



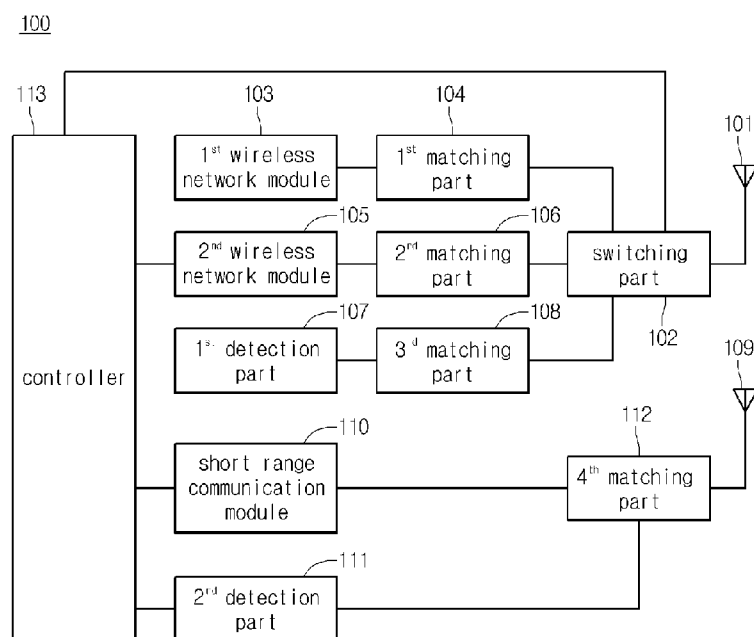
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(54) **Title:** WIRELESS NETWORK DEVICE METHOD FOR CONTROLLING OPERATION THEREOF

(57) **Abstract:** Disclosed are a wireless network device and a method for controlling the operation thereof. The wireless network device includes an antenna to transceive a wireless signal, a network communication module to receive the wireless signal received through the antenna or to output the wireless signal to the antenna, a detection part to detect the wireless signal received through the antenna and to determine if the wireless network device enters a coverage area by using the detected wireless signal, and a controller to supply power to the network communication module if the wireless network device enters the coverage area and to shut off the power supplied to the network communication module if the wireless network device is out of the coverage.

Description

Title of Invention: WIRELESS NETWORK DEVICE METHOD FOR CONTROLLING OPERATION THEREOF

Technical Field

- [1] The embodiment relates to a wireless network device and a method for controlling the operation thereof.

Background Art

- [2] A wireless local area network (WLAN) provides communication service such as Internet service to wireless devices (e.g., personal digital assistant (PDA), laptop computer,) located within a predetermined range from an access point (AP).
- [3] Although the WLAN initially has only a propagation range of 10m, the range of the WLAN is significantly expanded to the propagation range of 50m to several hundreds of meters in 2000s. In addition, as the WLAN has a transmission rate of 4Mbps to 11Mbps, the WLAN can transceive large-size multimedia.
- [4] Thus, the WLAN has been used to provide high-speed data service to subscribers in a specific building such as a school, an airport, or a hotel.
- [5] As the WLAN service has been commercialized as described, a terminal having the hybrid form of a Wi-Fi terminal to provide the WLAN service and a mobile communication terminal has been developed. In other words, a dual-mode terminal providing both of Wi-Fi service and mobile service (dual-mode terminal) has been developed.
- [6] The dual-mode terminal includes a Wi-Fi module for Wi-Fi service and a mobile communication module (e.g., CDMA module) for mobile service. In addition, the dual-mode terminal operates in a Wi-Fi service mode when entering a Wi-Fi coverage, and operates in a mobile service mode when leaving the coverage.
- [7] To this end, a user must manually switch an operating mode of the dual-mode terminal whenever the dual-mode terminal enters the Wi-Fi coverage or leaves the Wi-Fi coverage.
- [8] Further, in the case of the dual-mode terminal including a plurality of operating modes, since power must be applied to all devices related to each operating mode in order to automatically recognize the movement from a specific coverage to another coverage to shift the operating mode, power may be wasted.
- [9] For example, if the above dual-mode terminal, which supports the Wi-Fi service and the mobile service, is maintained in a turn-on state with respect to both of the mobile communication module and the Wi-Fi module, power may be wasted.

Disclosure of Invention

Technical Problem

[10] The embodiment provides a network device capable of selectively controlling the power supplied in the network device by detecting whether the network device is located in a network coverage, and a method for controlling the operation thereof.

[11] However, the disclosure is not limited to the above object, but those skilled in the art can obviously comprehend other objects from the following description.

Solution to Problem

[12] According to the embodiment, there is provided a wireless network device includes an antenna to transceive a wireless signal, a network communication module to receive the wireless signal received through the antenna or to output the wireless signal to the antenna, a detection part to detect the wireless signal received through the antenna and to determine if the wireless network device enters a coverage area by using the detected wireless signal, and a controller to supply power to the network communication module if the wireless network device enters the coverage area and to shut off the power supplied to the network communication module if the wireless network device is out of the coverage.

[13] According to the embodiment, there is provided a method for controlling an operation of a wireless network device. The method includes receiving a wireless signal, detecting intensity of the wireless signal that has been received, determining by using the intensity of the wireless signal if the wireless network device enters a coverage, activating a network module if the wireless network device enters the coverage, and deactivating the network module if the wireless network device is out of the coverage.

Advantageous Effects of Invention

[14] According to the embodiment, as the network device enters a network coverage, the power of a module to operate in the network coverage is selectively controlled, thereby solving the inconveniences occurring when using the network function, so that the efficiency of a network function not only can be increased, but power consumption can be reduced.

[15] In addition, according to the embodiment, the reading range of a network can be prevented from being reduced due to a hand or surrounding materials by performing impedance matching between input and output terminals.

Brief Description of Drawings

[16] FIG. 1 is a block diagram showing the structure of a wireless network device according to the embodiment;

[17] FIG. 2 is a view showing a coverage of the wireless network device according to the embodiment;

[18] FIG. 3 is a view showing the structure of a detector shown in FIG. 2 in detail;

- [19] FIG. 4 is a circuit diagram showing a magnifying part of FIG. 3 in detail;
- [20] FIG. 5 is a graph showing an output value of the magnifying part of FIG. 3;
- [21] FIG. 6 is a graph used to explain a method of detecting a coverage according to the embodiment; and
- [22] FIGS. 7 and 8 are flowcharts showing a method for operating a wireless network device according to the embodiment step by step.

Mode for the Invention

- [23] The terms of the embodiment are used only for the illustrative purpose of the embodiment, and the embodiment is not limited thereto. The term expressed in the singular includes a plural meaning unless the term obviously specifies different meanings in context. In the following description of the embodiment, the terms "include" or "have" are used to indicate the feature, number, step, operation, elements, parts or combination thereof without excluding other feature, number, step, operation, elements, parts or combination thereof.
- [24] All terms, including technical and scientific terms, used for the embodiment have the same meanings as meanings generally known to those skilled in the art.
- [25] In addition, those skilled in the art should comprehend that the terms defined in typical dictionaries have meanings matching with meanings represented in context of the related art without being interpreted as ideal meaning or excessively formal meanings unless the terms are definitely defined in the following description of the embodiment.
- [26] Hereinafter, the embodiment will be described in more detail with reference to accompanying drawings. In the following description, the same reference numerals will be assigned to the same components for the obvious comprehension of the embodiment, and the same components will not be repeatedly described in order to avoid redundancy.
- [27] FIG. 1 is a view showing the structure of a wireless network device according to the embodiment.
- [28] Referring to FIG. 1, a wireless network device 100 includes a first antenna 101, a switching part 102, a first wireless network module 103, a first matching part 104, a second wireless network module 105, a second matching part 106, a first detection part 107, a third matching part 108, a second antenna 109, a short range communication module 110, a second detection part 111, a fourth matching part 112, and a controller 113.
- [29] The first antenna 101 is connected to an access point (AP) to make data communication. The AP may include first and second APs.
- [30] The first AP refers to an AP of a basic service set (BSS), to which the wireless

network device 100 currently belongs, in a wireless network system.

- [31] In addition, the second AP refers to an AP allowing the wireless network device 100 to continuously provide a service, which is provided from the first AP, after the wireless network device 100 has been moved to another area.
- [32] In this case, the second AP refers to an AP belonging to another BSS over the same network, that is, the wireless network system. In particular, the second AP has a service set identifier (SSID) the same as that of the first AP.
- [33] In this case, the first antenna 101 transceives a wireless signal having a first frequency band, and the first frequency band may be 2.4GHz.
- [34] In particular, the first antenna 101 transmits or receives a first wireless signal having a frequency band of 2.4GHz when the wireless network device 100 moves into a pre-determined coverage (possible area for Wi-Fi communication or Bluetooth communication).
- [35] The switching part 102 switches the path of the first wireless signal received through the first antenna 101, or the path of the first wireless signal transmitted through the first antenna 101.
- [36] The first wireless network module 103 performs a first wireless network function within a first coverage. Preferably, the first coverage includes a Wi-Fi coverage. Therefore, the first wireless network module 103 may include a Wi-Fi communication module.
- [37] The first matching part 104 performs matching between the impedance of the first wireless network module 103 and an external impedance. The first matching part 104 may include at least one capacitor and at least one inductor.
- [38] Preferably, the first matching part 104 may include one inductor series-connected between an input terminal and an output terminal, and first and second variable capacitors parallel-connected to the input terminal and the output terminal. The impedance matching between the input terminal and the output terminal may be performed according to one pair of changed capacitances and the inductance of the inductor after individually changing the capacitances of the first and second variable capacitors.
- [39] The second wireless network module 105 performs a second wireless network function within a second coverage. Preferably, the second coverage includes a Bluetooth coverage. Accordingly, the second wireless network module 105 may include the Bluetooth communication module.
- [40] The second matching part 106 performs matching between the impedance of the second wireless network module 105 and an external impedance. In this case, the second matching part 106 may have the same components as those of the first matching part 104.

- [41] The first detection part 107 includes a zero bias RF power detector. The first detection part 107 detects the intensity of the first wireless signal received through the first antenna 101 to determine if the wireless network device 100 is located within a coverage. The first wireless signal has a frequency band of 2.4GHz.
- [42] FIG. 2 is a view showing a coverage according to the embodiment of the disclosure.
- [43] In general, referring to FIG. 2, a wireless network can operate when APs exist around the wireless network. In other words, if the wireless network device 100 is located within a predetermined radius from an AP, the wireless network device 100 is located within a coverage. If the wireless network device 100 is located beyond the radius from the AP, the wireless network device 100 is located out of the coverage.
- [44] In other words, as shown in FIG. 2, if the wireless network device 100 is located within the predetermined radius of the AP to receive a high wireless signal or a low wireless signal, the wireless network device 100 is located within the coverage.
- [45] In addition, if the wireless network device 100 does not receive the wireless signal (No signal) as the wireless network device 100 leaves the predetermined radius of the AP, the wireless network device 100 is located out of the coverage.
- [46] FIG. 3 is a block diagram showing the detailed structure of the detection part of FIG. 2.
- [47] Referring to FIG. 3, the first detection part 107 includes a magnifying part 1071, a limiting part 1072, and a regulator 1073.
- [48] The magnifying part 1071 increases the intensity of the first wireless signal, which is received through the first antenna 101, at a preset magnification.
- [49] FIG. 4 is a circuit diagram showing the magnifying part of FIG. 3 in detail.
- [50] Referring to FIG. 4, the magnifying part 1071 includes at least one diode D and at least one capacitor C.
- [51] In this case, the magnification of the magnifying part 1071 is determined according to the number of diodes D and the number of capacitors C.
- [52] According to the embodiment, the magnification of the magnifying part 1071 is determined based on the intensity of the first wireless signal generated as the wireless network device 100 enters the coverage.
- [53] In other words, when the intensity of the first wireless signal received through the first antenna 101 is slightly represented, since the first wireless signal may not be detected by the first detection part 107, the magnifying part 1071 magnifies the first wireless signal, which is received through the first antenna 101, at a predetermined magnification, so that the first wireless signal can be effectively detected.
- [54] In other words, as shown in FIG. 5, after increasing an input voltage ($V_{in}=A$) of the first wireless signal (preferably, RF signal) received through the first antenna 101 at a predetermined magnification, the magnifying part 1071 outputs the voltage ($V_{out}=B$)

increased at the predetermined magnification.

- [55] The limiting part 1072 limits the size of the output value output through the magnification part 1071. In other words, the voltage value of the first wireless signal received through the first antenna 101 varies according to the intensity of the first wireless signal. In this case, when the first wireless signal having a great intensity is received, since the output value of the first magnifying part 1071 may be excessively increased, the limiting part 1072 limits the output value of the magnifying part 1071.
- [56] The regulator 1073 performs the smoothing for the output value output through the limiting part 1072 to output the stable voltage value.
- [57] The third matching part 108 performs the impedance matching between the first detection part 107 and an external impedance. In this case, the third matching part 108 may have the same components as those of at least one of the first and second matching parts 104 and 106.
- [58] The second antenna 109 receives a second wireless signal having a second frequency band. In this case, the second frequency band is 13.56MHz. In other words, in the case of near field communication (NFC), data communication is made by using the frequency band of 13.56MHz. Therefore, the second antenna 109 receives the second wireless signal corresponding to the NFC.
- [59] The short range communication module 110 operates when the entrance of the wireless network device 100 into a third coverage is determined according to the second wireless signal received through the second antenna 109.
- [60] In this case, the third coverage includes an NFC area. Therefore, the short range communication module 110 includes an NFC module.
- [61] In this case, the short range communication module 110 can operate in one of the first and second modes.
- [62] The first mode may represent a tag mode, and the second mode may represent a reader mode.
- [63] In other words, when the user sets the short range communication module 110 to the tag mode in the state that the power supplied to the short range communication module 110 is shut off, the short range communication module 110 operates in the tag mode by receiving power from a battery thereof.
- [64] To this end, the short range communication module 110 may include a tag. In this case, if the wireless network device 100 includes a cellular terminal, a power supplying path is preferably designed to continuously supply power to the short range communication module 110 even if the power to support other functions (e.g., call function and file playing function) is shut off.
- [65] The short range communication module 110 can operate in a reader mode. To this end, the short range communication module 110 may include a reader to recognize the

information of tag identification generated from an external tag.

[66] The second detection part 111 detects whether the wireless network device 100 enters the third coverage by using the second wireless signal received through the second antenna 109.

[67] In this case, the second detection part 111 may have the same operation and structure as those of the first detection part 107. Accordingly, the detailed description of the operation and structure of the second detection part 111 may be omitted.

[68] The matching part 112 is placed between the short range communication module 110 or the second detection part 111 and the second antenna 109 to perform the impedance matching between the input terminal and the output terminal. In other words, the fourth matching part 112 performs the impedance matching between the input and output terminals, thereby preventing an NFC reading distance from being reduced due to a hand or surrounding materials.

[69] The controller 113 controls the whole operations of the wireless network device 100.

[70] In particular, the controller 113 controls the operation of the first wireless network module 103 or the second wireless network module 105 according to the entrance state into the first coverage or the second coverage.

[71] In other words, if the wireless network device 100 is not located within the first coverage or the second coverage, the controller 113 deactivates the first wireless network module 103 or the second wireless network module 105 by shutting off the power supplied to the first wireless network module 103 or the second wireless network module 105.

[72] In this case, the controller 113 controls the switching operation of the switching part 102 to output the first wireless signal received through the first antenna 101 to the first detection part 107.

[73] In addition, the controller 109 checks the voltage value output through the first detection part 107, and determines based on the voltage value if the wireless network device 100 enters the first coverage or the second coverage.

[74] In detail, the controller 109 determines if the voltage value of the first detection part 107 is within a preset range. If the voltage value is within the preset range, the controller 109 determines that the wireless network device 100 enters the first coverage or the second coverage.

[75] In addition, if the voltage value is beyond the preset range, the controller 109 determines if the wireless network device 100 is located out of the coverage.

[76] In this case, as shown in FIG. 6, if the wireless network device 100 enters the first coverage or the second coverage, the voltage value may be in the range of 1.5V to 3V.

[77] Therefore, if the voltage value is within the preset range, the controller 113 supplies power to operate at least one of the first and second wireless network modules 103 and

105.

- [78] In other words, if the voltage value within the present range in the state that the first and second wireless network modules 103 and 105 are powered off, the controller 113 outputs a wake-up signal to the first wireless network module 103 or the second wireless network module 105 so that the first wireless network module 103 or the second wireless network module 105 performs a related network service function.
- [79] In this case, the controller 113 outputs the wake-up signal to the first wireless network module 103. In this case, if the first wireless network module 103, which has received the wake-up signal, normally operates, the controller 113 maintains a present state. However, if the first wireless network module 103, which has received the wake-up signal, abnormally operates (does not operate), the controller 113 outputs the wake-up signal to the second wireless network module 105, and powers off the first wireless module 103 that has received the wake-up signal.
- [80] In addition, when the wireless network device 100 is located in the first coverage or the second coverage so that one of the first and second wireless network modules 103 and 105 operates, the controller 113 controls the switching part 102 to switch to the path corresponding to the operating wireless network module.
- [81] Meanwhile, the controller 113 determines if the wireless network device 100 enters in the third coverage by using the voltage value output through the second detection part 111. In this case, the determination of the entrance into the third coverage has been already described in the process of determining the operation of the first detection part 107 and the entrance into the first coverage and the second coverage. Accordingly, the detailed description thereof will be omitted.
- [82] If the voltage value output through the second detection part 111 is within a preset range, the controller 113 determines that the wireless network device 100 enters the coverage. Accordingly, the controller 113 supplies power to the short range communication module 110.
- [83] In this case, as the controller 113 supplies the power to the short range communication module 110, the controller 113 sets a mode so that the short range communication module 110 operates in one of the first and second modes. The first mode is the tag mode, and the second mode is the reader mode.
- [84] If the operating mode of the short range communication module 110 is not set, the controller 113 controls the short range communication module 110 so that the short range communication module 110 operates in the tag mode. Accordingly, the tag identification information, which has been previously stored, is transferred to an external device through the second antenna 109.
- [85] In addition, the controller 113 determines if the identification information, which is transferred from an external tag through the second antenna 100, exists as the short

range communication module 110 operates. If the transferred identification information exists, the controller 113 sets the operating mode of the short range communication module 110 to the second mode (reader mode) to read the identification information of the external tag.

[86] In addition, the controller 113 determines if the operating mode of the short range communication module 110 is set by the user before power has been supplied to the short range communication module 110. In addition, the controller 113 controls the short range communication module 110 so that the short range communication module 110 operates in the operating mode set by the user.

[87] As described above, according to the wireless network device 100 of the embodiment, when the wireless network device 100 enters a predetermined coverage, operating power can be applied to the module corresponding to the coverage. Thereafter, if the wireless network device 100 is out of the coverage, the operating power applied to the module is shut off. Accordingly, the inconveniences occurring when using a network function not only can be solved, but the efficiency of the network function can be improved. Accordingly, power consumption can be reduced.

[88] FIGS. 7 and 8 are flowcharts showing the operating method of the wireless network device 100 according to one embodiment of the disclosure.

[89] Referring to FIG. 7, the first wireless signal is detected through the first antenna 101 (step S701). In this case, the first wireless signal may have a voltage value representing a predetermined intensity when the wireless network device 100 enters the first coverage or the second coverage. However, if the wireless network device 100 does not enter the first coverage or the second coverage, the first wireless signal may not be detected.

[90] Thereafter, the entrance of the wireless network device 100 into the first coverage or the second coverage is determined by using the intensity of the first wireless signal (step S702).

[91] In other words, when the wireless network apparatus 100 enters the first coverage or the second coverage, since the intensity of the first wireless signal is within the range of 1.5V to 3.0V, a determination is made if the intensity of the wireless signal is within the range of 1.5V to 3.0V.

[92] Thereafter, if the wireless network device 100 enters the first coverage or the second coverage, power is supplied to a specific module to perform functions corresponding to the coverage which the wireless network device 100 enters.

[93] To this end, power is primarily supplied to the first wireless network module 103 so that the first wireless network module 103 can be operated (step S703).

[94] Before the first wireless network module 103 is operated, if the intensity of the first wireless signal is beyond the range, determination is made that the wireless network

device 100 is located out of the coverage. Therefore, the power supplied to the first and second network modules 103 and 105 are shut off (step S704).

[95] After the step S703, a determination is made if the first wireless network module 103 receiving the power normally operates (step S705).

[96] In other words, the determination is made if the coverage is the first coverage corresponding to the first wireless network module 103.

[97] Thereafter, if the first wireless network module 103 normally operates, the power supplied to the first wireless network module 103 is maintained. Accordingly, the function corresponding to the first wireless network module 103 is performed (step S706).

[98] Meanwhile, if the first wireless network module 103, which has received the power, abnormally operates, the power supplied to the first wireless network module 103 is shut off. Accordingly, the power is supplied to the second wireless network module 105 so that the second wireless network module 105 can be operated (step S707).

[99] Thereafter, the function corresponding to the second wireless network module 105 is performed (step S708).

[100] In addition, referring to FIG. 8, the second wireless signal received through the second antenna 109 is detected (step S801). In this case, the second wireless signal may have a voltage value representing a predetermined intensity if the wireless network device 100 enters the third coverage. In addition, the second wireless signal may be not detected if the wireless network device 100 does not enter the third coverage area.

[101] Thereafter, based on the intensity of the second wireless signal, a determination is made if the wireless network device 100 enters the third coverage (step S802).

[102] In other words, if the wireless network device 100 enters the third coverage, the intensity of the second wireless signal is within the range of 1.5V to 3.0V. Accordingly, a determination is made if the intensity of the second wireless signal is within the range of 1.5V to 3.0V.

[103] In this case, if the wireless network device 100 does not enter the third coverage, the power supplied to the short range communication module 110 is shut off (step S803).

[104] In addition, if the wireless network device 100 enters the third coverage, power is supplied to the short range communication module 110, so that the short range communication module 110 is operated (step S804).

[105] In this case, the impedance matching is performed between the input and output terminals for the reliability of the second wireless signal (step S805).

[106] The short range communication module 110 is operated in a mode (reader mode or tag mode) corresponding to the preset condition (step S806).

[107] As described above, according to the embodiment, operating power is applied to a

module corresponding to a predetermined network coverage if the wireless network device enters the network coverage, and power applied to the module is shut off if the wireless network device is located out of the coverage, thereby not only solving the inconveniences occurring when using the network function, but improving the efficiency of a network function while reducing power consumption.

[108] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

- [Claim 1] A wireless network device comprising:
an antenna to transceive a wireless signal;
a network communication module to receive the wireless signal received through the antenna or to output the wireless signal to the antenna;
a detection part to detect the wireless signal received through the antenna and to determine if the wireless network device enters a coverage area by using the detected wireless signal; and
a controller to supply power to the network communication module if the wireless network device enters the coverage area and to shut off the power supplied to the network communication module if the wireless network device is out of the coverage.
- [Claim 2] The wireless network device of claim 1, wherein the detection part comprises:
a magnifying part to increase the wireless signal received through the antenna at a preset magnification;
a limiting part to limit an output value of the magnifying part; and
a regulator to stabilize an output value of the limiting part.
- [Claim 3] The wireless network device of claim 2, wherein the controller supplies the power to the network communication module if the output value of the regulator is within a preset range, and shuts off the power supplied to the network communication module if the output value of the regulator is beyond the preset range.
- [Claim 4] The wireless network device of claim 3, wherein the preset range satisfies a voltage value in a range of 1.5V to 3V.
- [Claim 5] The wireless network device of claim 1, wherein the network communication module includes at least one of a Wi-Fi module, a Bluetooth module, and a short range communication range, and wherein the coverage includes at least one of a Wi-Fi coverage, a Bluetooth coverage, and a short range communication coverage.
- [Claim 6] The wireless network device of claim 1, further comprising a switching part having one end connected to the antenna and an opposite end selectively connected to the network communication module or the detection part to control a path of the wireless signal, wherein the controller controls the path of the wireless signal according to entrance of the wireless network device into the coverage.

- [Claim 7] The wireless network device of claim 1, wherein the antenna comprises:
a first antenna to transceive a first wireless signal having a first frequency band; and
a second antenna to transceive a second wireless signal having a second frequency band.
- [Claim 8] The wireless network device of claim 7, wherein the first frequency band includes a frequency band of 2.4GHz, and the second frequency band includes a frequency band of 13.56MHz.
- [Claim 9] The wireless network device of claim 7, wherein the network communication module comprises first and second network communication modules to make data communication with the first antenna, and wherein the controller supplies the power to one of the first and second network modules according to a type of the first wireless signal if the entrance of the wireless network device into the coverage is detected based on the first wireless signal received through the first antenna.
- [Claim 10] The wireless network device of claim 9, wherein the network communication module further comprises a third network communication module performing data communication with the second antenna, and wherein the controller operates the third network communication module in one of a plurality of operating modes if the entrance of the wireless network device into the coverage is detected based on the second wireless signal received through the second antenna.
- [Claim 11] The wireless network device of claim 10, wherein the operating modes include a tag mode and a reader mode, and wherein the operating mode of the third network communication module is determined according to one of an existence state of identification information transferred from an external tag and an operating mode preset by a user.
- [Claim 12] The wireless network device of claim 1, further comprising a matching part provided between the antenna and the detection part to perform impedance matching.
- [Claim 13] A method for controlling an operation of a wireless network device, the method comprising:
receiving a wireless signal;
detecting intensity of the wireless signal that has been received;
determining by using the intensity of the wireless signal if the wireless network device enters a coverage;

activating a network module if the wireless network device enters the coverage; and
deactivating the network module if the wireless network device is out of the coverage.

[Claim 14]

The method of claim 13, wherein the detecting of the intensity of the wireless signal comprises:

increasing a value of the received wireless signal at a predetermined magnification;

limiting a maximum value of the increased wireless signal; and
stabilizing the value of the wireless signal by smoothing the limited value, and

wherein the determining of the wireless signal if the wireless network device enters the coverage comprises determining if the limited value of the increased wireless signal is within a preset range.

[Claim 15]

The method of claim 13, wherein the activating of the network module comprises:

activating a first network module if the wireless network device enters the coverage;

determining an operating state of the first network module that is activated;

maintaining an activation state of the first network module if the operating state of the first network module is normal; and

deactivating the first network module if the operating state of the first network module is abnormal and activating the second network module.

[Claim 16]

The method of claim 13, wherein the receiving of the wireless signal comprises:

receiving a first wireless signal having a first frequency band; and

receiving a second wireless signal having a second frequency band, and
wherein the deactivating of the network module comprises:

activating a network module to transceive the first wireless signal if the entrance of the wireless network device into the coverage is determined based on the first wireless signal; and

activating a network module to transceive the second wireless signal if the entrance of the wireless network device into the coverage is determined based on the second wireless signal.

[Claim 17]

The method of claim 16, wherein the first frequency band has a frequency band of 2.4GHz, and the second frequency band has a

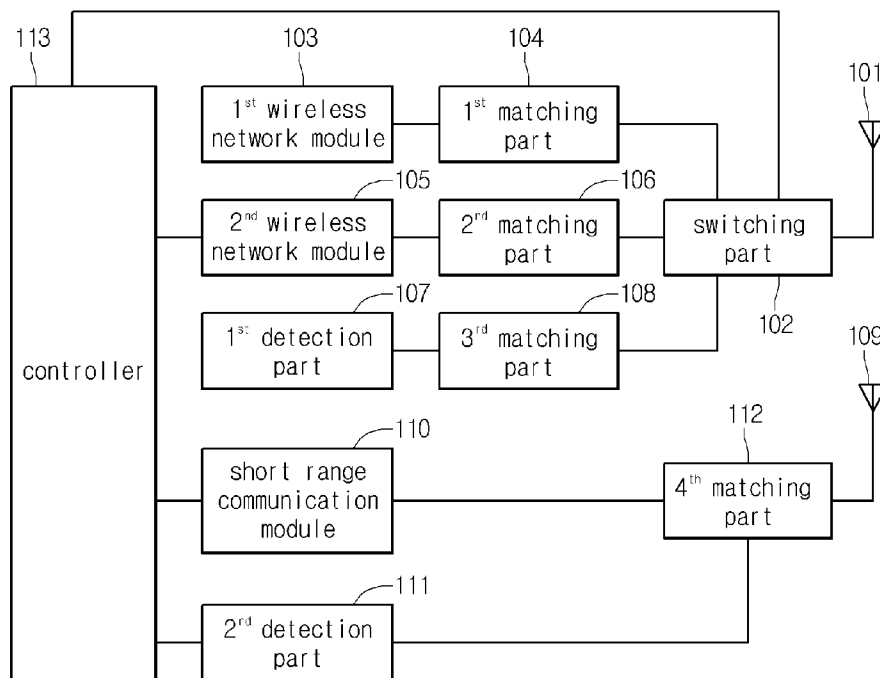
frequency band of 13.56MHz.

[Claim 18] The method of claim 13, further comprising determining an operating mode of the network module if the entrance of the wireless network device into the coverage is determined.

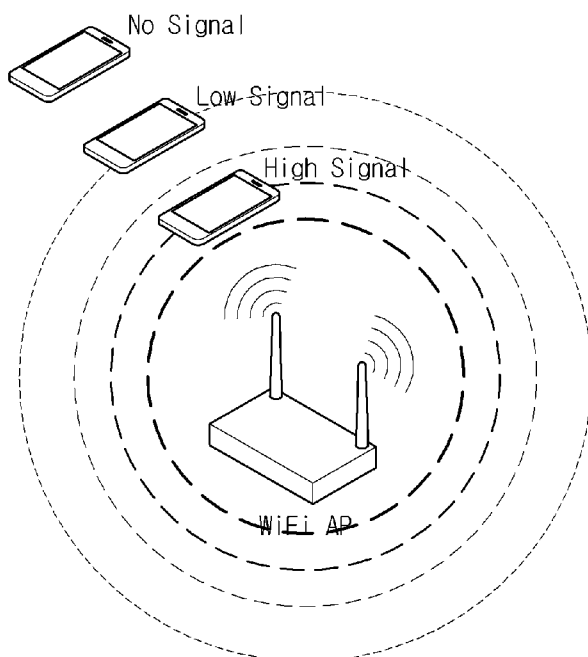
[Claim 19] The method of claim 18, wherein the operating mode includes a tag mode and a read mode, and wherein the determining of the operating mode of the network module comprises determining the operating mode of the network module according to one of conditions including existence of identification information transmitted from an external tag and an operating mode preset by a user.

[Claim 20] The method of claim 13, wherein the wireless signal is output through a first path including the network module if the network module is activated, and output through a second path without the network module if the network module is deactivated.

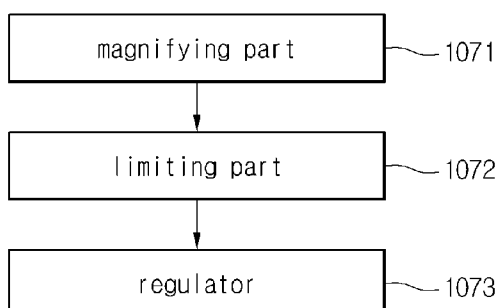
[Fig. 1]

100

[Fig. 2]

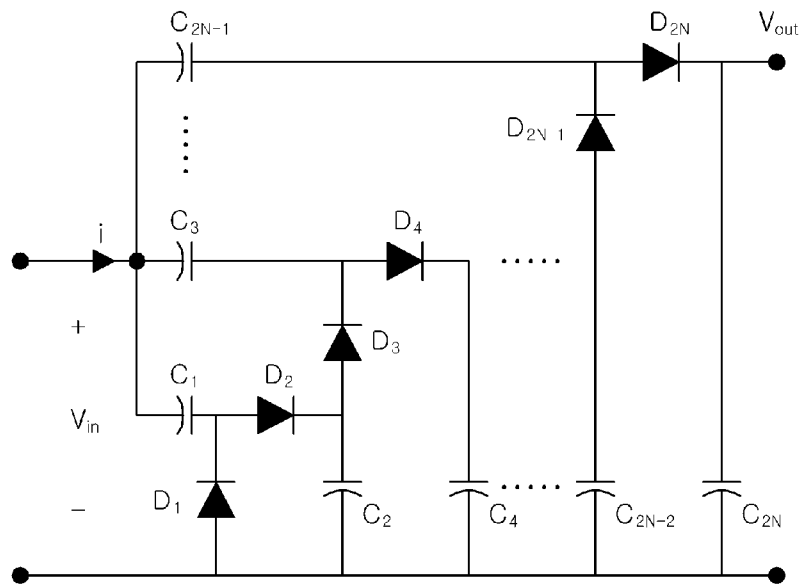


[Fig. 3]

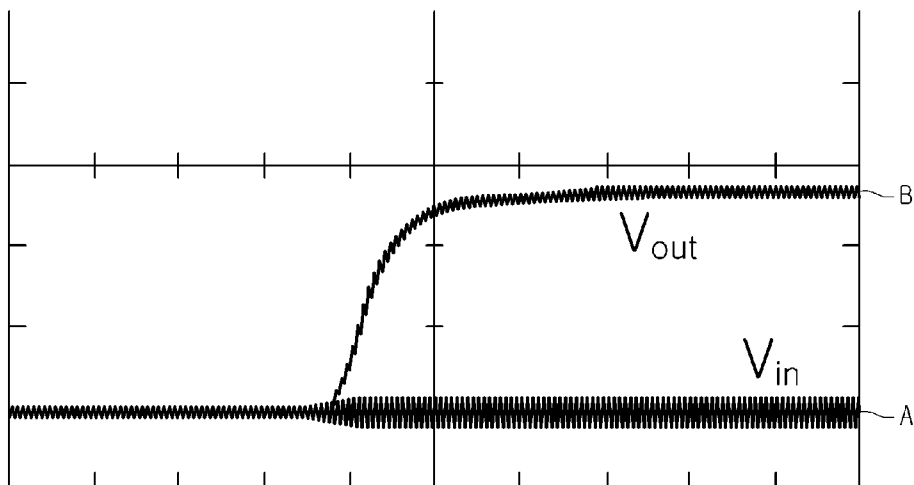
107

[Fig. 4]

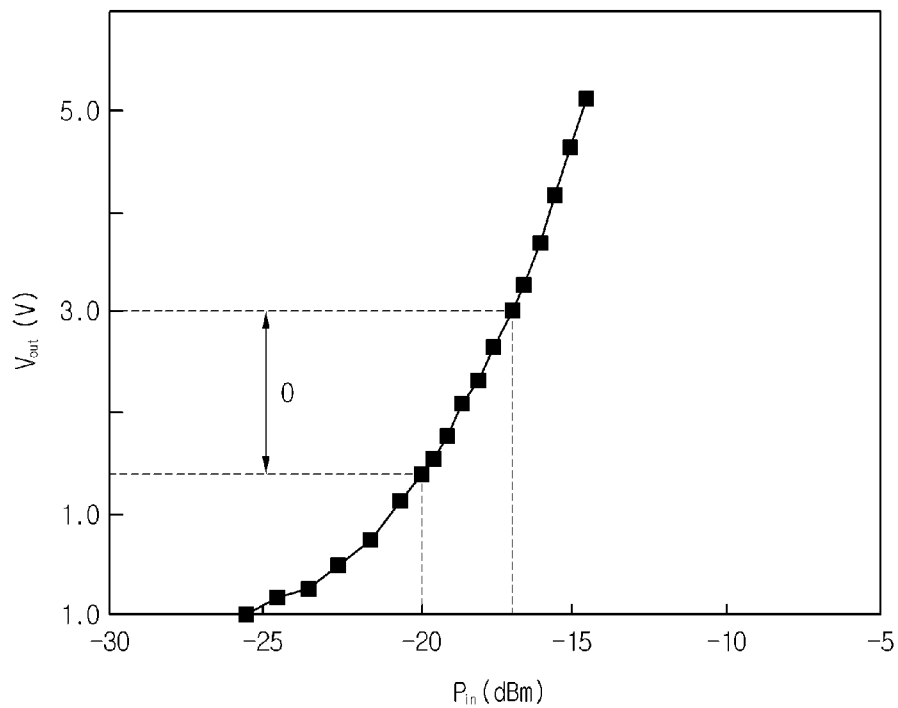
1071



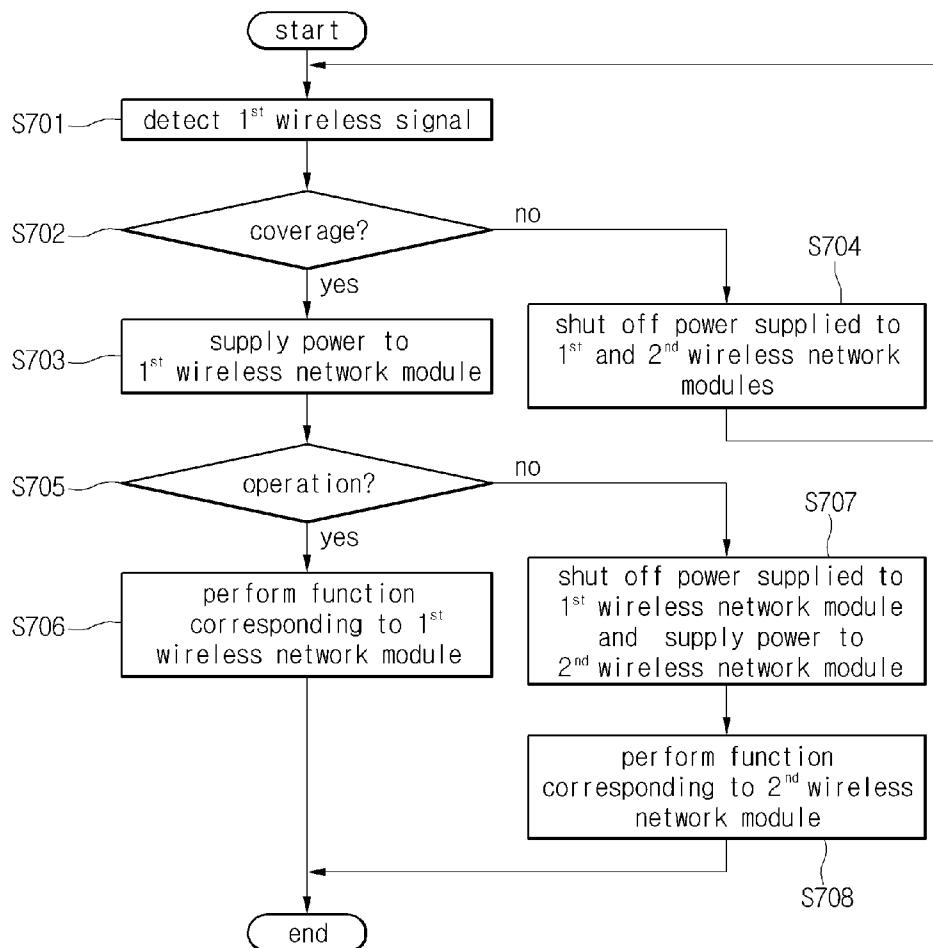
[Fig. 5]



[Fig. 6]



[Fig. 7]



[Fig. 8]

