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(54) **A SECURITY MONITORING SYSTEM**

SICHERHEITSÜBERWACHUNGSSYSTEM

SYSTÈME DE SURVEILLANCE DE LA SÉCURITÉ

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Description

Technical field

[0001] The present invention relates to a security monitoring system for monitoring premises, a method of operating a security monitoring system, a camera node and a control unit for such a system, a method of operating a control unit, and a method of controlling data transmission from a camera node to a control unit in such a system.

Background

[0002] Security monitoring systems for monitoring premises typically provide a means for detecting the presence and/or actions of people at the premises, and reacting to detected events. Commonly such systems include sensors to detect the opening and closing of doors and windows, movement detectors to monitor spaces for signs of movement, microphones to detect sounds such as breaking glass, and image sensors to capture still or moving images of monitored zones. Such systems may be self-contained, with alarm indicators such as sirens and flashing lights that may be activated in the event of an alarm condition being detected.

[0003] Alternatively, a security monitoring system may include an installation at a premises, domestic or commercial, that is linked to a Central Monitoring Station (CMS) where typically human operators manage the responses required by different alarm and notification types.

[0004] Such installations typically include a central unit (also known as a control unit) that is coupled to the sensors, detectors, cameras, etc. ("nodes"), and which processes received notifications and determines a response. The control unit is commonly linked to the various nodes wirelessly, rather than by wires, since this facilitates installation and may also provide some safeguards against sensors/detectors effectively being disabled by disconnecting them from the control unit. Similarly, for ease of installation and to improve security, the nodes of such systems typically include an autonomous power supply, such as a battery, rather than being mains powered.

[0005] In centrally monitored systems, the central unit at the premises installation typically processes notifications received from the nodes in the installation, and notifies the Central Monitoring Station of only some of these, depending upon the settings of the system and the nature of the detected events. In such a configuration, the central unit at the installation is effectively acting as a gateway between the nodes and the Central Monitoring Station.

[0006] In both centrally-managed and self-contained security monitoring systems one of the most important issues, from a practical perspective, is the battery life of the nodes of the installation - that is, the battery life of the various detectors, sensors, cameras. Obviously, if a node's battery loses sufficient power, the node may be unable to sense a change of state or to contact the central unit, and consequently the security installation develops a weak spot where an intruder may gain access to the premises undetected or otherwise have their actions undetected. For centrally-managed systems it is usually the responsibility of the company running the system, rather than the premises owner or occupier, to change batteries, and obviously the shorter the battery life in nodes, the more frequently site visits need to be made and the greater the administrative cost. Consequently, controlling power consumption in the nodes is a high priority. Further to this, it is very important to ensure a swift and timely delivery of notifications and alarms from the node to the CMS so that necessary and appropriate actions and interventions can be organised. Perhaps surprisingly, from a practical perspective, delaying the initial delivery of a notification of an incident to the CMS by even a second or less can have very significant consequences - and this is because of the effective quantisation of the availability of response options. For example, there will always be a limited number of available first responders, and response vehicles (collectively "first responder resources"), and in general once a first responder resource has been allocated to a first incident, that resource will not be available for allocation to another incident until stood down from the first. In other words, even a momentary delay in delivering the initial incident report to the CMS can lead to delays of minutes or hours in delivering the necessary response to the incident - and of course the consequence of a delayed response may quite literally be fatal. It is known to provide video cameras for security monitoring systems with Wi-Fi radios to enable them to transmit video data to a central unit of the monitoring system over Wi-Fi. The Wi-Fi radio, and the video camera, are turned on in the event that a PIR associated with the video camera detects movement. Unfortunately, Wi-Fi radios tend to drain batteries quite quickly, and such an arrangement typically requires large capacity batteries, and/or an external power source, if frequent battery replacement or power loss are to be avoided. Another disadvantage of using Wi-Fi in a security system is that one needs to monitor or supervise the nodes of the system. This is done by periodic messaging, and Wi-Fi consumes significant power in performing this simple task. It would be beneficial if an alternative approach could be provided to enable, for example, video data to be transmitted at high speed between a node and a central unit of a security monitoring system, to enable timely action to be taken based on the information contained in the video data, in such a way as to avoid excessive power consumption at the node, thereby prolonging battery life at the node.

[0007] US 2009/0189981 A1 concerns video delivery systems using wireless cameras. A wireless camera can be configured to generate a video feed, operate a first radio to transmit at least a portion of the video feed to a base station over a first wireless channel, and operate a second radio in a polling mode to receive information over a second wireless channel. The base station can be configured to receive the video feed from the wireless camera. The base station can reserve the first wireless channel for the wireless camera by transmitting on the first wireless channel, wherein the base station transmits information to the wireless camera over the second wireless channel to instruct the wireless camera to transmit on the first wireless channel at a known time. The base station can be configured to process the video feed and deliver the processed video feed to a video portal for remote viewing of the video feed.

[0008] The low-bandwidth radio can be, e.g., a low-overhead, long-range radio transceiver. The low-bandwidth radio can be a radio frequency and baseband chipset that implements any low power, low-bandwidth technique that will likely have longer reach and higher reliability than the bulk high-bandwidth radio. One purpose of the low-bandwidth radio is to transfer status, control and alarm information to and from the base station. In receive mode, the power consumption can be extremely low in comparison to the bulk radio and can be low enough to allow the low-bandwidth radio to operate continuously. Using this approach, the low-bandwidth radio has a low power mode where the radio can be activated to respond to a short duration, beacon transmission that originates from the base station. The bit stream information contained in the beacon transmission can identify the correct camera and can also have other command/status information. In another implementation, the low-bandwidth radio can be used as a backup when the bulk radio fails or is disabled, e.g., due to jamming signals. In this manner, reliability of the wireless camera can be increased because there are a primary high-bandwidth radio and secondary low-bandwidth radio for redundancy. In certain implementations, the high-bandwidth radio and the low-bandwidth radio can be in the same transceiver block.

Summary of the invention

[0009] According to a first aspect, the present invention provides a security monitoring system for a building or a secured space within a building, the system being operatively connected to a monitoring station, the system including: a control unit for controlling, arming and disarming the security monitoring system, and having a first radio frequency transceiver which can support a first maximum bitrate, and a second radio frequency transceiver which can support a second maximum bitrate lower than the first bitrate, and a controller for controlling the radio frequency transceivers; a camera node having a node controller; an image sensor for capturing images;

> a primary node radio frequency transceiver, for communication with the control unit;
> a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver; the node controller of the camera node being configured to: transmit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver and as a second image file using the secondary node radio frequency transceiver, the first image file having a higher resolution and a larger size than the second image file; the control unit being configured, on reception of the first to arrive of the first or second image files, to transmit the first arrived file to the monitoring station, and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station.

[0010] Such a system is advantageous in that it provides useful image data to the central monitoring station as soon as possible, even where there are adverse network conditions, thereby enabling determination of an appropriate response as quickly as possible. In addition, by providing both a higher resolution image and a lower resolution image, as soon as these can both be delivered, the system provides the added advantage that an early response to an incident can be provided without needing to wait for the arrival of a higher resolution image, but that a higher resolution image is made available as soon as possible thereby enabling identification of actors involved in a notified incident.

[0011] According to a further aspect of the invention, there is provided a method of operating a security monitoring system for a building or a secured space within a building, the system being operatively connected to a monitoring station, the system including: a control unit for controlling, arming and disarming the security monitoring system, and having a first radio frequency transceiver which can support a first maximum bitrate, and a second radio frequency transceiver which can support a second maximum bitrate lower than the first bitrate, and a controller for controlling the radio frequency transceivers; a camera node having a node controller; an image sensor for capturing images; a primary node radio frequency transceiver, for communication with the control unit; a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver;
the method comprising: the node controller of the camera node transmitting a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver and as a second image file using the secondary node radio frequency transceiver, the first image file having a higher resolution and a larger size than the second image file; the control unit transmitting, on reception of the first to arrive of the first or second image files, the first arrived file to the monitoring station, and thereafter, if the first arrived file was the second im-

age file, on arrival of the first image file, transmitting the first image file to the monitoring station.

[0012] According to a further aspect of the present invention, there is provided a control unit for a security monitoring system for a building or a secured space within a building, the system being operatively connected to a monitoring station, and the system including a camera node having:
a node controller; an image sensor for capturing images; a primary node radio frequency transceiver, for communication with the control unit; a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver; the control unit having: a first radio frequency transceiver which can support a first maximum bitrate, and a second radio frequency transceiver which can support a second maximum bitrate lower than the first bitrate, and a controller for controlling the radio frequency transceivers; the control unit being configured, on reception of a captured image file from the camera node, the received image file having a first ID, to transmit the received image file to the monitoring station, and thereafter, if a second image file is received having the first ID, to transmit the second image file to the monitoring station in the event that the second image file has a higher resolution and a larger size than the first image file.

[0013] According to a further aspect of the present invention there is provided a method of operating a control unit of a security monitoring system for a building or a secured space within a building, the system being operatively connected to a monitoring station, and the system including a camera node having: a node controller; an image sensor for capturing images; a primary node radio frequency transceiver, for communication with the control unit; a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver; the control unit having: a first radio frequency transceiver which can support a first maximum bitrate, and a second radio frequency transceiver which can support a second maximum bitrate lower than the first bitrate, and a controller for controlling the radio frequency transceivers; the method comprising: the control unit transmitting, on reception of a captured image file from the camera node, the received image file having a first ID, the received image file to the monitoring station, and thereafter, if a second image file is received having the first ID, transmitting the second image file to the monitoring station in the event that the second image file has a higher resolution and a larger size than the first image file .

[0014] According to a further aspect of the present invention there is provided a camera node for a security monitoring system for a building or a secured space within a building , the system including a control unit for controlling, arming and disarming the security monitoring system and the control unit being operatively connected to a monitoring station;

the camera node comprising: a node controller; an image sensor for capturing images;
a primary node radio frequency transceiver, for communication with the control unit;
a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver; and the node controller being configured to: transmit to the control unit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver and as a second image file using the secondary node radio frequency transceiver, the first image file having a higher resolution and a larger size than the second image file, so that the control unit can, on reception of the first to arrive of the first or second image files, transmit the first arrived file to the monitoring station, and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station.

[0015] According to a further aspect of the present invention there is provided a method of controlling data transmission from a camera node to a control unit of a security monitoring system, the control unit being operatively connected to a monitoring station; the camera node including a node controller; an image sensor for capturing images;

a primary node radio frequency transceiver, for communication with the control unit;
a secondary node radio frequency transceiver, to receive control messages from the control unit, the primary node radio frequency transceiver supporting a higher maximum bitrate than the secondary node radio frequency transceiver; the method comprising: the node controller transmitting to the control unit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver and as a second image file using the secondary node radio frequency transceiver, the first image file having a higher resolution and a larger size than the second image file, so that the control unit can, on reception of the first to arrive of the first or second image files, transmit the first arrived file to the monitoring station, and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station.

Brief description of the drawings

[0016] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is an overview of a security monitoring system according to a first aspect of the invention;
Figure 2 is a schematic drawing showing in more detail features of the gateway or central unit of Figure 1; and
Figure 3 is a schematic drawing showing features of a two-transceiver camera node of the security monitoring system according to an embodiment of the invention.

Specific description

[0017] One of the principal components of node power consumption is activity of the circuitry responsible for wireless, typically RF, communication with the control unit 110. Generally, in high security systems, nodes are in bidirectional contact with the central unit, being able to receive as well as send information to the control unit 110. For example, some security monitoring installations may operate on a synchronised basis, with each of the nodes having an internal clock that must be kept synchronised with the master clock in the control unit 110. To maintain synchronisation, the central unit may send out periodic beacon signals, and the nodes periodically listen for these and adjust their clock synchronisation as necessary. Such synchronisation can help ensure that plural nodes can communicate with the central unit, in the event of detecting an incident, without the nodes' transmissions colliding. Power consumption considerations also influence the choice of RF communication mode, and regular speed transmission is typically possible between the nodes and the central unit, and vice versa. Typically such low power radio systems make use of ISM radio channels and protocols designed to reduce power consumption.

[0018] When not listening for synchronisation beacons, and when not sending an event notification, the radios of the nodes are typically in a low-power consumption sleep state. Some detectors and sensors, such as magnetic switches used on doors and windows, and PIR detectors, consume virtually no power when waiting to detect an event. But other detectors, such as cameras, need to have high power functionality shut down to avoid consuming power, typically only being powered up when trigged by low power functionality of the detector, when another sensor detects movement or when instructed to power up by the control unit 110.

[0019] The use of regular speed transmission is possible and in many cases advantageous because, in general, nodes can notify the central unit of events with only very modest quantities of data. The main exceptions are sensors which provide image data, image sensors - generally cameras of some kind, and those which provide sound data - microphones, which can each produce significant quantities of data. Although it is of course possible to send such large quantities of data over a low bit rate channel, this takes considerable time and consequently consumes a lot of power. If an event has been detected by a sensor such as a PIR or a door/window opening sensor, and there is for example a video camera able to monitor a zone including the location of the event, it would be desirable to be able to transfer useable images and video frames to the central unit as soon as possible so that the nature and scale of the threat can be determined - and so that in a centrally monitored system the images/video sequence can be forwarded to the CMS 200 for analysis and action. Currently such analysis is typically performed by human operators, but it is likely that in the near future artificial intelligence will be used to supplement, and eventually perhaps replace or largely replace human operators. But in any event, the need exists for images and video sequences to be available for analysis at the CMS as soon as possible after an incident is first detected.

[0020] Figure 1 is an overview of a security monitoring system according to a first aspect of the invention. The figure shows a stylised domestic installation 100 of a monitoring system according to an embodiment of the invention, and a monitoring centre (Central Monitoring Station) 200 that supports the domestic installation. The installation 100 includes a gateway or control unit, 110, which is connected to the monitoring centre 200 by means of a data connection 150. The data connection 150 may be provided over a phone line, a broadband internet connection, Ethernet, a dedicated data connection, or wirelessly, for example using an LTE or GSM network, and in general multiple of these options will exist for any installation, so that there is security of connection between the gateway 110 and the monitoring centre 200. For additional security, the central unit 110, or a sensor in communication with the central unit 110 and the monitoring centre may both be provided with means to support an ISM radio connection, for example in the European 863 to 870MHz frequency band, preferably one configured to resist jamming.

[0021] The domestic installation 100 involves a typical arrangement where the exterior doors 120 and windows 124 are fitted with sensors 114, for example magnetic contact sensors, to detect opening of the door or window. Each of the rooms of the building having the installation may be provided with a combined fire/smoke detector 116, as shown in the Figure. In addition, several rooms have movement detectors 118, such as passive infrared (PIR) detectors, to detect movement within an observed zone within the room. The front door 120 of the building leads into a hall which also has internal doors to various rooms of the house. The hall is monitored by a video camera 125 having an associated motion detector. Similarly, the kitchen which is entered from the back door 121 is monitored by a video camera 126 which includes a motion detector. Each of the sensors, detectors and video cameras, which may throughout this specification be referred to generically as nodes, includes a wireless interface by means of which it can communicate with the central unit 110. The central unit 110 includes first and second antennas 130 and 132 for communication with the sensors, detectors and video cameras. In addition, the central unit 110 may include at least one further antenna 134 for wireless communication with the monitoring centre. Each of these antennas may be connected to a corresponding transceiver, not shown. Additionally, the central unit 110 may include a dedicated antenna arrangement for Wi-Fi, for example to connect to camera nodes 125 and also to connect to a domestic Wi-Fi access point 180. The Wi-Fi access point may also provide one of the means of access to the monitoring centre 200. Optionally, the central unit 110 may itself function as a Wi-Fi access point, with a connection (e.g. a wired connection) to an Internet service provider, to provide Wi-Fi coverage within the building in place of the Wi-Fi access point 180.

[0022] Some installations may include more than one control unit (CU), for example two control units, to provide a failsafe backup. In general in such multi CU installations the two CUs work together in parallel. However, in some installations the two CUs may work in parallel in communication with some of the nodes of the domestic installation and individually in communication with other nodes of the domestic installation. The latter may be the case when CU is used as a range extender in domestic installations covering larger installations. That is, if there are two CUs, they work in parallel but a node is only logged into one of the CUs at a time, and that CU is responsible for all communication with the node while the other CU can hear all and understand all communication between the other two - if it is not a range extension scenario.

[0023] In a domestic installation 100, the control unit 110 typically has knowledge of all nodes comprised in the installation 100. Each node may have a unique node identifier or serial number that is used to identify the node. Each node may have different functionalities associated with it, such as e.g. video capabilities, motion detection, still imaging, audio recording, communication speeds etc. Some or all capabilities may be communicated from the node to the control unit during a login procedure during setup of the installation 100. Alternatively and/or additionally, some or all capabilities may be communicated to the control unit from the node upon request from the control unit 110. Alternatively and/or additionally, some or all capabilities may be retrieved, by the control unit 110, from the CMS 200.

[0024] Figure 2 is a schematic drawing showing in more detail features of a gateway or control unit 110 of Figure 1. The control unit 110 includes a first transceiver 230 coupled to the first antenna 130. The transceiver 230 can both transmit and receive, but cannot both transmit and receive at the same time. Thus, the transceiver 230 operates in half duplex, and may use the same frequency for transmit and receive, or different frequencies. The transceiver 230 is coupled to a controller 250 by a bus. The controller 250 is also connected to a network interface 260 by means of which the controller 250 may be provided with a wired connection to the Internet and hence to the monitoring centre 200. The controller 250 is also coupled to a memory 270 which may store data received from the various nodes of the installation - for example event data, sounds, images and video data, as well as stored programs to control the operation of the control unit. In general, the control unit acts as a router providing a path to the central monitoring station for audio and video (more generally image) data - the storing of such data at the control unit is optional. The control unit 110 includes a power supply 262 which may be coupled to a domestic mains supply, from which the control unit 110 generally derives power, and a backup battery pack 264 which provides power to the control unit in the event of failure of the mains power supply.

[0025] The control unit 110 also includes a second transceiver 240 which, unlike the first transceiver, supports the use of Wi-Fi protocols (using some variant of IEEE 802.11), and associated antenna arrangement 242, which may be used for communication with any of the nodes that is Wi-Fi enabled, for example with one or camera nodes. A Wi-Fi enabled camera node may include or be associated with a motion detector and have video and/or still picture capabilities. Such a Wi-Fi node (whether a camera node or not) may, and preferably will, include both means for Wi-Fi communication and means for regular (non-Wi-Fi) ISM communication.

[0026] The control unit 110 may also include an interface enabling bidirectional communication over a Public Land Mobile Network (PLMN), such as GSM or LTE, and one is shown in the Figure as interface 244 with antenna arrangement 246. Optionally, a third antenna 134 and associated ISM transceiver 234 may be provided for communication with the monitoring centre 200 over, for example, the European 863 to 870MHz frequency band.

[0027] Throughout this specification, references to Wi-Fi relate to systems and elements operating according to some variant of the 802.11 standard. Conversely, systems, devices and elements referred to as ISM should not be taken to embrace Wi-Fi, unless the context requires otherwise.

[0028] The first transceiver is tuneable ISM device, operating for example in the European 863 to 870MHz frequency band or in the 915MHz band (which may span 902-928MHz or 915-928MHZ depending upon the country). The first transceiver may be tuned, i.e. is tuneable, to the frequencies within the regulatorily agreed subbands within this defined frequency band. As will be explained, first transceiver 230 generally provides a control channel for communication between the control unit and the nodes of the system, but may also be used for other purposes. Whereas the Wi-Fi transceiver 240 is used to support a high speed channel (that is one having a higher symbol rate or bitrate than the control channel provided by the first transceiver) that is not supported by the first transceiver. But the controller of the gateway may be configured to offer one or more communication channels operated over the first transceiver that provide a higher transmission speed than is provided by control channel provided by the first transceiver.

[0029] Figure 3 is a schematic drawing showing features of a Wi-Fi enabled node of the security monitoring system according to an embodiment of the invention. In this case the node is a camera node like the video camera 126 which is mounted in the kitchen, as shown in figure 1, although it could instead be a camera to produce only still images or sequences of still images. The Wi-Fi node includes one radiofrequency node transceiver 340, coupled to an antenna 330, primarily for the exchange of control messages with the control unit. This transceiver may be referred to as the secondary transceiver. The camera node also includes a primary radiofrequency node transceiver 350, coupled to an antenna 355, which supports the use of Wi-Fi protocols and which hence can communicate with the second transceiver of the control unit 110. A controller 360 is coupled to the primary and secondary transceivers of the node, and also to the image sensor 310 of the video camera. The controller 360 may also be coupled to a motion sensor 320, which may be an integral motion sensor, as shown, or one mounted remotely, and to a memory 370. An autonomous power supply, for example a battery, 380, provides power to the node, in particular powering the controller, transceivers, image sensor and integral motion sensor (if present). The autonomous power supply may include one or more elements to enable energy to be obtained from the environment - such as one or more photovoltaic elements, an RF energy harvesting arrangement, and even a compact wind turbine arrangement. The video camera also includes a lens arrangement 315 for forming an image on the image sensor 310. Optionally, the node includes an infrared light source 325, and possibly a source of visible light, suitable for illuminating images detectable by the image sensor. The secondary node transceiver 340 is tuneable. In particular, the node transceiver 340 can be tuned to frequencies to match those transmitted by or receivable by the first transceiver of the gateway 110. Likewise, the secondary node transceiver 350 is tuneable. In particular, the secondary node transceiver 350 can be tuned to frequencies to match those transmitted by or receivable by the second transceiver of the control unit 110.

[0030] When a motion detector, for example a PIR (passive infrared) sensor of or associated with a camera node, detects motion it transmits a signal to the control unit 110 using the secondary node transceiver in control channel mode. Depending on the settings of the system, the control unit 110 may forward this movement detected signal to the central monitoring station. If the motion detector reporting the detection of motion is, for example, in or associated with a video camera, the control unit 110 will know this from the identity of the node that transmitted the motion detected signal. The control unit 110 may then send a message to the video camera using the control unit's first transceiver in control channel mode, the message requesting the video camera to transmit video data to the central unit 110 at high speed (e.g. higher bitrate than is used for control signals). Such a request may be for the video camera to stream video data. More generally, the control unit may send a message to an image source, such as a camera, requesting it to transmit image data, in the form of an image file, at high speed. Alternatively, if the

[0031] Trigger events other than the triggering of a movement sensor may also be used to initiate the process. For example, the activation of a node that monitors the status of an entrance to the building or to a controlled space in the building, for example a magnetic switch at a door or window, or detection of a sound, such as that of breaking glass, by a node comprising a microphone, will be transmitted by the relevant node to the control unit 110. The control unit 110 may, depending upon its programming and status, report the event to the CMS 200. Alternatively, a trigger event may be sent from CMS 200 requesting images or audio data from a particular node, this trigger may be used by the control unit 110 to instruct that particular node to transmit the requested images or audio data.

First Example

[0032] A first approach to reducing the time needed to transmit in particular image data to the central monitoring station will now be described.

[0033] If a motion detector of or associated with a camera node detects motion, the camera is activated to capture an image(s) or video. The camera node will then prepare two images or clips. One of the images or clips will be a relatively low resolution (e.g. standard VGA or QVGA) in the form of an image file of modest file size (e.g. 30kB once compressed), while the other image will be of significantly higher resolution (e.g.1080P or 4K,) and in the form of an image file of considerably (which might have a file size possibly in the range 600kB - 2MB) greater size (although the size of the image file once compressed might be in the range of 4 to 10 times the size of the compressed low resolution image file . The smaller image file, (hereinafter the second image file) is transmitted using the secondary transceiver of the node, while the larger image file (hereinafter the first image file) is transmitted using the node's Wi-Fi primary transceiver. The node controller provides the two image files with the same ID.

[0034] The system may be configured such that when the control unit receives an event notification from the motion sensor, the control unit sends a message to the camera node (over a non-Wi-Fi channel) instructing the camera node to transmit image data.

[0035] The idea is that although it is better for the CMS (more particularly the analyst in the CMS) to receive the more detailed image file, it may be that the smaller file sent using the secondary transceiver may actually arrive sooner than that sent via the Wi-Fi transceiver, for example due to congestion of the Wi-Fi network or interference (intentional or not) with transmission over the Wi-Fi network) - and hence the CMS may be able to make an earlier decision based on the smaller image file than would be the case if the CMS had to await the bigger file sent via Wi-Fi.

[0036] It will be appreciated that where the system is configured such that when the control unit receives an event notification from the motion sensor, the control unit sends a message to the camera node (over a non-Wi-Fi channel) instructing the camera node to transmit image data the node's secondary transceiver will already be active - having been used to receive the message from the control unit, the secondary transceiver is likely to be able to begin transmitting its smaller image file before the node's Wi-Fi transceiver has been activated, configured and registered with the Wi-Fi transceiver (effectively the Wi-Fi bases station) of the control unit. It may therefore be the case that even though the node controller nominally initiates the two transmission processes at the same time, the smaller image file transmitted by the node's secondary transceiver may actually arrive before the larger image file sent via Wi-Fi, even if the current radio environment supports high speed transmission over a Wi-Fi channel.

[0037] The control unit 110 forwards to the CMS the first to arrive of the first or second image files. Subsequently, if the first arrived file was the smaller second image file, on arrival of the larger first image file, the control unit will forward the first image file to the CMS. Conversely, of course, the control unit does not forward the smaller second image file to the CMS if the larger first image file with the same ID has already been forwarded to the CMS.

[0038] At the CMS, the human (or AI) analyst reacts to the arrival of the first to arrive image file. If another image file with the same ID arrives at the CMS while the relevant event is still being handled by the analyst, the CMS system substitutes the later arriving image file for the first. The system of the CMS may be configured to notify the operator of the availability of a higher resolution image file. For example, a work station of a human operator may provide an on-screen warning and/or an audible announcement of the updating of the available image.

Second Example

[0039] In an alternative approach, with a camera node which has a primary transceiver which supports a first maximum bandwidth, and a secondary transceiver that supports a second maximum bandwidth lower than the first and which is used for exchanging control signals with the control unit, the secondary transceiver may be used to provide redundancy enabling an image file to be transmitted to the control unit even though that image file sent using the primary transceiver has failed to reach the control unit.

[0040] A camera node may be configured to transmit, possibly in response to receiving a message from the control unit to transmit image data, the image file using just the primary transceiver, or may be configured, as in the first example, to transmit image data by transmitting the image file using both the primary and secondary transceivers. The control unit may be configured to respond to receiving an image file by transmitting an acknowledgement ("ack") message, so that the camera node knows whether or not the transmission of an image file was successful. If the camera node fails to receive an expected ack message in respect of the transmission of an image file using the primary transceiver, it may be configured to attempt to transmit the image file (or a smaller image file) using the secondary transceiver instead.

[0041] With the camera node set up as in the first example, if an ack message is received in respect of an image file transmitted using the secondary transceiver but not in respect of an image file transmitted using the primary transceiver, the camera node may be configured to transmit the higher resolution image file using the secondary transceiver. Although the lower bandwidth of the secondary transceiver will mean that transmission of the larger file will take longer than it should have taken using the primary transceiver, if transmission problems are affecting the higher bandwidth channel the larger file might actually reach the CMS more quickly using the lower bandwidth transceiver instead of the primary transceiver.

[0042] So, for example, in a camera node having a Wi-Fi enabled primary transceiver and a non-Wi-Fi control channel transceiver, an image file intended for transmission using the primary transceiver may instead be sent using the control channel transceiver in the event that an expected ack message in response to attempted transmission of the image file using the primary transceiver is not received.

[0043] It will be appreciated that a low resolution image can enable a person/ not a person decision to be made - e.g. distinguishing between the presence of a non-human animal or other source of movement, such as vegetation being moved by the wind, whereas a higher resolution image file may enable a description to be given of the person or persons captured by the image, or to enable the identity of the person or persons captured by the image - e.g. to enable the householder to be told that one or other children of the house are present. And clearly it is therefore useful to provide a higher resolution file to the CMS even after the supply of a low resolution image (e.g. despite the availability of a low resolution thumbnail).

Third Example

[0044] In an alternative approach not covered by the claimed invention, a camera node having one transceiver that supports one or more control channels and another, primary transceiver that supports a higher bitrate, is arranged to maintain the primary transceiver in an inactive state (e.g. powered down, turned off) until either the control channel transceiver (which may be termed the secondary transceiver) receives a message from the control unit of the system following the latter's reception of an event notification from a node of the system, or the primary transceiver is activated as the result of a motion (or other) sensor of or associated with the camera node being triggered causing the camera to capture one or more images or video sequences.

[0045] The message from the control unit of the system includes credentials for use by the primary transceiver in accessing a higher bitrate channel for the transmission of an image file.

[0046] For example, where the primary transceiver is configured for accessing a Wi-Fi channel, the message from the control unit may contain the SSID, PSK and channel ID to enable the primary transceiver to reduce the lead time needed to access a transmission channel. Although Wi-Fi enabled devices typically store the SSID and corresponding PSK of the last Wi-Fi connection that they used, generally the channel identifier is not stored - because in general Wi-Fi devices switch between different channels of an SSID very frequently. It is therefore normal for a Wi-Fi enabled device to have to hunt for a free channel with the correct SSID before being able to start to transmit data. By having the system control unit, which in this instance is also working as a Wi-Fi base station, provide not only the relevant SSID and PSK but also the identifier of an available channel, potentially several seconds of delay are avoided. It also needs to be borne in mind that there may be months or potentially years between events in which the system control unit will message a particular camera node for image data. There is therefore a possibility that, when a camera node next needs to activate its primary transceiver, the SSID and or the PSK may have changed since the transceiver was last activated - so that the SSID and/or PSK in the memory of the camera node may no longer be correct. It will be appreciated that in general, most installed Wi-Fi devices maintain some level of connectivity with the Wi-Fi Base Station/ Access Point. In this example, and generally for all the examples, the camera node turns off its Wi-Fi transceiver completely when not in use.

[0047] By providing the secondary control channel (non-Wi-Fi), we can send all the access credentials, including channel ID, to the camera node, meaning that the camera node doesn't need to waste several precious seconds scanning for an available channel before being able to send its image file. The secondary control channel also enables the control unit to transmit any changes in the Wi-Fi credentials as and when they occur, so that the updated credentials are stored in a memory of the camera node for use when the camera node next needs to use its Wi-Fi transceiver. Consequently, even if since the last time the Wi-Fi transceiver of the camera node was in use there have been changes to the credentials needed to access a suitable Wi-Fi channel, the camera node will quickly be able to access a suitable channel. Clearly, the transmissions of the Wi-Fi credentials should be encrypted so that their contents (the credentials) are not discernible by eavesdroppers. Thus, the following way of working is also supported in this example:

1. PIR detects motion
2. Image is captured by camera
3. The WiFi credentials needed should be stored (the last know ones are stored) in the node and available for use when needed

    a. If the WiFi channel changes while the primary node receiver is off, then the updated WiFi credentials should have been communicated by the CU to the node via 868 during this time, so that they are available when needed

4. The node WiFI connects with the network
5. The image is sent via WiFi without waiting for there to be an exchange via 868 which ends in the control message from the CU asking for the image.

Fourth Example

[0048] In an alternative approach not covered by the claimed invention, which can work even if the camera node only has one transceiver (but which works equally well in transceivers having two transceivers as in the other examples), a target delivery time is determined within which a camera image will be delivered to the central monitoring station. The camera node uses an estimate of uplink bandwidth to determine the parameters for the image file to ensure that the image file will be delivered in time at a level of quality satisfying a known quality requirement.

[0049] The control unit and the camera node periodically exchange control messages over a control channel, for example they may exchange control messages every 10 minutes. The control channel will typically be provided in the 868 MHz band. When sending such a control message, each of the control unit and the camera node will determine an RSSI level and_supply the determined level to its counterpart. These supplied RSSI levels are stored until the next control packet is received.

[0050] When the control unit wants the camera node to transmit an image file, the control unit may send a message requesting an image file, and that message may include an RSSI measurement from the control unit. The camera node can then use this supplied RSSI measurement to estimate uplink bandwidth. The camera node may perform an RSSI check or similar at each of several RF frequencies to determine whether local signal conditions / background noise (e.g. interference or jamming) prevent or otherwise make undesirable the selection of particular ones of the several RF frequencies. Based on this determination, the camera node may compose an acceptance message, and the node transmits this message to the control unit at a usual control signal frequency/speed. The controller of the control unit 110 then sets the controls for the second transceiver to suit the parameters corresponding to the choice made by the node. The control unit 110 may then onward transmit these data to the CMS 200 using an available connection, so that an automated system or human operator can determine an appropriate response - such as despatching human intervention (e.g. security personnel, Fire, Police, Ambulance, etc.) or the like, and/or they may be played out locally to enable an appropriate response to be determined locally. When high speed data transmission is complete, the node sends notice to the control unit 110 (in any appropriate form) to enable the control unit 110 to repurpose the second transceiver. This will generally involve the control unit 110 switching the second transceiver back to a regular speed mode until the second transceiver is needed for some other purpose. Thus, the second transceiver can again be regarded as providing diversity.

[0051] The controller of the camera node may then determine a resolution and compression ratio to be used to produce an image file which can be delivered to the CMS within the target delivery at an acceptable resolution. For example, the controller of the camera node may refer to a table which, for a given target delivery time maps uplink bandwidth to target image file size and hence compression ratio. Clearly, if the uplink bandwidth is low, for a given resolution, the compression ratio may need to be high to ensure timely delivery . With higher uplink bandwidth a lower compression ratio and/or higher resolution may be used - and the table will include the relevant parameters. The goal is to deliver something as quickly as possible.

[0052] The important input is the target size estimated based on the uplink. When we have the target size we can, based on experience, guess a good quality value for the compression. If we miss the target we can do a second one and if that also misses the target we can use linear extrapolation (even it is not 100% linear). As a rule of thumb its always better to compress than resample. It keeps more information in the image.

[0053] It can be seen that the camera node is configured to transmit a captured image as an image file using a node radio frequency transceiver, the transmission of the image file to the control unit being subject to a predetermined maximum transmission duration, the node controller being configured to determine the resolution and compression of the image file based on the predetermined maximum transmission duration and an estimate up of the uplink bandwidth between the camera node and the control unit in order to enable the image file to be transmitted to the control unit within the predetermined maximum transmission duration.

[0054] It may also be that the installation 100 is configured such that a user of the installation 100 can request images, audio data, or other relevant data from particular nodes of the installation 100 to be delivered to e.g. a mobile device of the user. The request may be generated from the mobile device and sent to the CMS 200 where it may be forwarded to the control unit 110. The control unit 110 may, if configured to do so, formulate an instruction and send that instruction to the node from which the user requested data.

[0055] The message from the control unit 110 requesting high speed transmission of video may specify the parameters of at least one high speed channel. The parameters may include the SSID and PSK for connection to the Wi-Fi transceiver of the control unit, and may also include an identifier for a particular channel provided by the SSID.

[0056] The packet structure of the communications described herein are of known structures comprising preamble, synch word and data. Depending on the transmission structure used, e.g. block transmission etc., data messages may contain packet identifiers, sender identification, recipient identifier and/or counters and the length of packets may be e.g. predetermined, configurable, negotiable etc. The packets may be encrypted and there may a Cyclic Redundancy Check, CRC, comprised in the packet. The skilled person will know how to form packets that will enable the implementation of the embodiments described herein.

[0057] When it comes to choice of frequencies and transmission speed, regard must be had to the prevailing regulations in the region where the security system is deployed. In Europe, radio systems for security monitoring systems commonly make use of ISM (Industrial Scientific and Medical) radio frequencies around 868 MHz (the 863-870MHz band). Similar bands, but centred around different frequencies, are similarly allocated for the same purposes in other territories. For example, in the USA, Canada, Chile, Colombia, Costa Rica, Mexico, Panama, Uruguay the 915MHz band spans 902 - 928MHz, whereas in Australia, Peru and Brazil it spans 915-928MHz, and in other countries other portions of a band from 915 to 928Mhz are available. In Europe duty cycles in the ISM bands are regulated by relevant sections of the latest harmonized revision of the ETSI EN300 220 standard. This standard defines, at the time of this application, the following sub-bands and their allowable duty cycles:

g (863.0 - 868.0 MHz): 1%
g1 (868.0 - 868.6 MHz): 1%
g2 (868.7 - 869.2 MHz): 0.1%
g3 (869.4 - 869.65 MHz): 10%
g4 (869.7 - 870.0 MHz): 1%

[0058] Embodiments of the invention deployed in Europe may make use of the g1 and g2 sub-bands, where the allowable Effective Radiated Power (ERP) is 25 mW

(+14 dBm), with a 1% duty cycle for communication between the Central Unit 110 and the nodes. Typically systems are configured to provide choices of predefined frequencies in each of the g1 and g2 bands. In such systems high speed channels may be offered in the g3 sub-band, which has an allowable ERP of 500mW (+27 dBm) with a 10% duty cycle. Again, more than one frequency may be pre-selected in this band to enable alternative options. But it will be appreciated that it the invention does not rely on the use of the g3 sub-band for the high speed channel, channels could be set aside for high speed use within the g1 or g2 sub-bands. If the security monitoring system is deployed in another territory, it is anticipated that the RF bands allocated security and alarm systems, or available for such use even if not specifically allocated, will likewise provide opportunities to preselect some frequencies for regular speed, control and messaging functions, while allowing others to be preselected for use as high speed channels in the context of the invention.

[0059] Typically, the regular speed channels or configuration may operate around 30 to 45 kbit/s - e.g. 38.4 kbit/s. The "High speed" may equate to 128 to 500 kbit/s e.g. 200 kbit/s.

[0060] The abovementioned frequencies and their corresponding maximum allowable duty cycles may optionally be used by the Control Unit 110 when formulating the offer to a node. The control unit 110 may have at least one counter per band and node keeping track of how much time each node has transmitted into each frequency band during a configurable time period. If the time spent transmitting is close to, or at, the maximum allowed duty cycle of the associated band, the Control Unit 110 may decide against making an offer of a high speed channel in that band. Correspondingly and optionally, each node may have similar counters keeping track of their respective time spent transmitting in each band and may consequently reject certain offers if they are in a band where the node is close to, or at, the maximum allowable duty cycle.

[0061] In one embodiment of the installation 100, more than one Control Unit 110 is part of the installation. The Control Units are in communication with each other and are synchronized. In this embodiment, the Control Unit 110 being used for high speed data may be chosen to be the Control Unit that has the most suitable data connection 150 to the CMS 200, for instance Ethernet over Wi-Fi over cellular.

[0062] References made to nodes having e.g. video capabilities or audio capabilities are understood to be easily replaced with nodes having other relevant functionality that will benefit from high bit-rate transfers such as, but not limited to still imaging, thermal imaging etc.

Claims

1. A security monitoring system (100) for a building or a secured space within a building, the system (100) being operatively connected to a monitoring station (200), the system including:

   a control unit (110) for controlling, arming and disarming the security monitoring system (100), and having a first radio frequency transceiver (230) which can support a first maximum bitrate, and a second radio frequency transceiver (232) which can support a second maximum bitrate lower than the first bitrate, and a controller (250) for controlling the radio frequency transceivers (230, 232);
   a camera node (126) having
   a node controller (360);
   an image sensor (310) for capturing images;
   a primary node radio frequency transceiver (340), for communication with the control unit (110);
   a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (350);
   the node controller (360) of the camera node (126) being configured to:

      transmit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver (340) and as a second image file using the secondary node radio frequency transceiver (350), the first image file having a higher resolution and a larger size than the second image file;
      the control unit (110) being configured, on reception of the first to arrive of the first or second image files, to transmit the first arrived file to the monitoring station (200), and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station (200).

2. The security monitoring system as claimed in claim 1, wherein the control unit (110) is configured:

   in response to receiving an event notification from a node (114, 118) of the system, to transmit, using the second radio frequency transceiver (232), a control message to the camera node (126) for the camera node (126) to transmit a captured image;
   and the camera node (126) is configured to transmit the first and second image files only in response to receiving the control message.

3. The security monitoring system as claimed in claim 1 or claim 2, wherein the first radio frequency trans-

ceiver (230) and the primary node radio frequency transceiver (340) are Wi-Fi transceivers.

4. The security monitoring system as claimed in any one of the preceding claims, wherein the second radio frequency transceiver (232) and the secondary node radio frequency transceiver (350) are non-Wi-Fi transceivers configured to operate in one or more Industrial Scientific and Medical radio frequency bands.

5. The security monitoring system as claimed in claim 4, wherein the second radio frequency transceiver (232) and the secondary node radio frequency transceiver (350) operate within the 863 to 870MHz frequency range.

6. The security monitoring system as claimed in claim 5, wherein the frequency range is between 868 and 870MHz.

7. The security monitoring system as claimed in any one of the preceding claims, wherein the camera node (126) has an autonomous power supply.

8. The security monitoring system as claimed in any one of the preceding claims, wherein the first image file comprises a video sequence.

9. The security monitoring system as claimed in any one of the preceding claims, wherein the second image file comprises one or more still images.

10. The security monitoring system as claimed in any one of the preceding claims, wherein the event notification is the output of a motion sensor, a microphone, or of a door or window opening sensor.

11. A method of operating a security monitoring system (100) for a building or a secured space within a building, the system being operatively connected to a monitoring station (200), the system including:

a control unit (110) for controlling, arming and disarming the security monitoring system, and having a first radio frequency transceiver (230) which can support a first maximum bitrate, and a second radio frequency transceiver (232) which can support a second maximum bitrate lower than the first bitrate, and a controller (250) for controlling the radio frequency transceivers (230, 232);
a camera node (126) having
a node controller (360);
an image sensor (310) for capturing images;
a primary node radio frequency transceiver (340), for communication with the control unit (110);
a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (250);
the method comprising:

the node controller (360) of the camera node (126) transmitting a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver (340 and as a second image file using the secondary node radio frequency transceiver, the first image file having a higher resolution and a larger size than the second image file;
the control unit (110) transmitting, on reception of the first to arrive of the first or second image files, the first arrived file to the monitoring station (200), and thereafter, if the first arrived file was the second image file, on arrival of the first image file, transmitting the first image file to the monitoring station (200).

12. The method as claimed in claim 11, the method further comprising in response to receiving at the control unit (110) an event notification from a node (114, 118) of the system, transmitting, using the second radio frequency transceiver (232), a control message to the camera node (126) for the camera node (126) to transmit a captured image;
and the transmitting of the first and second image files being in response to the node controller (360) of the camera node (126) receiving the control message.

13. The method as claimed in claim 11 or 12, wherein the first radio frequency transceiver (230) and the primary node radio frequency transceiver (340) are Wi-Fi transceivers.

14. The method as claimed in any one of claims 11 to 13, wherein the second radio frequency transceiver (232) and the secondary node radio frequency transceiver (350) are non-Wi-Fi transceivers configured to operate in one or more Industrial Scientific and Medical radio frequency bands.

15. The method as claimed in claim 14, wherein the second radio frequency transceiver (232) and the secondary node radio frequency transceiver (350) operate within the 863 to 870MHz frequency range.

16. The method as claimed in claim 15, wherein the frequency range is between 868 and 870MHz.

17. The method as claimed in any one of claims 11 to 16, wherein the camera node (126) has an autonomous power supply.

18. The method as claimed in any one claims 11 to 17, wherein the first image file comprises a video sequence.

19. The method as claimed in any one claims 11 to 18, wherein the second image file comprises one or more still images.

20. The method as claimed in any one of claims 11 to 19, wherein the event notification is the output of a motion sensor, a microphone, or of a door or window opening sensor.

21. A control unit (110) for a security monitoring system (100) for a building or a secured space within a building, the system being operatively connected to a monitoring station (200), and the system (100) including a camera node (126) having:

a node controller (360);
an image sensor (310) for capturing images;
a primary node radio frequency transceiver (340), for communication with the control unit;
a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (350);
the control unit (110) having:

a first radio frequency transceiver (230) which can support a first maximum bitrate, and a second radio frequency transceiver (232) which can support a second maximum bitrate lower than the first bitrate, and a controller (250) for controlling the radio frequency transceivers (230, 232);
the control unit (110) being configured, on reception of a captured image file from the camera node (126), the received image file having a first ID, to transmit the received image file to the monitoring station (200), and thereafter, if a second image file is received having the first ID, to transmit the second image file to the monitoring station (200) in the event that the second image file has a higher resolution and a larger size than the first image file.

22. The control unit (110) of claim 21, wherein the control unit (110) is configured, in response to receiving an event notification from a node (114, 118) of the system, to transmit, using the second radio frequency transceiver (232), a control message to the camera node (126) for the camera node (126) to transmit a captured image.

23. A method of operating a control unit (110) of a security monitoring system (100) for a building or a secured space within a building, the system (100) being operatively connected to a monitoring station (200), and the system including a camera node (126) having:

a node controller (360);
an image sensor (310) for capturing images;
a primary node radio frequency transceiver (340), for communication with the control unit (110);
a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (350);
the control unit (110) having:

a first radio frequency transceiver (230) which can support a first maximum bitrate, and a second radio frequency transceiver (232) which can support a second maximum bitrate lower than the first bitrate, and a controller (250) for controlling the radio frequency transceivers (230, 232);

the method comprising:
the control unit (110) transmitting, on reception of a captured image file from the camera node (126), the received image file having a first ID, the received image file to the monitoring station (200), and thereafter, if a second image file is received having the first ID, transmitting the second image file to the monitoring station (200) in the event that the second image file has a higher resolution and a larger size than the first image file.

24. The method of claim 23, wherein, in response to receiving an event notification from a node (114, 118) of the system, the control unit (110) transmitting, using the second radio frequency transceiver (232), a control message to the camera node (126) for the camera node (126) to transmit a captured image.

25. A camera node (126) for a security monitoring system (100) for a building or a secured space within a building, the system (100) including a control unit (110) for controlling, arming and disarming the security monitoring system (100) and the control unit being operatively connected to a monitoring station (200);

the camera node (126) comprising:

a node controller (360);
an image sensor (310) for capturing images;
a primary node radio frequency transceiver (340), for communication with the control unit (110);
a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (350); and
the node controller (126) being configured to:
transmit to the control unit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver (340) and as a second image file using the secondary node radio frequency transceiver (350), the first image file having a higher resolution and a larger size than the second image file so that the control unit can, on reception of the first to arrive of the first or second image files, transmit the first arrived file to the monitoring station (200), and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station (200).

26. The camera node as claimed in claim 25, wherein the node controller (360) is configured to transmit the first and second image files only in response to receiving a control message from the control unit (110).

27. The camera node as claimed in claim 25 or claim 26, wherein the primary node radio frequency transceiver (340) is a Wi-Fi transceiver.

28. The camera node as claimed in any one of claims 25 to 27, wherein the secondary node radio frequency transceiver (350) is a non-Wi-Fi transceiver configured to operate in one or more Industrial Scientific and Medical radio frequency bands.

29. The camera node as claimed in any one of claims 25 to claim 28, wherein the first and second image files are transmitted in parallel.

30. The camera node as claimed in any one of claims 25 to claim 29, wherein the camera node (126) includes an autonomous power supply.

31. The camera node as claimed in claim 30, wherein the power supply includes a passive radio-frequency energy harvesting arrangement.

32. The camera node as claimed in claim 30 or claim 31, wherein the power supply includes one or more photovoltaic elements.

33. The camera node as claimed in any one of claims 25 to 32, wherein the node (126) is configured to perform a determination of radio frequency conditions.

34. A method of controlling data transmission from a camera node (126) to a control unit (110) of a security monitoring system (100), the control unit (110) being operatively connected to a monitoring station (200); the camera node (126) including

a node controller (360);
an image sensor (310) for capturing images;
a primary node radio frequency transceiver (340), for communication with the control unit (110);
a secondary node radio frequency transceiver (350), to receive control messages from the control unit (110), the primary node radio frequency transceiver (340) supporting a higher maximum bitrate than the secondary node radio frequency transceiver (350);
the method comprising:
the node controller (360) transmitting to the control unit a captured image with a first image ID both as a first image file using the primary node radio frequency transceiver (340) and as a second image file using the secondary node radio frequency transceiver (350), the first image file having a higher resolution and a larger size than the second image file, so that the control unit can, on reception of the first to arrive of the first or second image files, transmit the first arrived file to the monitoring station (200), and thereafter, if the first arrived file was the second image file, on arrival of the first image file, to transmit the first image file to the monitoring station (200).

35. The method of claim 34, wherein the node controller (360) transmits the first and second image files only in response to receiving a control message from the control unit (110).

Patentansprüche

1. Sicherheitsüberwachungssystem (100) für ein Gebäude oder einen gesicherten Raum innerhalb eines Gebäudes, wobei das System (100) wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist, wobei das System Folgendes aufweist:

eine Steuereinheit (110) zur Steuerung, Aktivierung und Deaktivierung des Sicherheitsüberwachungssystems (100), die einen ersten Hoch-

frequenz-Sender/Empfänger (230), der eine erste maximale Bitrate unterstützen kann, und einen zweiten Hochfrequenz-Sender/Empfänger (232), der eine zweite maximale Bitrate unterstützen kann, die geringer als die erste Bitrate ist, sowie eine Steuerung (250) zum Steuern der Hochfrequenz-Sender/Empfänger (230, 232) aufweist,
einen Kameraknoten (126) mit
einer Knotensteuerung (360),
einen Bildsensor (310) zur Erfassung von Bildern,
einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit (110),
einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350),
wobei die Knotensteuerung (360) des Kameraknotens (126) so eingerichtet ist, dass sie:

ein erfasstes Bild mit einer ersten Bildkennung sowohl als eine erste Bilddatei unter Verwendung des Primärknoten-Hochfrequenz-Sender/Empfängers (340) als auch als eine zweite Bilddatei unter Verwendung des Sekundärknoten-Hochfrequenz-Sender/Empfängers (350) überträgt, wobei die erste Bilddatei eine höhere Auflösung und eine größere Größe als die zweite Bilddatei aufweist,
wobei die Steuereinheit (110) so eingerichtet ist, dass sie bei Empfang der zuerst ankommenden Bilddatei, d.h. der ersten oder der zweiten, die zuerst angekommene Datei an die Überwachungsstation (200) überträgt und danach, wenn die zuerst angekommene Datei die zweite Bilddatei war, bei Ankunft der ersten Bilddatei die erste Bilddatei an die Überwachungsstation (200) überträgt.

2. Sicherheitsüberwachungssystem nach Anspruch 1, bei dem die Steuereinheit (110) so eingerichtet ist, dass sie:

als Reaktion auf den Empfang einer Ereignismeldung von einem Knoten (114, 118) des Systems unter Verwendung des zweiten Hochfrequenz-Sender/Empfängers (232) eine Steuernachricht an den Kameraknoten (126) überträgt, damit der Kameraknoten (126) ein erfasstes Bild überträgt,
und der Kameraknoten (126) so eingerichtet ist, dass er die erste und die zweite Bilddatei nur als Reaktion auf den Empfang der Steuernachricht überträgt.

3. Sicherheitsüberwachungssystem nach Anspruch 1 oder Anspruch 2, bei dem der erste Hochfrequenz-Sender/Empfänger (230) und der Primärknoten-Hochfrequenz-Sender/Empfänger (340) Wi-Fi-Sender/Empfänger sind.

4. Sicherheitsüberwachungssystem nach einem der vorhergehenden Ansprüche, bei dem der zweite Hochfrequenz-Sender/Empfänger (232) und der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) Nicht-Wi-Fi-Sender/Empfänger sind, die so eingerichtet sind, dass sie in einem oder mehreren Hochfrequenzbändern für Industrie, Wissenschaft und Medizin arbeiten.

5. Sicherheitsüberwachungssystem nach Anspruch 4, bei dem der zweite Hochfrequenz-Sender/Empfänger (232) und der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) innerhalb des Frequenzbereichs von 863 bis 870 MHz arbeiten.

6. Sicherheitsüberwachungssystem nach Anspruch 5, bei dem der Frequenzbereich zwischen 868 und 870 MHz liegt.

7. Sicherheitsüberwachungssystem nach einem der vorhergehenden Ansprüche, bei dem der Kameraknoten (126) eine autonome Stromversorgung aufweist.

8. Sicherheitsüberwachungssystem nach einem der vorhergehenden Ansprüche, bei dem die erste Bilddatei eine Videosequenz umfasst.

9. Sicherheitsüberwachungssystem nach einem der vorhergehenden Ansprüche, bei dem die zweite Bilddatei ein oder mehrere Standbilder umfasst.

10. Sicherheitsüberwachungssystem nach einem der vorhergehenden Ansprüche, bei dem die Ereignismeldung das Ausgangssignal eines Bewegungssensors, eines Mikrophons oder eines Tür- oder Fensteröffnungssensors ist.

11. Verfahren zum Betreiben eines Sicherheitsüberwachungssystems (100) für ein Gebäude oder einen gesicherten Raum innerhalb eines Gebäudes, wobei das System wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist, wobei das System Folgendes aufweist:

eine Steuereinheit (110) zur Steuerung, Aktivierung und Deaktivierung des Sicherheitsüberwachungssystems, die einen ersten Hochfre-

quenz-Sender/Empfänger (230), der eine erste maximale Bitrate unterstützen kann, und einen zweiten Hochfrequenz-Sender/Empfänger (232), der eine zweite maximale Bitrate unterstützen kann, die geringer als die erste Bitrate ist, sowie eine Steuerung (250) zum Steuern der Hochfrequenz-Sender/Empfänger (230, 232) aufweist,
einen Kameraknoten (126) mit
einer Knotensteuerung (360),
einen Bildsensor (310) zur Erfassung von Bildern,
einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit (110),
einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hochfrequenz-Sender/Empfänger (250),
wobei bei dem Verfahren:

die Knotensteuerung (360) des Kameraknotens (126) ein erfasstes Bild mit einer ersten Bildkennung sowohl als eine erste Bilddatei unter Verwendung des Primärknoten-Hochfrequenz-Sender/Empfängers (340) als auch als eine zweite Bilddatei unter Verwendung des Sekundärknoten-Hochfrequenz-Sender/Empfängers überträgt, wobei die erste Bilddatei eine höhere Auflösung und eine größere Größe als die zweite Bilddatei aufweist,
wobei die Steuereinheit (110) bei Empfang der zuerst ankommenden Bilddatei, d.h. der ersten oder der zweiten, die zuerst angekommene Datei an die Überwachungsstation (200) überträgt und danach, wenn die zuerst angekommene Datei die zweite Bilddatei war, bei Ankunft der ersten Bilddatei die erste Bilddatei an die Überwachungsstation (200) überträgt.

12. Verfahren nach Anspruch 11, wobei bei dem Verfahren ferner als Reaktion auf den Empfang einer Ereignismeldung von einem Knoten (114, 118) des Systems an der Steuereinheit (110) unter Verwendung des zweiten Hochfrequenz-Sender/Empfängers (232) eine Steuernachricht an den Kameraknoten (126) übertragen wird, damit der Kameraknoten (126) ein erfasstes Bild überträgt,
und das Übertragen der ersten und der zweiten Bilddatei als Reaktion darauf erfolgt, dass die Knotensteuerung (360) des Kameraknotens (126) die Steuernachricht empfängt.

13. Verfahren nach Anspruch 11 oder 12, bei dem der erste Hochfrequenz-Sender/Empfänger (230) und der Primärknoten-Hochfrequenz-Sender/Empfänger (340) Wi-Fi-Sender/Empfänger sind.

14. Verfahren nach einem der Ansprüche 11 bis 13, bei dem der zweite Hochfrequenz-Sender/Empfänger (232) und der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) Nicht-Wi-Fi-Sender/Empfänger sind, die so eingerichtet sind, dass sie in einem oder mehreren Hochfrequenzbändern für Industrie, Wissenschaft und Medizin arbeiten.

15. Verfahren nach Anspruch 14, bei dem der zweite Hochfrequenz-Sender/Empfänger (232) und der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) innerhalb des Frequenzbereichs von 863 bis 870 MHz arbeiten.

16. Verfahren nach Anspruch 15, bei dem der Frequenzbereich zwischen 868 und 870 MHz liegt.

17. Verfahren nach einem der Ansprüche 11 bis 16, bei dem der Kameraknoten (126) eine autonome Stromversorgung aufweist.

18. Verfahren nach einem der Ansprüche 11 bis 17, bei dem die erste Bilddatei eine Videosequenz umfasst.

19. Verfahren nach einem der Ansprüche 11 bis 18, bei dem die zweite Bilddatei ein oder mehrere Standbilder umfasst.

20. Verfahren nach einem der Ansprüche 11 bis 19, bei dem die Ereignismeldung das Ausgangssignal eines Bewegungssensors, eines Mikrophons oder eines Tür- oder Fensteröffnungssensors ist.

21. Steuereinheit (110) für ein Sicherheitsüberwachungssystem (100) für ein Gebäude oder einen gesicherten Raum innerhalb eines Gebäudes, wobei das System wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist und das System (100) einen Kameraknoten (126) aufweist, der Folgendes hat:

eine Knotensteuerung (360),
einen Bildsensor (310) zur Erfassung von Bildern,
einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit,
einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hoch-

frequenz-Sender/Empfänger (350), wobei die Steuereinheit (110) Folgendes aufweist:

einen ersten Hochfrequenz-Sender/Empfänger (230), der eine erste maximale Bitrate unterstützen kann, und einen zweiten Hochfrequenz-Sender/Empfänger (232), der eine zweite maximale Bitrate unterstützen kann, die geringer als die erste Bitrate ist, sowie eine Steuerung (250) zum Steuern der Hochfrequenz-Sender/Empfänger (230, 232), wobei die Steuereinheit (110) so eingerichtet ist, dass sie bei Empfang einer erfassten Bilddatei vom Kameraknoten (126), wobei die empfangene Bilddatei eine erste Kennung aufweist, die empfangene Bilddatei an die Überwachungsstation (200) überträgt, und danach, wenn eine zweite Bilddatei empfangen wird, die die erste Kennung aufweist, in dem Fall, dass die zweite Bilddatei eine höhere Auflösung und eine größere Größe als die erste Bilddatei aufweist, die zweite Bilddatei an die Überwachungsstation (200) überträgt.

22. Steuereinheit (110) nach Anspruch 21, wobei die Steuereinheit (110) dazu eingerichtet ist, dass sie als Reaktion auf den Empfang einer Ereignismeldung von einem Knoten (114, 118) des Systems unter Verwendung des zweiten Hochfrequenz-Sender/Empfängers (232) eine Steuernachricht an den Kameraknoten (126) überträgt, damit der Kameraknoten (126) ein erfasstes Bild überträgt.

23. Verfahren zum Betreiben einer Steuereinheit (110) eines Sicherheitsüberwachungssystems (100) für ein Gebäude oder einen gesicherten Raum innerhalb eines Gebäudes, wobei das System (100) wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist und das System einen Kameraknoten (126) aufweist, der Folgendes hat:

eine Knotensteuerung (360), einen Bildsensor (310) zur Erfassung von Bildern, einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit (110), einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350), wobei die Steuereinheit (110) Folgendes aufweist:

einen ersten Hochfrequenz-Sender/Empfänger (230), der eine erste maximale Bitrate unterstützen kann, und einen zweiten Hochfrequenz-Sender/Empfänger (232), der eine zweite maximale Bitrate unterstützen kann, die geringer als die erste Bitrate ist, sowie eine Steuerung (250) zum Steuern der Hochfrequenz-Sender/Empfänger (230, 232), wobei bei dem Verfahren: die Steuereinheit (110) bei Empfang einer erfassten Bilddatei von dem Kameraknoten (126), wobei die empfangene Bilddatei eine erste Kennung aufweist, die empfangene Bilddatei an die Überwachungsstation (200) überträgt, und danach, wenn eine zweite Bilddatei empfangen wird, die die erste Kennung aufweist, in dem Fall, dass die zweite Bilddatei eine höhere Auflösung und eine größere Größe als die erste Bilddatei aufweist, die zweite Bilddatei an die Überwachungsstation (200) überträgt.

24. Verfahren nach Anspruch 23, bei dem die Steuereinheit (110) als Reaktion auf den Empfang einer Ereignismeldung von einem Knoten (114, 118) des Systems unter Verwendung des zweiten Hochfrequenz-Sender/Empfängers (232) eine Steuernachricht an den Kameraknoten (126) überträgt, damit der Kameraknoten (126) ein erfasstes Bild überträgt.

25. Kameraknoten (126) für ein Sicherheitsüberwachungssystem (100) für ein Gebäude oder einen gesicherten Raum innerhalb eines Gebäudes, wobei das System (100) eine Steuereinheit (110) zur Steuerung, Aktivierung und Deaktivierung des Sicherheitsüberwachungssystems (100) aufweist und die Steuereinheit wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist,

wobei der Kameraknoten (126) Folgendes umfasst:

eine Knotensteuerung (360), einen Bildsensor (310) zur Erfassung von Bildern, einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit (110), einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350), und

wobei die Knotensteuerung (126) so eingerichtet ist, dass sie:
ein erfasstes Bild mit einer ersten Bildkennung sowohl als eine erste Bilddatei unter Verwendung des Primärknoten-Hochfrequenz-Sender/Empfängers (340) als auch als eine zweite Bilddatei unter Verwendung des Sekundärknoten-Hochfrequenz-Sender/Empfängers (350) an die Steuereinheit überträgt, wobei die erste Bilddatei eine höhere Auflösung und eine größere Größe als die zweite Bilddatei aufweist, so dass die Steuereinheit bei Empfang der zuerst ankommenden Bilddatei, d.h. der ersten oder der zweiten, die zuerst angekommene Datei an die Überwachungsstation (200) übertragen kann und danach, wenn die zuerst angekommene Datei die zweite Bilddatei war, bei Ankunft der ersten Bilddatei die erste Bilddatei an die Überwachungsstation (200) überträgt.

26. Kameraknoten nach Anspruch 25, bei dem die Knotensteuerung (360) so eingerichtet ist, dass sie die erste und die zweite Bilddatei nur als Reaktion auf den Empfang einer Steuernachricht von der Steuereinheit (110) überträgt.

27. Kameraknoten nach Anspruch 25 oder Anspruch 26, bei dem der Primärknoten-Hochfrequenz-Sender/Empfänger (340) ein Wi-Fi-Sender/Empfänger ist.

28. Kameraknoten nach einem der Ansprüche 25 bis 27, bei dem der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) ein Nicht-Wi-Fi-Sender/Empfänger ist, der so eingerichtet ist, dass er in einem oder mehreren Hochfrequenzbändern für Industrie, Wissenschaft und Medizin arbeitet.

29. Kameraknoten nach einem der Ansprüche 25 bis 28, bei dem die erste und die zweite Bilddatei parallel übertragen werden.

30. Kameraknoten nach einem der Ansprüche 25 bis 29, wobei der Kameraknoten (126) eine autonome Stromversorgung aufweist.

31. Kameraknoten nach Anspruch 30, bei dem die Stromversorgung eine passive Hochfrequenz-Energiegewinnungsanordnung aufweist.

32. Kameraknoten nach Anspruch 30 oder Anspruch 31, bei dem die Stromversorgung ein oder mehrere Photovoltaikelemente aufweist.

33. Kameraknoten nach einem der Ansprüche 25 bis 32, wobei der Knoten (126) zur Durchführung einer Bestimmung von Hochfrequenzbedingungen eingerichtet ist.

34. Verfahren zur Steuerung der Datenübertragung von einem Kameraknoten (126) an eine Steuereinheit (110) eines Sicherheitsüberwachungssystems (100), wobei die Steuereinheit (110) wirkungsmäßig mit einer Überwachungsstation (200) verbunden ist, wobei der Kameraknoten (126) Folgendes aufweist:

eine Knotensteuerung (360),
einen Bildsensor (310) zur Erfassung von Bildern,
einen Primärknoten-Hochfrequenz-Sender/Empfänger (340) zur Kommunikation mit der Steuereinheit (110),
einen Sekundärknoten-Hochfrequenz-Sender/Empfänger (350) zum Empfangen von Steuernachrichten von der Steuereinheit (110), wobei der Primärknoten-Hochfrequenz-Sender/Empfänger (340) eine höhere maximale Bitrate unterstützt als der Sekundärknoten-Hochfrequenz-Sender/Empfänger (350),
wobei bei dem Verfahren:
die Knotensteuerung (360) ein erfasstes Bild mit einer ersten Bildkennung sowohl als eine erste Bilddatei unter Verwendung des Primärknoten-Hochfrequenz-Sender/Empfängers (340) als auch als eine zweite Bilddatei unter Verwendung des Sekundärknoten-Hochfrequenz-Sender/Empfängers (350) an die Steuereinheit überträgt, wobei die erste Bilddatei eine höhere Auflösung und eine größere Größe als die zweite Bilddatei aufweist, so dass die Steuereinheit bei Empfang der zuerst ankommenden Bilddatei, d.h. der ersten oder der zweiten, die zuerst angekommene Datei an die Überwachungsstation (200) übertragen kann und danach, wenn die zuerst angekommene Datei die zweite Bilddatei war, bei Ankunft der ersten Bilddatei die erste Bilddatei an die Überwachungsstation (200) überträgt.

35. Verfahren nach Anspruch 34, bei dem die Knotensteuerung (360) die erste und die zweite Bilddatei nur als Reaktion auf den Empfang einer Steuernachricht von der Steuereinheit (110) überträgt.

Revendications

1. Système de surveillance de sécurité (100) pour un bâtiment ou un espace sécurisé dans un bâtiment, le système (100) étant fonctionnellement relié à une station de surveillance (200), le système comprenant :

une unité de commande (110) pour la comman-

de, l'activation et la désactivation du système de surveillance de sécurité (100) et présentant un premier émetteur-récepteur radiofréquence (230) qui peut supporter un premier débit binaire maximal, et un deuxième émetteur-récepteur radiofréquence (232) qui peut supporter un deuxième débit binaire maximal qui est inférieur au premier débit binaire, et un contrôleur (250) pour commander les émetteurs-récepteurs radiofréquence (230, 232) ;
un noeud de caméra (126) présentant
un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de noeud primaire (340) pour la communication avec l'unité de commande (110) ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (350) ;
le contrôleur de noeud (360) du noeud de caméra (126) étant réalisé de manière :

> à transmettre une image saisie avec un premier identifiant d'image en tant que premier fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud primaire (340) et en tant que deuxième fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud secondaire (350), le premier fichier d'images présentant une résolution plus élevée et une taille plus grande que le deuxième fichier d'images ;
> l'unité de commande (110) étant réalisée de manière à transmettre, lors de la réception du fichier d'images arrivé en premier parmi le premier et le deuxième fichier d'images, le fichier arrivé en premier à la station de surveillance (200) et ensuite, si le fichier arrivé en premier était le deuxième fichier d'images, à transmettre, lors de l'arrivée du premier fichier d'images, le premier fichier d'images à la station de surveillance (200).

2. Système de surveillance de sécurité selon la revendication 1, l'unité de commande (110) étant réalisée de manière :

> à transmettre un message de commande au noeud de caméra (126) en réponse à la réception d'une notification d'événement provenant d'un noeud (114, 118) du système en utilisant le deuxième émetteur-récepteur radiofréquence (232) de sorte que le noeud de caméra (126) transmet une image saisie ;
> et le noeud de caméra (126) étant réalisé de manière à transmettre le premier et le deuxième fichier d'images uniquement en réponse à la réception du message de commande.

3. Système de surveillance de sécurité selon la revendication 1 ou la revendication 2, le premier émetteur-récepteur radiofréquence (230) et l'émetteur-récepteur radiofréquence de noeud primaire (340) étant des émetteurs-récepteurs Wi-Fi.

4. Système de surveillance de sécurité selon l'une des revendications précédentes, le deuxième émetteur-récepteur radiofréquence (232) et l'émetteur-récepteur radiofréquence de noeud secondaire (350) étant des émetteurs-récepteurs non Wi-Fi réalisés de manière à fonctionner dans une ou plusieurs bandes radiofréquences industrielles, scientifiques et médicales.

5. Système de surveillance de sécurité selon la revendication 4, le deuxième émetteur-récepteur radiofréquence (232) et l'émetteur-récepteur radiofréquence de noeud secondaire (350) fonctionnant dans une plage de fréquences de 863 à 870 MHz.

6. Système de surveillance de sécurité selon la revendication 5, la plage de fréquences étant comprise entre 868 et 870 MHz.

7. Système de surveillance de sécurité selon l'une des revendications précédentes, le noeud de caméra (126) présentant une alimentation électrique autonome.

8. Système de surveillance de sécurité selon l'une des revendications précédentes, le premier fichier d'images comprenant une séquence vidéo.

9. Système de surveillance de sécurité selon l'une des revendications précédentes, le deuxième fichier d'images comprenant une ou plusieurs images fixes.

10. Système de surveillance de sécurité selon l'une des revendications précédentes, la notification d'événement étant la sortie d'un capteur de mouvement, d'un microphone, ou d'un capteur d'ouverture de porte ou de fenêtre.

11. Procédé de mise en oeuvre d'un système de surveillance de sécurité (100) pour un bâtiment ou un espace sécurisé dans un bâtiment, le système étant fonctionnellement relié à une station de surveillance (200), le système comprenant :

une unité de commande (110) pour la commande, l'activation et la désactivation du système de surveillance de sécurité, et présentant un premier émetteur-récepteur radiofréquence (230) qui peut supporter un premier débit binaire maximal, et un deuxième émetteur-récepteur radiofréquence (232) qui peut supporter un deuxième débit binaire maximal qui est inférieur au premier débit binaire, et un contrôleur (250) pour commander les émetteurs-récepteurs radiofréquence (230, 232) ;
un noeud de caméra (126) présentant
un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de noeud primaire (340) pour la communication avec l'unité de commande (110) ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (250) ;
le procédé comprenant :

la transmission, par le contrôleur de noeud (360) du noeud de caméra (126), d'une image saisie avec un premier identifiant d'image en tant que premier fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud primaire (340) et en tant que deuxième fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud secondaire, le premier fichier d'images présentant une résolution plus élevée et une taille plus grande que le deuxième fichier d'images ;
la transmission, par l'unité de commande (110), lors de la réception du fichier d'images arrivé en premier parmi le premier et le deuxième fichier d'images, du fichier arrivé en premier à la station de surveillance (200) et ensuite, si le fichier arrivé en premier était le deuxième fichier d'images, la transmission, lors de l'arrivée du premier fichier d'images, du premier fichier d'images à la station de surveillance (200).

12. Procédé selon la revendication 11, le procédé comprenant en outre la transmission d'un message de commande au noeud de caméra (126) en réponse à la réception, au niveau de l'unité de commande (110), d'une notification d'événement provenant d'un noeud (114, 118) du système en utilisant le deuxième émetteur-récepteur radiofréquence (232) de sorte que le noeud de caméra (126) transmet une image saisie ;
et la transmission du premier et du deuxième fichier d'images en réponse à la réception du message de commande par le contrôleur de noeud (360) du noeud de caméra (126).

13. Procédé selon la revendication 11 ou 12, le premier émetteur-récepteur radiofréquence (230) et l'émetteur-récepteur radiofréquence de noeud primaire (340) étant des émetteurs-récepteurs Wi-Fi.

14. Procédé selon l'une des revendications 11 à 13, le deuxième émetteur-récepteur radiofréquence (232) et l'émetteur-récepteur radiofréquence de noeud secondaire (350) étant des émetteurs-récepteurs non Wi-Fi réalisés de manière à fonctionner dans une ou plusieurs bandes radiofréquences industrielles, scientifiques et médicales.

15. Procédé selon la revendication 14, le deuxième émetteur-récepteur radiofréquence (232) et l'émetteur-récepteur radiofréquence de noeud secondaire (350) fonctionnant dans une plage de fréquences de 863 à 870 MHz.

16. Procédé selon la revendication 15, la plage de fréquences étant comprise entre 868 et 870 MHz.

17. Procédé selon l'une des revendications 11 à 16, le noeud de caméra (126) présentant une alimentation électrique autonome.

18. Procédé selon l'une des revendications 11 à 17, le premier fichier d'images comprenant une séquence vidéo.

19. Procédé selon l'une des revendications 11 à 18, le deuxième fichier d'images comprenant une ou plusieurs images fixes.

20. Procédé selon l'une des revendications 11 à 19, la notification d'événement étant la sortie d'un capteur de mouvement, d'un microphone, ou d'un capteur d'ouverture de porte ou de fenêtre.

21. Unité de commande (110) pour un système de surveillance de sécurité (100) pour un bâtiment ou un espace sécurisé dans un bâtiment, le système étant fonctionnellement relié à une station de surveillance (200), et le système (100) comprenant un noeud de caméra (126) présentant :

un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de noeud primaire (340) pour la communication

avec l'unité de commande ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (350) ;
l'unité de commande (110) présentant :

un premier émetteur-récepteur radiofréquence (230) qui peut supporter un premier débit binaire maximal, et un deuxième émetteur-récepteur radiofréquence (232) qui peut supporter un deuxième débit binaire maximal qui est inférieur au premier débit binaire, et un contrôleur (250) pour commander les émetteurs-récepteurs radiofréquence (230, 232) ;
l'unité de commande (110) étant réalisée de manière à transmettre, lors de la réception d'un fichier d'image saisi provenant du noeud de caméra (126), le fichier d'images reçu présentant un premier identifiant, le fichier d'images reçu à la station de surveillance (200), et ensuite, si un deuxième fichier d'images présentant le premier identifiant est reçu, à transmettre le deuxième fichier d'images à la station de surveillance (200) au cas où le deuxième fichier d'images présente une résolution plus élevée et une taille plus grande que le premier fichier d'images.

22. Unité de commande (110) selon la revendication 21, l'unité de commande (110) étant réalisée de telle sorte qu'en réponse à la réception d'une notification d'événement provenant d'un noeud (114, 118) du système, elle transmet, en utilisant le deuxième émetteur-récepteur radiofréquence (232), un message de commande au noeud de caméra (126) de sorte que le noeud de caméra (126) transmet une image saisie.

23. Procédé de mise en oeuvre d'une unité de commande (110) d'un système de surveillance de sécurité (100) pour un bâtiment ou un espace sécurisé dans un bâtiment, le système (100) étant fonctionnellement relié à une station de surveillance (200), et le système comprenant un noeud de caméra (126) présentant :

un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de noeud primaire (340) pour la communication avec l'unité de commande (110) ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (350) ;
l'unité de commande (110) présentant :

un premier émetteur-récepteur radiofréquence (230) qui peut supporter un premier débit binaire maximal, et un deuxième émetteur-récepteur radiofréquence (232) qui peut supporter un deuxième débit binaire maximal qui est inférieur au premier débit binaire, et un contrôleur (250) pour commander les émetteurs-récepteurs radiofréquence (230, 232) ;
le procédé comprenant :
la transmission, par l'unité de commande (110), lors de la réception d'un fichier d'image saisi provenant du noeud de caméra (126), le fichier d'images reçu présentant un premier identifiant, du fichier d'images reçu à la station de surveillance (200), et ensuite, si un deuxième fichier d'images présentant le premier identifiant est reçu, la transmission du deuxième fichier d'images à la station de surveillance (200) au cas où le deuxième fichier d'images présente une résolution plus élevée et une taille plus grande que le premier fichier d'images.

24. Procédé selon la revendication 23, l'unité de commande (110) transmettant un message de commande au noeud de caméra (126) en réponse à la réception d'une notification d'événement provenant d'un noeud (114, 118) du système en utilisant le deuxième émetteur-récepteur radiofréquence (232), de sorte que le noeud de caméra (126) transmet une image saisie.

25. Noeud de caméra (126) pour un système de surveillance de sécurité (100) pour un bâtiment ou un espace sécurisé dans un bâtiment, le système (100) présentant une unité de commande (110) pour la commande, l'activation et la désactivation du système de surveillance de sécurité (100), et l'unité de commande étant fonctionnellement reliée à la station de surveillance (200) ;
le noeud de caméra (126) comprenant :

un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de

noeud primaire (340) pour la communication avec l'unité de commande (110) ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (350) ; et
le contrôleur de noeud (126) étant réalisé de manière :
à transmettre, à l'unité de commande, une image saisie avec un premier identifiant d'image en tant que premier fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud primaire (340) et en tant que deuxième fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud secondaire (350), le premier fichier d'images présentant une résolution plus élevée et une taille plus grande que le deuxième fichier d'images, de sorte que lors de la réception du fichier d'images arrivé en premier parmi le premier et le deuxième fichier d'images, l'unité de commande peut transmettre le fichier arrivé en premier à la station de surveillance (200), et ensuite, si le fichier arrivé en premier était le deuxième fichier d'images, à transmettre, lors de l'arrivée du premier fichier d'images, le premier fichier d'images à la station de surveillance (200).

26. Noeud de caméra selon la revendication 25, le contrôleur de noeud (360) étant réalisé de manière à transmettre le premier et le deuxième fichier d'images uniquement en réponse à la réception d'un message de commande provenant de l'unité de commande (110).

27. Noeud de caméra selon la revendication 25 ou la revendication 26, l'émetteur-récepteur radiofréquence de noeud primaire (340) étant un émetteur-récepteur Wi-Fi.

28. Noeud de caméra selon l'une des revendications 25 à 27, l'émetteur-récepteur radiofréquence de noeud secondaire (350) étant un émetteur-récepteur non Wi-Fi réalisé de manière à fonctionner dans une ou plusieurs bandes radiofréquences industrielles, scientifiques et médicales.

29. Noeud de caméra selon l'une des revendications 25 à 28, le premier et le deuxième fichier d'images étant transmis en parallèle.

30. Noeud de caméra selon l'une des revendications 25 à 29, le noeud de caméra (126) présentant une alimentation électrique autonome.

31. Noeud de caméra selon la revendication 30, l'alimentation électrique présentant un agencement passif de récolte d'énergie radiofréquence.

32. Noeud de caméra selon la revendication 30 ou la revendication 31, l'alimentation électrique présentant un ou plusieurs éléments photovoltaïques.

33. Noeud de caméra selon l'une des revendications 25 à 32, le noeud (126) étant réalisé de manière à effectuer une détermination de conditions de radiofréquence.

34. Procédé de commande de transmission de données d'un noeud de caméra (126) à une unité de commande (110) d'un système de surveillance de sécurité (100), l'unité de commande (110) étant fonctionnellement reliée à une station de surveillance (200); le noeud de caméra (126) comprenant :

un contrôleur de noeud (360) ;
un capteur d'image (310) pour saisir des images ;
un émetteur-récepteur radiofréquence de noeud primaire (340) pour la communication avec l'unité de commande (110) ;
un émetteur-récepteur radiofréquence de noeud secondaire (350) pour recevoir des messages de commande provenant de l'unité de commande (110), l'émetteur-récepteur radiofréquence de noeud primaire (340) supportant un débit binaire maximal plus élevé que l'émetteur-récepteur radiofréquence de noeud secondaire (350) ;
le procédé comprenant :
la transmission, par le contrôleur de noeud (360), à l'unité de commande d'une image saisie avec un premier identifiant d'image en tant que premier fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud primaire (340) et en tant que deuxième fichier d'images en utilisant l'émetteur-récepteur radiofréquence de noeud secondaire (350), le premier fichier d'images présentant une résolution plus élevée et une taille plus grande que le deuxième fichier d'images, de sorte que lors de la réception du fichier d'images arrivé en premier parmi le premier et le deuxième fichier d'images, l'unité de commande peut transmettre le fichier arrivé en premier à la station de surveillance (200), et ensuite, si le fichier arrivé en premier était le deuxième fichier d'images, à transmettre, lors de l'arrivée du premier fichier d'images, le premier fichier d'images à la station de surveillance (200).

35. Procédé selon la revendication 34, le contrôleur de noeud (360) transmettant le premier et le deuxième fichier d'images uniquement en réponse à la réception d'un message de commande provenant de l'unité de commande (110).

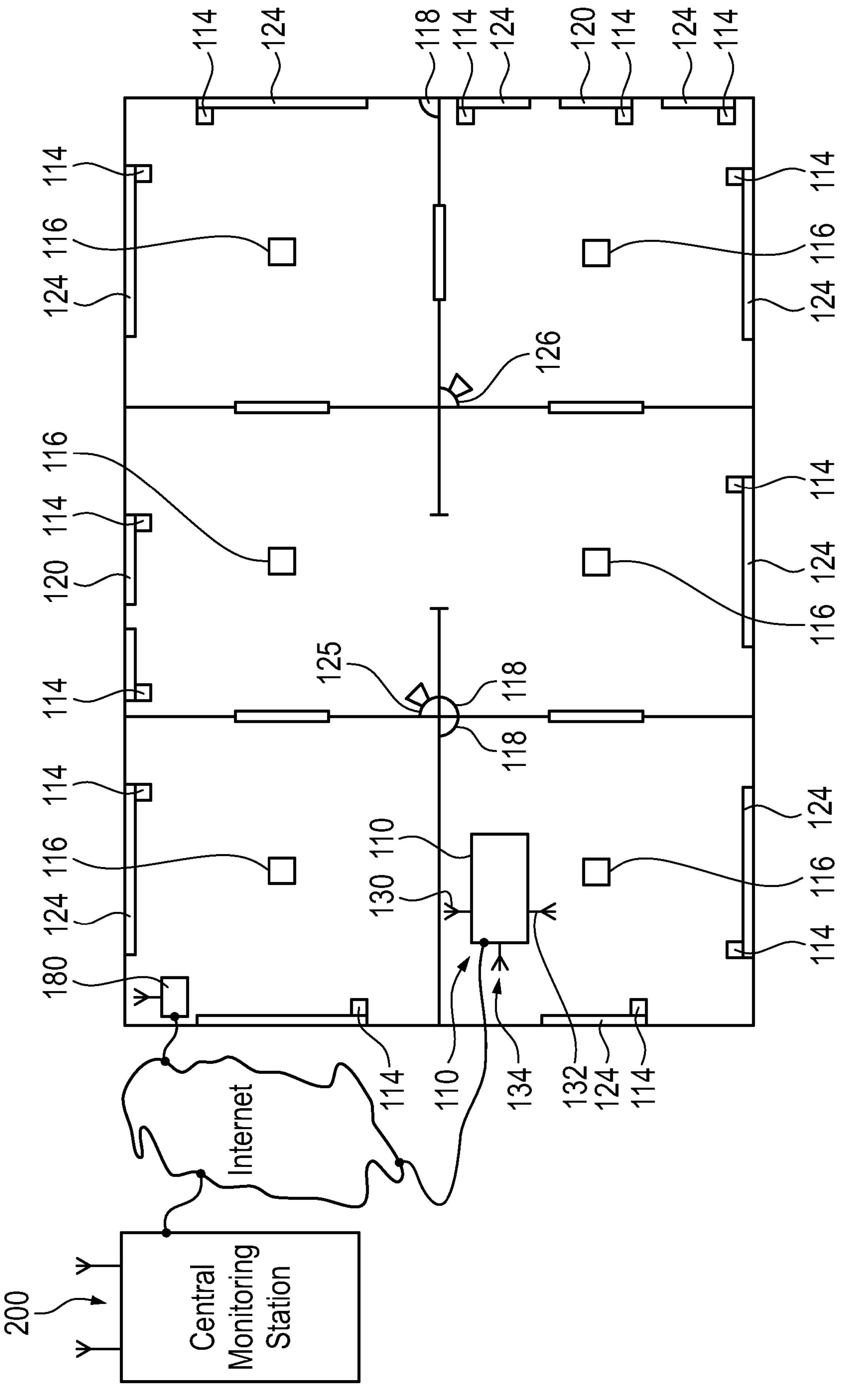
Internet
Central Monitoring Station
110
114
116
118
120
124
125
126
130
132
134
180
200

Fig. 1

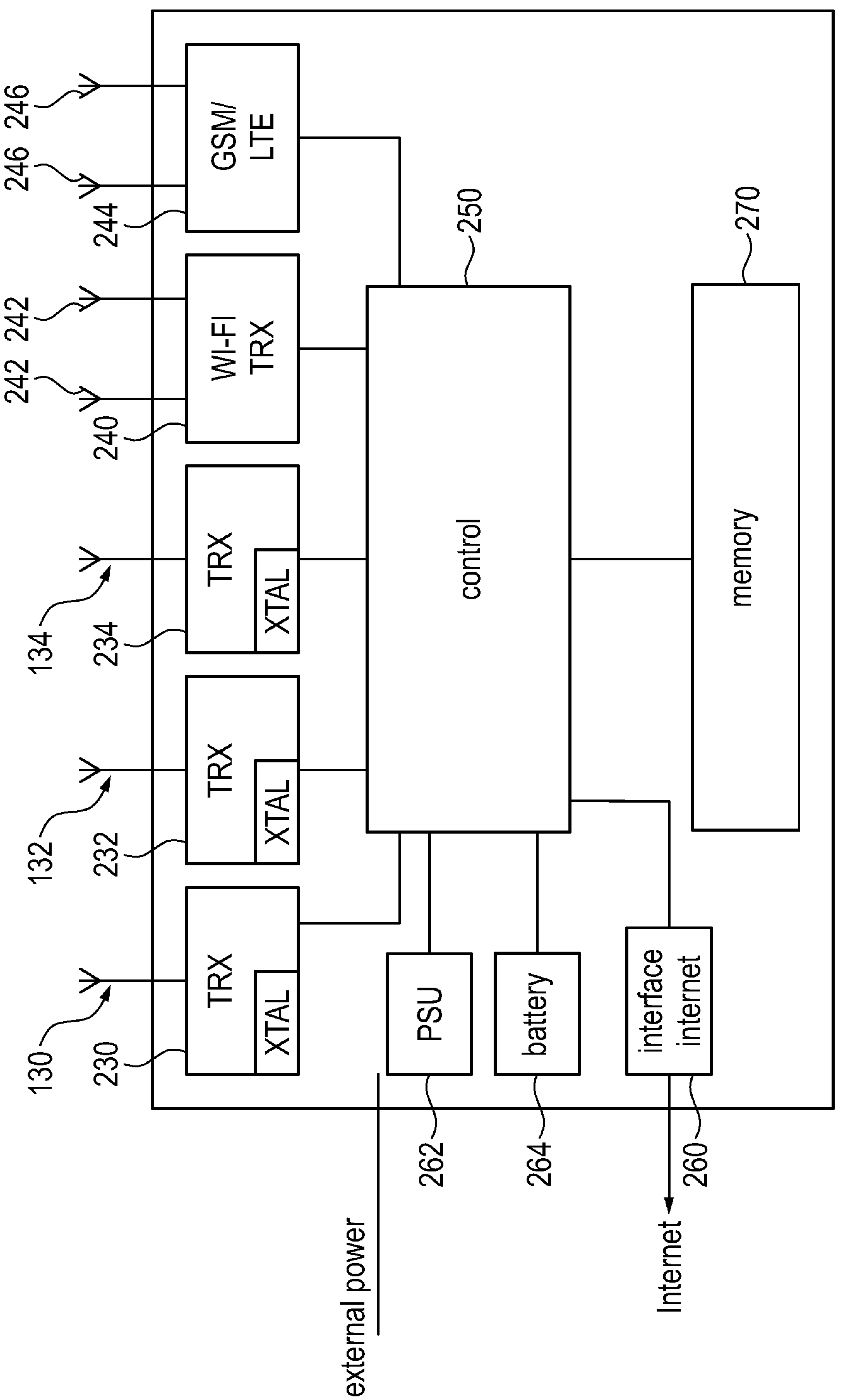
GSM/
LTE
WI-FI
TRX
TRX
XTAL
TRX
XTAL
TRX
XTAL
control
memory
PSU
battery
interface
internet
external power
Internet
246
246
244
242
242
240
134
234
132
232
130
230
250
270
262
264
260

Fig. 2

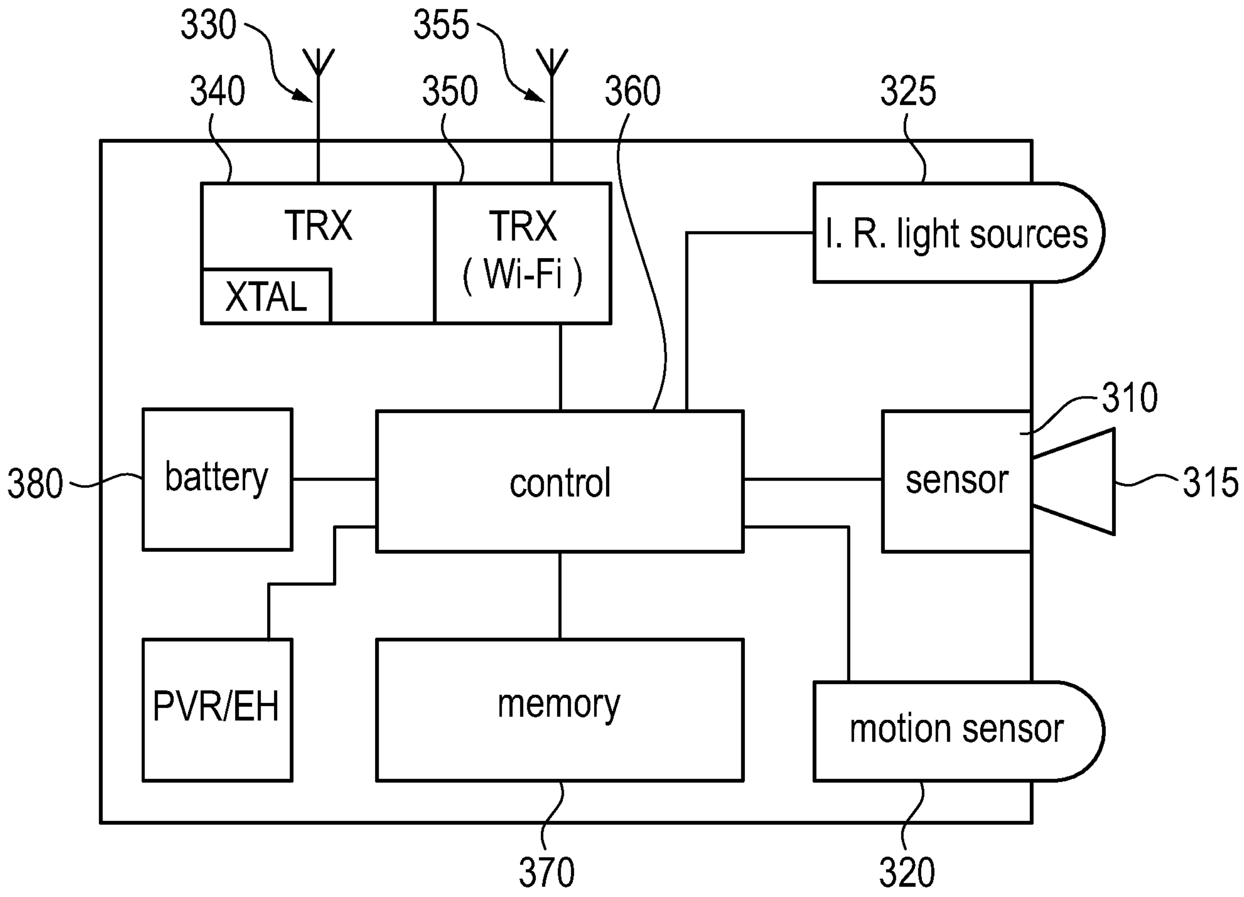
330
355
340
350
360
325
TRX
XTAL
TRX
(Wi-Fi)
I. R. light sources
310
380
battery
control
sensor
315
PVR/EH
memory
motion sensor
370
320

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20090189981 A1 **[0007]**