiments, the distance comprises a radius.

According to some embodiments, the request comprises a request for environmental condition information for a specified timeframe.

10 According to some embodiments, the specified timeframe comprises a pre-determined time before and/or after the information is received from the first device.

According to some embodiments, the environmental condition information comprises weather information.

According to some embodiments, the environmental condition information comprises information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

15 According to some embodiments, the information received from the first device comprises an alarm status.

According to some embodiments, the output comprises information of a type of environmental condition.

20 According to some embodiments the type of environmental condition comprises one or more of: rain; flood; tsunami; heatwave; fire; snow; avalanche; high winds.

According to some embodiments, the output comprises a visualization of the environmental conditions, the apparatus configured to cause the visualization to be displayed on a display.

25 According to some embodiments, the output comprises directional information of the environmental condition.

According to some embodiments, the directional information comprises a direction of travel of the environmental condition.

According to some embodiments, the visualization is overlaid on a map.

30 According to some embodiments, the apparatus is configured to contact emergency services in response to determination of an emergency environmental condition.

According to some embodiments, the one or more devices comprises at least one cellular internet-of-things device.

5 According to some embodiments, the one or more devices comprise at least one user equipment.

The one or more devices comprise at least one cellular internet-of-things device.

According to some embodiments the one or more devices comprise at least one user equipment.

According to some embodiments the one or more devices comprises the first device.

10 In a third aspect there is provided an apparatus comprising: at least one sensor; at least one processor; and at least one memory including computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to: monitor one or more environmental conditions using the at least one sensor; in response to determining a trigger condition; send information to a second apparatus, the
15 information indicative of an environmental condition at a location of the apparatus.

In a fourth aspect there is provided an apparatus comprising: sensing means for monitoring one or more environmental conditions; in response to determining a trigger condition; sending means for sending information to a second apparatus, the information indicative of an environmental condition at a location of the apparatus.

20 According to some embodiments, the trigger condition comprises a threshold value of the monitored one or more environmental conditions.

According to some embodiments, the apparatus is configured to receive a request from the second apparatus for environmental condition information for a specified timeframe.

25 According to some embodiments, the environmental condition information comprises weather information.

According to some embodiments, the environmental condition information comprises information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

30 According to some embodiments the at least one sensor comprises one or more of: a temperature sensor; a pressure sensor; a humidity sensor; a wind speed sensor; a rain sensor; a snow sensor; a water level sensor.

According to some embodiments, the information sent to the second apparatus comprises an alarm status.

According to some embodiments, the apparatus comprises a cellular internet of things device.

5 According to some embodiments the apparatus comprises a user equipment.

In a fifth aspect there is provided a method comprising: receiving information from a first device, the information indicative of an environmental condition at a location of the first device; in response to receiving the information from the first device, sending a request for environmental condition information to one or more devices; and processing environmental
10 condition information received in response to the request; and generating an output based on the processed information.

According to some embodiments, the method comprises storing location information of the one or more devices.

15 According to some embodiments, the method comprises determining a group comprising the one or more devices.

According to some embodiments, the determining a group based upon a distance of the one or more devices from the first device.

According to some embodiments, the distance comprises a radius.

20 According to some embodiments, the request comprises a request for environmental condition information for a specified timeframe.

According to some embodiments, the specified timeframe comprises a pre-determined time before and/or after the information is received from the first device.

According to some embodiments, the environmental condition information comprises weather information.

25 According to some embodiments, the environmental condition information comprises information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

According to some embodiments, the information received from the first device comprises an alarm status.

30 According to some embodiments, the output comprises information of a type of environmental condition.

According to some embodiments the type of environmental condition comprises one or more of: rain; flood; tsunami; heatwave; fire; snow; avalanche; high winds.

5 According to some embodiments, the output comprises a visualization of the environmental conditions, the method comprising causing the visualization to be displayed on a display.

According to some embodiments, the output comprising directional information of the environmental condition.

10 According to some embodiments, the directional information comprises a direction of travel of the environmental condition.

According to some embodiments, the visualization is overlaid on a map.

According to some embodiments, the method comprises contacting emergency services in response to determination of an emergency environmental condition.

15 According to some embodiments, the one or more devices comprises at least one cellular internet-of-things device.

According to some embodiments, the one or more devices comprise at least one user equipment.

According to some embodiments, the one or more devices comprise at least one cellular internet-of-things device.

20 According to some embodiments the one or more devices comprise at least one user equipment.

According to some embodiments the one or more devices comprises the first device.

25 In a sixth aspect there is provided a computer program comprising program code means adapted to perform the steps of the fifth aspect when the program is run on a data processing apparatus.

In a seventh aspect there is provided a method comprising: monitoring one or more environmental conditions using at least one sensor of an apparatus; in response to determining a trigger condition; sending information to a second apparatus, the information indicative of an environmental condition at a location of the apparatus.

According to some embodiments, the trigger condition comprising a threshold value of the monitored one or more environmental conditions.

According to some embodiments, the method comprises receiving a request from the second apparatus for environmental condition information for a specified timeframe.

5 According to some embodiments, the environmental condition information comprises weather information.

According to some embodiments, the environmental condition information comprises information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

10 According to some embodiments the at least one sensor comprises one or more of: a temperature sensor; a pressure sensor; a humidity sensor; a wind speed sensor; a rain sensor; a snow sensor; a water level sensor.

According to some embodiments, the information sent to the second apparatus comprises an alarm status.

15 According to some embodiments, the apparatus comprises a cellular internet of things device.

According to some embodiments the apparatus comprises a user equipment.

In an eighth aspect there is provided a computer program comprising program code means adapted to perform the steps of the seventh aspect when the program is run on a data processing apparatus.

20

Brief description of drawings

To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

25 Figure 1 schematically shows an example of a system for recording environmental conditions;

Figure 2 schematically shows an example of an apparatus for recording one or more environmental conditions;

Figure 3 schematically shows a central function apparatus;

30 Figure 4A schematically shows grouping of apparatus according to an example;

Figure 4B schematically shows grouping of apparatus according to another example;

Figure 5 schematically shows a look-up table according to an example;

Figure 6 schematically shows a signalling diagram according to an example;

Figure 7 schematically shows weather condition visualisation according to an example;

5 Figure 8 schematically shows a flow chart according to an example;

Figure 9 schematically shows a flow chart according to an example.

Detailed description

10 The examples disclosed in this application are applicable to apparatus, methods and computer programs for recording and/or predicting environmental conditions at one or more locations. An environmental condition may for example be a weather condition.

Figure 1 shows an exemplary system 100. A plurality of recording devices 102, 104, 106, 108 and 110 are provided at respective locations. In some examples one or more of these apparatus or devices 102 to 110 comprises a cellular internet of things (cellular – IoT) device. According to some examples one or more of the devices 102 to 110 comprises a user equipment such as a smartphone or tablet. Whatever the type, each device is capable of recording information of at least one environmental condition, and can wirelessly communicate information indicative of the at least one environmental condition to network apparatus, for example base stations 114 and 116. Base stations 114 and 116 are in communication with a central function 118, which can record, store and process received environmental condition information, as will be explained in more detail below.

In the example of Figure 1 the central function 118 is in communication with the devices 102 to 110 via internet or cloud connection 112, and via base stations 114 and 116.

25 In Figure 1 an environmental condition, in this case a weather condition, is schematically shown at 120. In this example the weather condition is a thunderstorm. One or more of the devices 102 to 110 can record information pertaining to or indicative of this weather condition, such as air pressure, rainfall etc. and pass this information on to the central function 118, enabling the central function 118 to make one or more determinations and/or recommendations regarding the weather condition 120.

30 Figure 2 shows an example device 202. One or more of the devices 102 to 110 shown in Figure 1 may be structured as per the example of Figure 2. The device 202 comprises a memory 204 and a processor 206. The device 202 also comprises at least one sensor. By way of example only the device 202 comprises a temperature sensor 208, a pressure sensor

210, a humidity sensor 212, a wind speed sensor 214, a rain sensor 216, a snow sensor 218, and a water level sensor 220. Of course, in other examples any particular device may comprise only one of or indeed any combination of these sensors. It will also be understood that whilst Figure 2 schematically shows the functionality of the sensors, of course one or more of these functionalities could be combined into a unitary sensor.

The device 202 also comprises a transmitter 222 for transmitting information of or indicative of the sensed condition(s). The device 202 may also comprise a receiver (or indeed comprise a transceiver) enabling the device to receive information e.g. configuration information, updates etc.

In some examples the device 202 is arranged to periodically send environmental condition information to central function 118. The time period between reports may be predetermined and/or configurable.

In another example, the device 202 is configured to send information of a sensed environmental condition only when that environmental condition reaches a certain threshold value. The threshold value may be considered a trigger condition. For example, the device 202 may be configured to record rainfall information, and when an amount of rainfall in a given period reaches a threshold level, then this triggers the device 202 to report that environmental condition information to the central function 118, and/or to provide an alarm signal.

In some examples the information that is sent to the central function 118 comprises actual data of the environmental condition e.g. a temperature, a pressure etc. Additionally or alternatively, the device 202 may send a warning or alarm condition signal to the central function 118, when one or more environmental conditions reaches a threshold value. The alarm condition information may comprise some basic further information, such as the type of condition to which the alarm relates. For example the device 202 may send a water level alarm condition, when a water level in a river reaches a certain value (but without necessarily specifying the actual water level).

In some examples the device 202 may also comprise a display, which is arranged to display information of the device and/or of environmental condition(s). The device may also comprise an input such as one or more keys or buttons, enabling settings of the device to be changed and/or for controlling the device. Additionally or alternatively in some embodiments the device can be controlled wirelessly.

Figure 3 shows an example of a network side apparatus 318. The central function apparatus 118 of Figure 1 may be structured in the same or a similar way as the apparatus 318 of Figure of 3. The apparatus 318 comprises a memory 302 and a processor 304. The apparatus 318 also comprises a receiver at 306 for receiving information from the one or more devices 102 to 110. The device 318 may also comprise a transmitter (or indeed a transceiver)

enabling the apparatus 318 to also transmit information e.g. control signals and/or updates to the devices 102 to 110. In this example, the apparatus 318 also comprises, or is in communication with, a display 308 which enables the apparatus 318 to provide output in a visual fashion such that it can be interpreted by a viewer. For example the apparatus 318 may cause visual information to be provided on display 308 which can be viewed by emergency services such as police, fire service etc.

In some examples, the central function 118 can organise or group devices in response to receiving a warning or an alarm signal from a first device. This is shown for example in Figures 4A and 4B.

In Figure 4A a weather condition 120, in this example a thunderstorm, is taking place at location “v”. This is detected by device 110. As previously explained, the device 110 sends information to central function 118, with data and/or an alarm signal regarding this event. In order to obtain more information regarding the weather condition 120, the central function 118 initiates a process of obtaining weather information from further devices in the area. In order to do so, the central function 118 creates a group of devices to send a request to for information. In an example, the formed group is based upon a distance from the device 110 which initially reported the condition. This distance may be a radius. This enables the central function 118 to poll one or more devices falling within that radius. As shown in Figure 4A the group contained within the radius comprises device 110 and device 108. This enables the central function to obtain weather information from device 108 (and possibly further information from device 110) enabling a more accurate picture of the weather condition to be obtained. The radial distance may be preconfigured and/or configurable. The radial distance and/or grouping may also be adapted in real-time in response to received information. For example if a central function receives information from device 108 from which the central function is unable to form an accurate picture of the weather condition, then it may increase the radius to encompass more devices. Of course the reverse may also happen, where the radius can be reduced in order to obtain more localised information from one or more specific devices at a specific location.

Figure 4B shows another example where a weather condition has occurred at location “w”, which has been initially detected by device 104. In this example the central function forms a group that comprises devices 102, 104 and 106.

In some examples, and as shown schematically in Figure 5, the central function 118 may store location information of the devices. This may be in the form of a lookup table 500, as shown in Figure 5 for example. The lookup table 500 comprises a first column 502 which includes device identifiers, and a second column 504 which provides respective location information for each device. The location information may be in any form, for example GPS

co-ordinates. In some examples the location information may automatically update if a device is moved. Where a device is a mobile user equipment, then this location information will of course update more regularly than permanent or semi permanently located devices. The central function 118 can use this location information in forming the groups, as previously described.

Figure 6 is a signalling diagram according to an example. A detecting device is shown at 602, a nearby device (i.e. near device 602) is shown at 604, and a central function is shown at 618.

At step S1 an event occurs. This event is detected by detecting (or first) device 602. This event may be, for example, an environmental condition reaching a threshold level or state, such as an amount of rainfall.

In response to this, at step S2 the detecting (or first) device 602 sends an alarm signal to central function 618.

Then, at step S3 the central function 618 forms a grouping of one or more other devices from which it wishes to obtain information, so as to obtain a more detailed view of the event.

Accordingly, at step S4 the central function 618 sends a request to nearby (or second) device 604 for further information, the nearby device falling within the group arranged by the central function 618. The request may include information of a time period for which information is sought. The request may additionally or alternatively request that information continue to be provided by the nearby device 604 for a certain period of time or until a further request is sent informing the nearby device 604 that it can halt providing information. The nearby device may alternatively be preconfigured to report the environmental condition information in a certain fashion, when a request is received from the central function 618. Similar request or preconfiguration may apply to the detecting (or first) device 602, to keep it providing information to the central function 618.

Then, at step S5 the nearby device 604 sends the requested information to the central function 618.

At step S6 the central function 618 processes and analyses the received information in order to provide a more accurate picture of the event (e.g. weather condition) originally detected at step S1.

At step S7 the central function 618 creates an output. This output may comprise for example a message. The message for example may be sent to emergency services warning them of the event. In some embodiments contact with emergency services is initiated in an automated fashion i.e. without a person having to contact the emergency services. This may enable emergency services to be contacted in a quicker fashion. The output may additionally or alternatively include a visualisation of the event, as will be explained in more detail with

respect to Figure 7.

It will be understood that the example of Figure 6 where the central function is receiving information from first and second devices 602 and 604 is by way of example only. The central function 618 is configured such that in other embodiments it can receive and process information from more, and possibly many more, devices.

An example visualisation of an environmental condition is shown in Figure 7. As previously described, such a visualisation may be part of (or caused by) the output provided by the central function 118.

In Figure 7 a display is shown at 700. The display may be part of, or in communication with, central function 118. On the display there is a map 702 of an area in which a weather condition 704 has occurred, in this example heavy rainfall. Thus, using the visualisation, operators can identify a type (e.g. rainfall) and the location of the environmental condition. Additional information may also be provided. For example directional information showing actual or predicted movement of the environmental condition may be provided. Directional information may be determined from, for example, recorded wind direction and/or recorded wind speed information. For example an arrow 706 is provided on the display showing in which direction the environmental condition is moving. Other information such as speed, severity of the condition, likelihood of impacting on population and/or structures etc. may also be provided. Other types of environmental condition, which may be indicated or visualised, include (but are not limited to): rainfall; flood; tsunami; heatwave; low temperature; fire; snow; avalanche; high winds etc.

According to the examples, relatively simple cellular internet of things devices can be used to provide data to the centralised function 118, where the processing of the received information can take place. By use of the relatively simple IoT devices, then many devices can be spread throughout an area, enabling sampling of many different location points to obtain information regarding nature (e.g. type) and/or direction of an environmental or weather condition, at relatively low cost. The centralised function 118 can then use this information to warn the population and/or to initiate protective or preventative measures. In some embodiments the centralised function 118 can cause automated initiation of the preventative measure. For example, in the event of a flood, then the central function 118 could initiate closing of a flood barrier.

The ability of the centralised function 118 to create and/or modify groups of devices to be polled provides flexibility in the way in which the conditions are recorded and/or monitored. In some embodiments the groups can be created and/or modified in real-time or “on-the-fly”, as an environmental condition unfolds. That is in some examples the grouping of devices can be dynamically changed over time.

According to the described examples the processing demand on the centralised function 118 may also be relatively reduced. Rather than constantly processing information from all devices, in some examples only once an alarm signal has been received does the centralised function send out a request for further information, and even then this request may only be sent to certain devices (i.e. those within a selected group). Therefore over a period of time the processing demand is relatively low since the centralised function does not have to constantly process information from all devices all of the time in order to obtain important environmental condition information.

Figure 8 is a flow chart of a method according to an embodiment. This method may occur, for example, at a centralised function as previously described.

At S1, an apparatus receives information from a first device. The information is indicative of an environmental condition at a location of the first device.

At S2, in response to receiving the information from the first device, the apparatus sends a request for environmental condition information to one or more devices.

At S3, the apparatus processes environmental condition information received in response to the request.

At S4, the apparatus generates an output based on the processed information.

Figure 9 is a flow chart of a method according to an embodiment. This method may occur, for example, at a cellular IoT apparatus as previously described.

At S1, the apparatus monitors one or more environmental conditions using at least one sensor of the apparatus.

At S2, the apparatus determines a trigger condition.

At S3, in response to determining the trigger condition, the apparatus sends information to a second apparatus, the information indicative of an environmental condition at a location of the apparatus.

In general, the various embodiments may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. Some aspects of the invention may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device, although the invention is not limited thereto. While various aspects of the invention may be illustrated and described as block diagrams, flow charts, or using some other pictorial representation, it is well understood that these blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

The embodiments of this invention may be implemented by computer software executable by a data processor of the mobile device, such as in the processor entity, or by hardware, or by a combination of software and hardware. Computer software or program, also called program product, including software routines, applets and/or macros, may be stored in any apparatus-readable data storage medium and they comprise program instructions to perform particular tasks. A computer program product may comprise one or more computer-executable components which, when the program is run, are configured to carry out embodiments. The one or more computer-executable components may be at least one software code or portions of it.

Further in this regard it should be noted that any blocks of the logic flow as in the Figures may represent program steps, or interconnected logic circuits, blocks and functions, or a combination of program steps and logic circuits, blocks and functions. The software may be stored on such physical media as memory chips, or memory blocks implemented within the processor, magnetic media such as hard disk or floppy disks, and optical media such as for example DVD and the data variants thereof, CD. The physical media is a non-transitory media.

The memory may be of any type suitable to the local technical environment and may be implemented using any suitable data storage technology, such as semiconductor based memory devices, magnetic memory devices and systems, optical memory devices and systems, fixed memory and removable memory. The data processors may be of any type suitable to the local technical environment, and may comprise one or more of general purpose computers, special purpose computers, microprocessors, digital signal processors (DSPs), application specific integrated circuits (ASIC), FPGA, gate level circuits and processors based on multi core processor architecture, as non-limiting examples.

Embodiments of the inventions may be practiced in various components such as integrated circuit modules. The design of integrated circuits is by and large a highly automated process. Complex and powerful software tools are available for converting a logic level design into a semiconductor circuit design ready to be etched and formed on a semiconductor substrate.

The foregoing description has provided by way of non-limiting examples a full and informative description of the exemplary embodiment of this invention. However, various modifications and adaptations may become apparent to those skilled in the relevant arts in view of the foregoing description, when read in conjunction with the accompanying drawings and the appended claims. However, all such and similar modifications of the teachings of this invention will still fall within the scope of this invention as defined in the appended claims.

Indeed there is a further embodiment comprising a combination of one or more embodiments with any of the other embodiments previously discussed.

Claims

1. An apparatus comprising at least one processor, and at least one memory including computer program code, wherein the at least one memory and the computer program code
5 are configured, with the at least one processor, to:

receive information from a first device, the information indicative of an environmental condition at a location of the first device;

in response to receiving the information from the first device, send a request for environmental condition information to one or more devices; and

10 process environmental condition information received in response to the request; and
generate an output based on the processed information.

2. The apparatus according to claim 1, wherein the apparatus stores location information of the one or more devices.

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3. The apparatus according to claim 1 or claim 2, the apparatus configured to determine a group comprising the one or more devices.

4. The apparatus according to claim 3, the apparatus configured to determine the group
20 based upon a distance of the one or more devices from the first device.

5. The apparatus according to any preceding claim, the request comprising a request for environmental condition information for a specified timeframe.

25 6. The apparatus according to any preceding claim, the environmental condition information comprising weather information.

7. The apparatus according to any preceding claim, the environmental condition information comprising information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

5 8. The apparatus according to any preceding claim, the information received from the first device comprising an alarm status.

9. The apparatus according to any preceding claim, the output comprising a visualization of the environmental conditions, the apparatus configured to cause the visualization to be
10 displayed on a display.

10. The apparatus according to any preceding claim, the output comprising directional information of the environmental condition.

15 11. An apparatus comprising: at least one sensor; at least one processor; and at least one memory including computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to:

monitor one or more environmental conditions using the at least one sensor;

in response to determining a trigger condition; send information to a second apparatus,
20 the information indicative of an environmental condition at a location of the apparatus.

12. The apparatus according to claim 11, the trigger condition comprising a threshold value of the monitored one or more environmental conditions.

25 13. An apparatus according to claim 11 or claim 12, the apparatus configured to receive a request from the second apparatus for environmental condition information for a specified timeframe.

14. An apparatus according to any of claims 11 to 13, the environmental condition
30 information comprising weather information.

15. A method comprising:

receiving information from a first device, the information indicative of an environmental condition at a location of the first device;

5 in response to receiving the information from the first device, sending a request for environmental condition information to one or more devices; and

processing environmental condition information received in response to the request; and

generating an output based on the processed information.

10

16. The method according to claim 15, comprising storing location information of the one or more devices.

15 17. The method according to claim 15 or claim 16, comprising determining a group comprising the one or more devices.

18. The method according to claim 17, the determining a group based upon a distance of the one or more devices from the first device.

20 19. The method according to any of claims 15 to 18, the request comprising a request for environmental condition information for a specified timeframe.

20. The method according to any of claims 15 to 19, the environmental condition information comprising weather information.

25

21. The method according to any of claims 15 to 20, the environmental condition information comprising information of one or more of: temperature; pressure; humidity; wind; rain; snow; water level.

22. The method according to any of claims 15 to 21, the information received from the first device comprising an alarm status.

23. The method according to any of claims 15 to 22, the output comprising a visualization of the environmental conditions, the method comprising causing the visualization to be displayed on a display.

24. The method according to any of claims 15 to 23, the output comprising directional information of the environmental condition.

25. A computer program comprising program code means adapted to perform the steps of any of claims 15 to 24 when the program is run on a data processing apparatus.

26. A method comprising:

monitoring one or more environmental conditions using at least one sensor of an apparatus;

in response to determining a trigger condition; sending information to a second apparatus, the information indicative of an environmental condition at a location of the apparatus.

27. The method according to claim 26, the trigger condition comprising a threshold value of the monitored one or more environmental conditions.

28. The method according to claim 26 or claim 27, comprising receiving a request from the second apparatus for environmental condition information for a specified timeframe.

29. The method according to any of claims 26 to 28, the environmental condition information comprising weather information.

30. A computer program comprising program code means adapted to perform the steps of any of claims 26 to 29 when the program is run on a data processing apparatus.

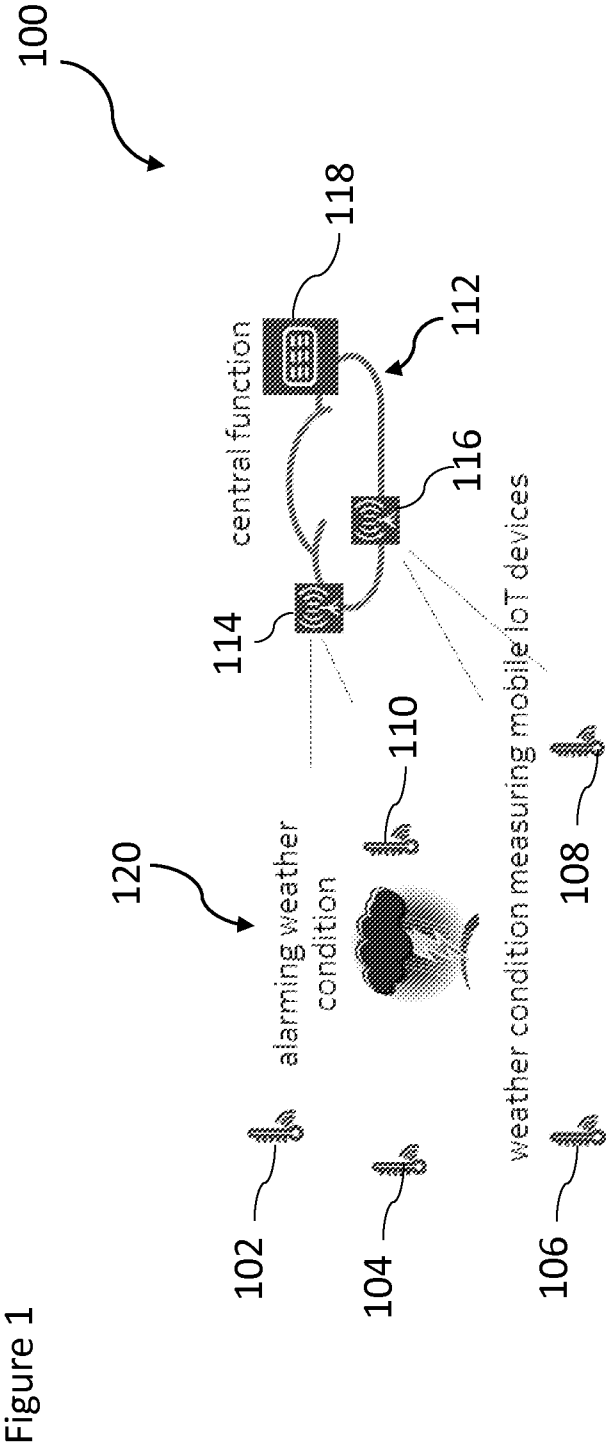
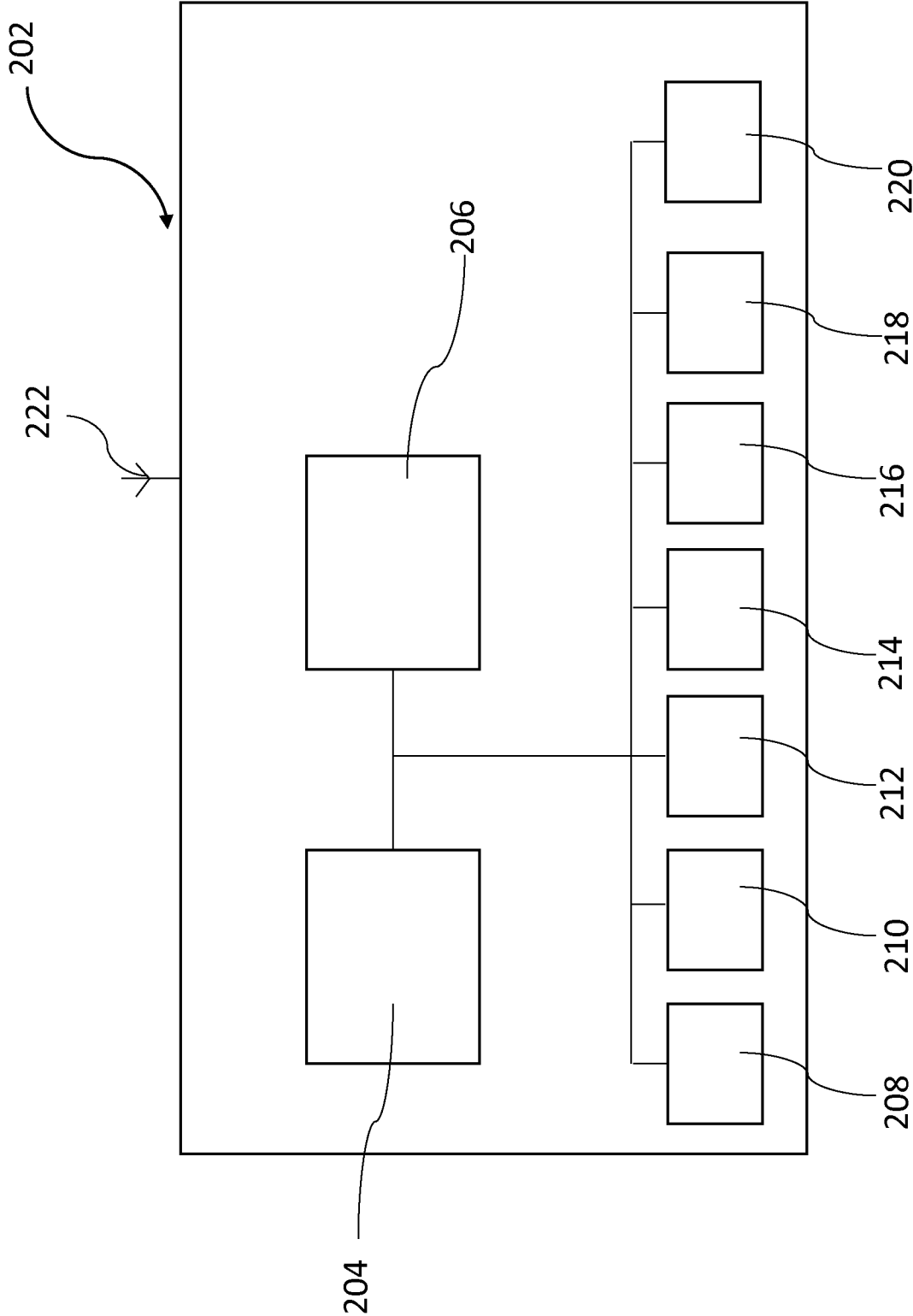


Figure 2



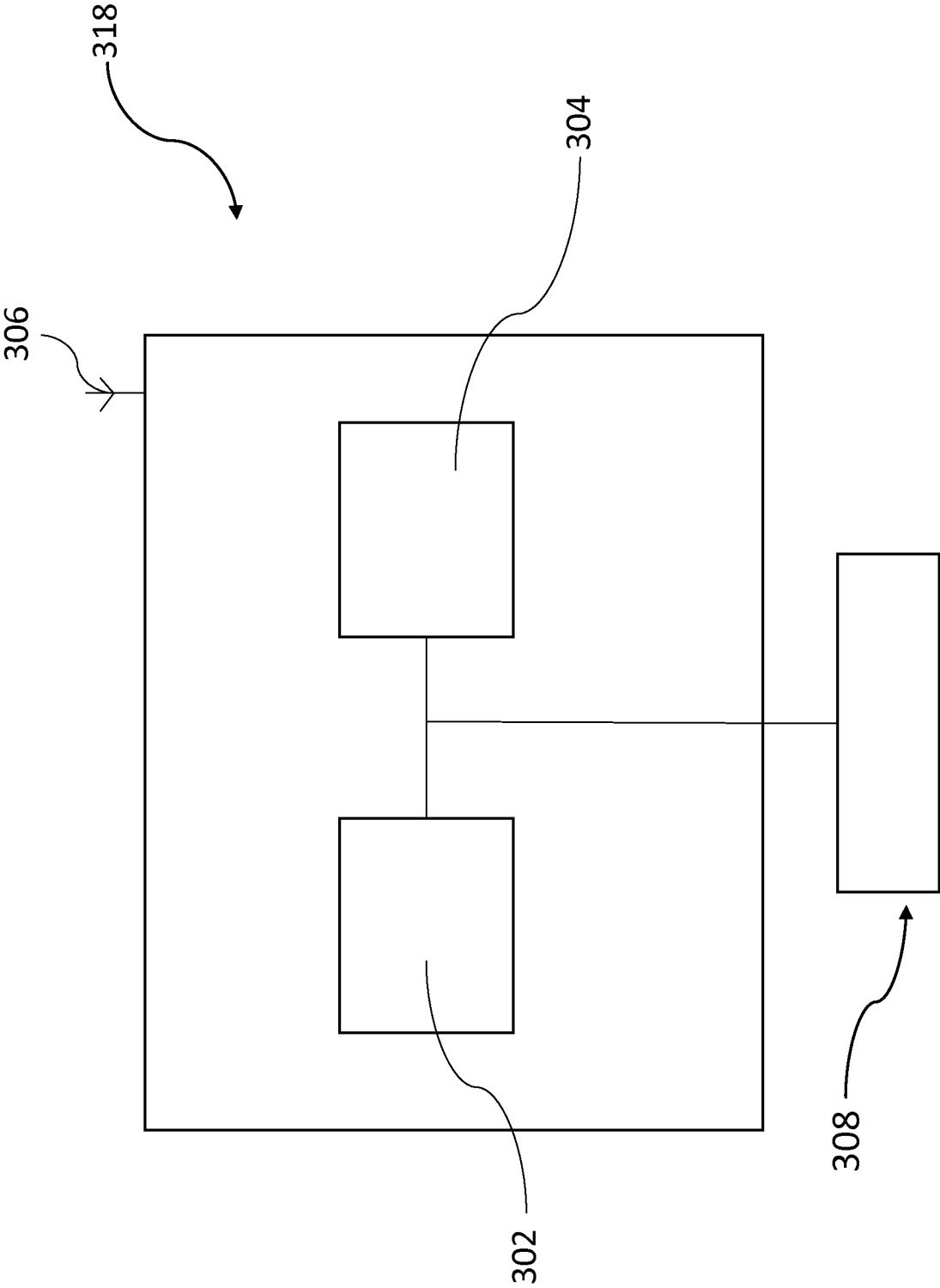


Figure 3

Figure 4A

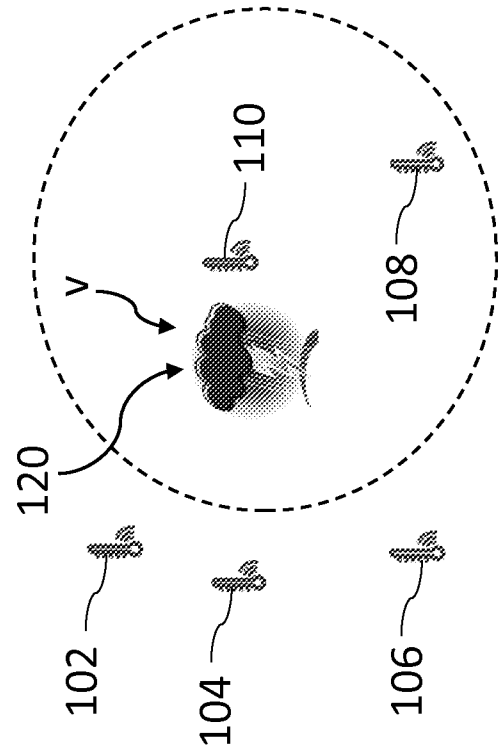


Figure 4B

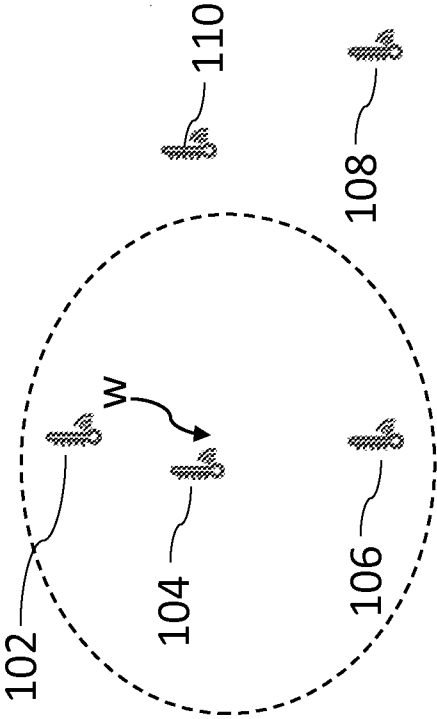


Figure 5

502 504 500

Device	Location
A	x
B	y
C	z

The diagram shows a table with two columns and three rows. The first column is labeled 'Device' and the second column is labeled 'Location'. The rows contain the following data: (A, x), (B, y), and (C, z). Arrows point from the labels 502, 504, and 500 to the table structure.

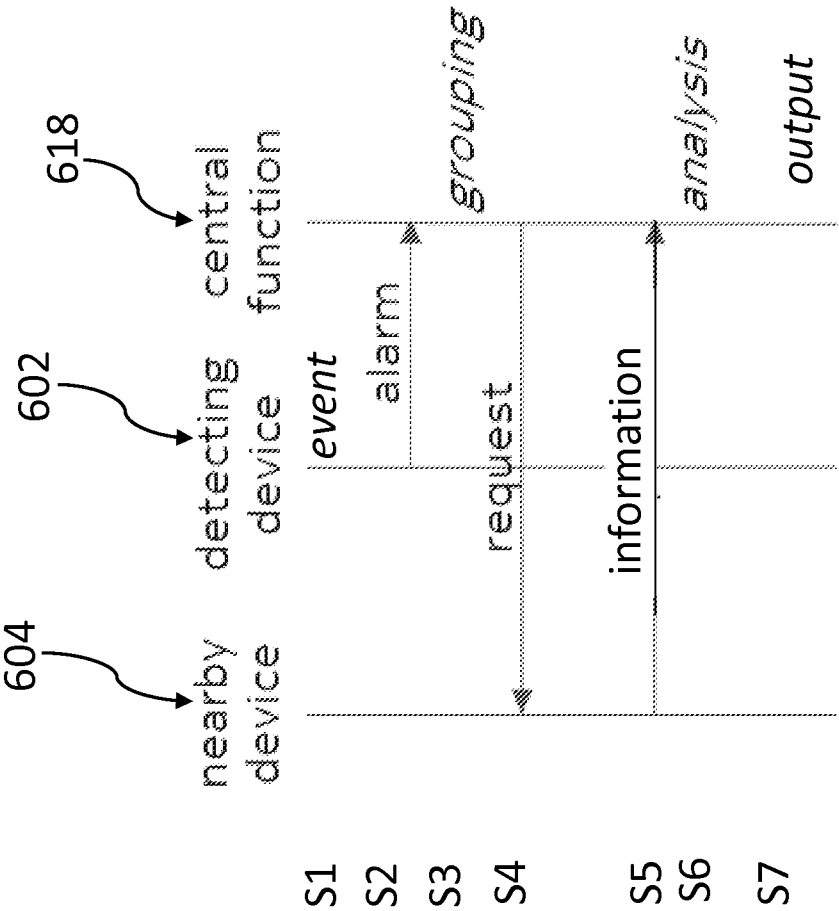


Figure 6

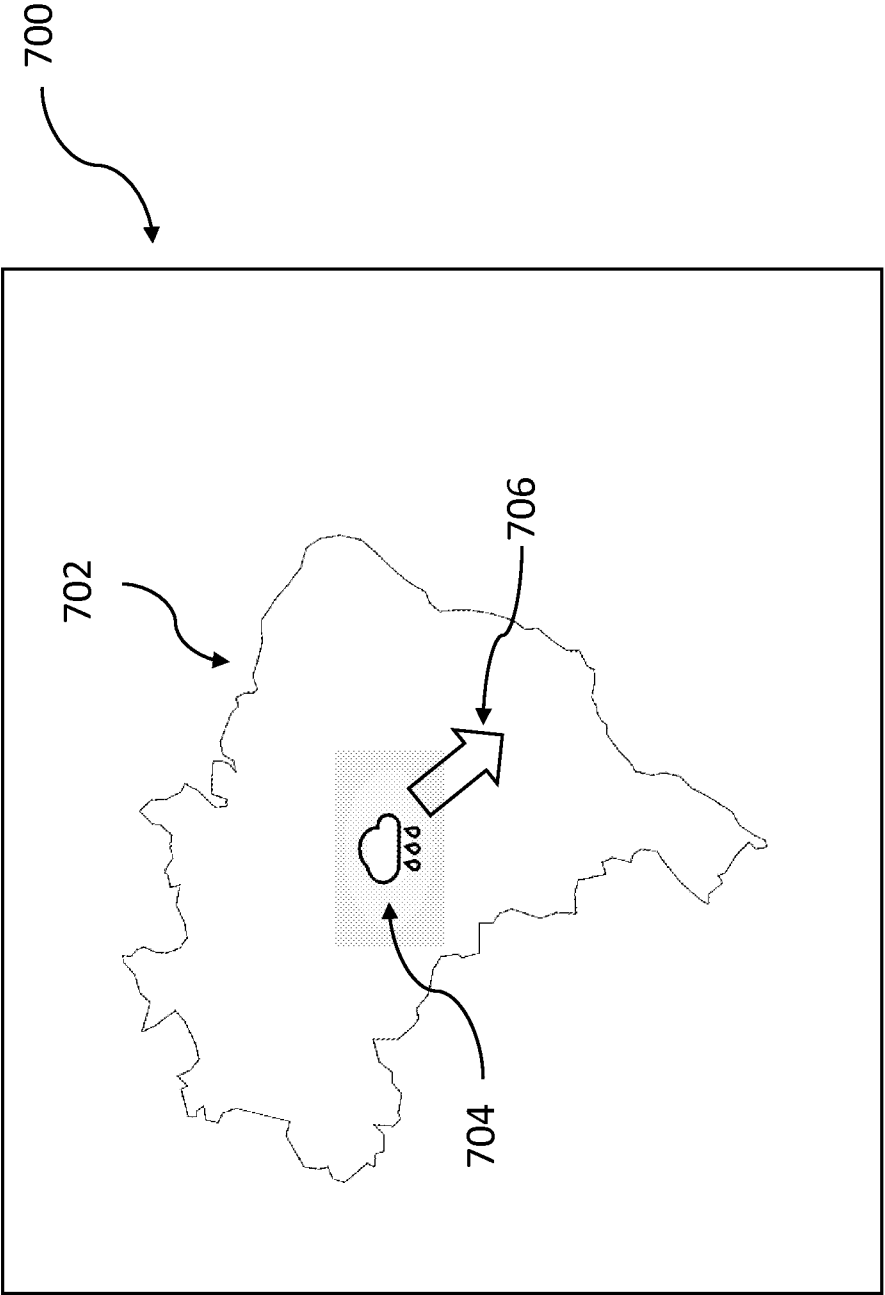


Figure 7

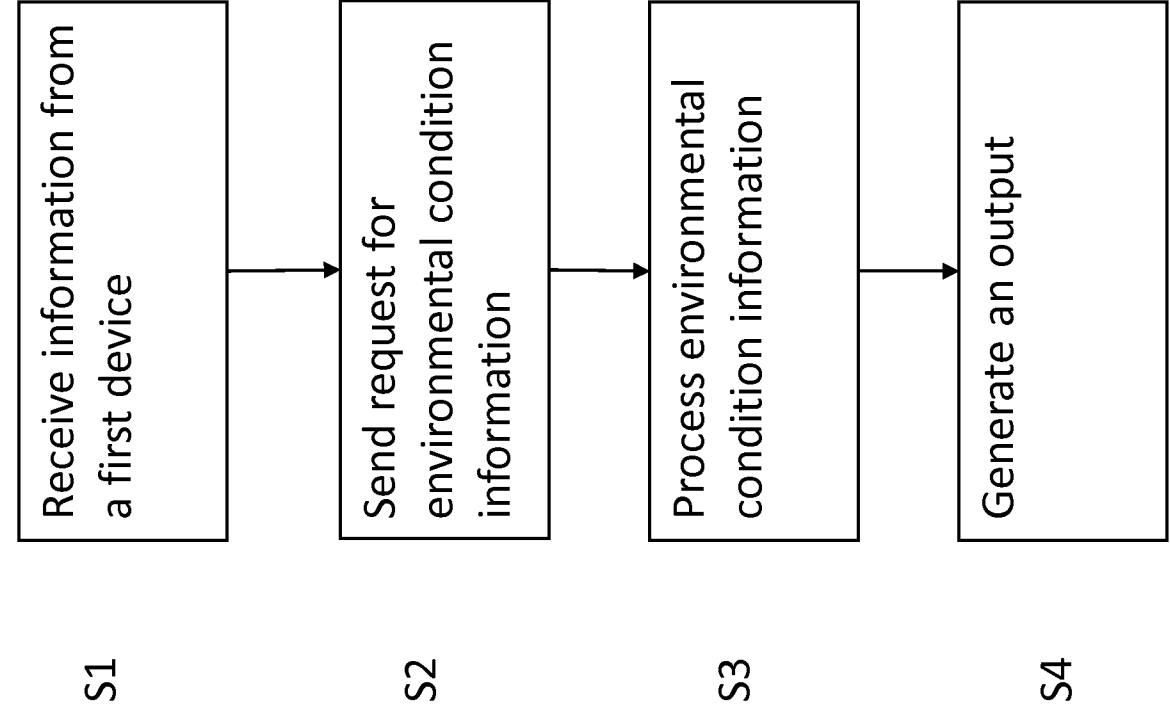


Figure 8

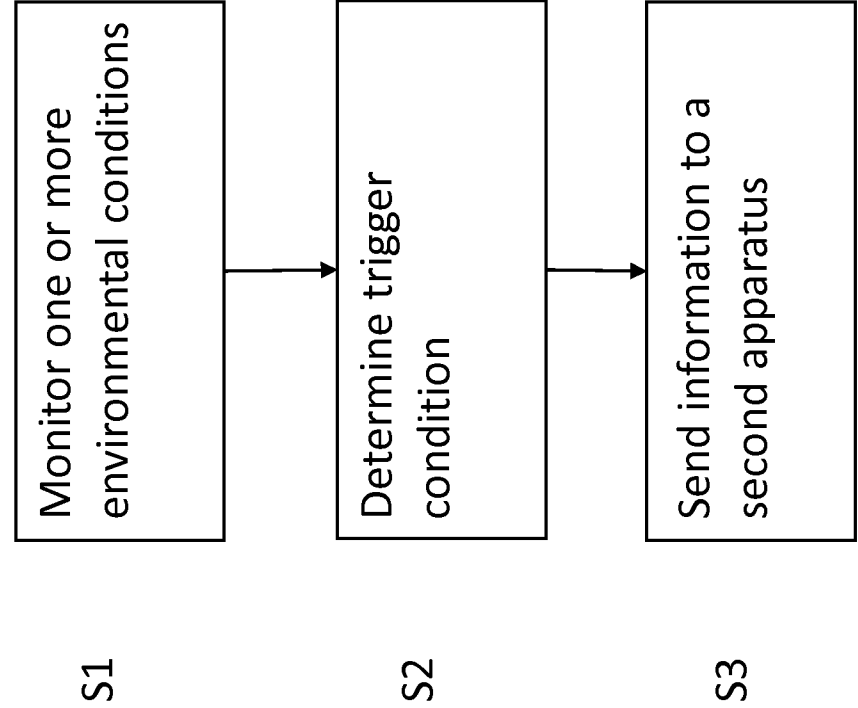


Figure 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2017/050348

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: G01W, G08B, H04W, H04Q, H04B, H04M, G05B, G06K, G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

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

EPODOC, EPO-Internal full-text databases, Full-text translation databases from Asian languages, XP3GPP, XPAIP, XPESP, XPETSI, XPI3E, XPIEE, XPIETF, XPIOP, XPIPCOM, XPJPEG, XPMISC, XPOAC, XPRD, XPTK, COMPDX, INSPEC, TDB, NPL, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2016196738 A1 (VIGGEDAL ANNA [SE] et al.) 07 July 2016 (07.07.2016) abstract; paragraphs [0022]-[0023], [0025]-[0035], [0048], [0072]-[0073]; figures 3-4	1, 3-5, 7, 9, 11, 13, 15, 17-19, 21, 23, 25-26, 28, 30
X	US 2006028334 A1 (ADONAILO ROBERT S [US] et al.) 09 February 2006 (09.02.2006) abstract; paragraphs [0021]-[0022], [0028]-[0030]; figures 1-3	1, 8, 11-12, 14-15, 22, 25-27, 29-30
X	US 2015339594 A1 (GALLO JOSEPH L [US] et al.) 26 November 2015 (26.11.2015) abstract; paragraphs [0024]-[0027], [0033], [0044]-[0045], [0047], [0051]- [0053], [0055]; figures 1-2	1-4, 6-11, 14-18, 20-26, 29-30

☒ Further documents are listed in the continuation of Box C.
☒ See patent family annex.

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
02 November 2017 (02.11.2017)Date of mailing of the international search report
06 November 2017 (06.11.2017)Name and mailing address of the ISA/FI
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2017/050348

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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CLASSIFICATION OF SUBJECT MATTER

IPC

G01W 1/10 (2006.01)**G08B 21/18** (2006.01)**G08B 25/00** (2006.01)**G08B 25/10** (2006.01)**H04W 4/22** (2009.01)**H04W 84/18** (2009.01)**H04Q 9/00** (2006.01)**G08B 29/18** (2006.01)**H04W 4/00** (2009.01)**H04L 12/18** (2006.01)