Description

Title of Invention: System of living

Technical Field

[0001]
The present invention relates to a system and methods to respond to monitored conditions in a living space (“space”) as a unitary and independent complex: a tenant unit, a building. The related users may be the tenant, management staff, visitor, intruder. The tenant is identified through an identification entity with short-range wireless communicative capacities; or a user carried mobile device (“user mobility”) – such as digital cellular systems, personal communications systems (“PCS”), enhanced specialized mobile radios (“ESMRs”), radio frequency (“RF”) based tracking systems (Bluetooth, WiFi, ZigBee). A digital device (“staff digital device”) is carried by management staff servicing a user’s space: a house, a building. A processing system processes signals/data received from at least one: monitoring device, user mobile device, staff digital device and a plurality of beacons.

Background Art

[0002]
A space typically undergoes dynamic daily residing tenant (“user as inhabitant”) activities, comprising departing, returning and staying within. Other users of the environment include management staff and visitors. Prevention of intruders trespassing entails user activated alarm system, closed-circuit television (“CCTV”) monitoring and patrolling by management staff.

Summary of Invention

[0003]
The present disclosure relates to methods that generate and send signals/data when a detected condition is beyond a state level; under some conditions, alerts are sent to selected receiving nodes upon detection of occupancy, also, the system correspondingly limits elevator use.

Technical Problem

[0004]
Monitoring systems are mostly related to alarm systems, which commonly have unresolved problems with false alarms triggered by animals and heedless users. In converse, the alarm is dependent on user activation and is otherwise unreactive to actual intrusion. The CCTV is incapable of alerting property management staff with possible security incidents – it is commonly for recording. The outcome is ineffective assurance of alert sending prior to and during intrusion of a space. An intruder also conveniently uses the elevator and endangers safety of tenants in different building territories. What remains an unresolved problem is to have in place a system to ensure sheer authorized entry into the monitored space without triggering false alarms.
[0005]
The space inhabitant needs some conditions within a space at a “comfortable“ state. Selected systems allow data display on the user’s mobility: adjustment of those conditions demand manual input. It would be ideal to automate adjustment of those monitored conditions.

Description of Embodiments

Solution to Problem

[0006]
The present invention provides a system and methods to monitor conditions in a space, respond when a condition is detected. One condition is detected intrusion, whereas a system response is to trigger an alert. Another exemplary condition is indoor temperature, the system response allows automated regulation at an intended state through a state system.
[0007]
To counter connectivity disablement, the system encompasses a pulser to send signals/data to the cloud based processing system in accordance with a preconfigured address and frequency. When signal disruption from the system in the space to the processing system occurs, the processing system determines to alert designated parties. The system alert is through the send of messages upon or prior to an incident of possible intrusion and trespassing to selected devices, including the user mobility and client computer.
[0008]
The system has a learning capability to project the arrival time of user as inhabitant at the space; when the user mobility is at other locations, questions are prompted for understanding those locations. The system will exclude the possibility of false alarm if projected user arrival time is beyond the concurrent time of occupancy detection during an activated alarm operation. The operation also involves preventing the detected intruder from using the elevator for escape.

Advantageous Effects of Invention

[0009]
Monitoring of the space entails identification of the occupancy status within and the environment around it. The invention involves automated activation and deactivation of an alarm operation – commonplace systems require manual input.
[0010]
The space conditions are monitored through a slew of sensors, encompassing camera (for video), microphone (for audio), passive infrared sensor (to detect motion), and climate sensors, such as carbon monoxide sensor, temperature sensor, humidity sensor and others. Contemporaneous signals/data are collected by a monitoring device (“gateway”) for processing with the processing unit; or sent for processing to a cloud-based processing system, comprising an application server and memory with a database.
[0011]
The conditions of a monitored space may be maintained at a desired state through sending gateway output, as well as, processing system output, comprising signals/data to other devices or systems.

Brief Description of Drawings

[0012]
The drawings constitute to embodiments of the present invention and serve to depict the apparatuses infrastructure and operating principles.
[0013]
FIG.1 depicts a building under surveillance of the system.
[0014]

FIG.2 depicts the system triggering an alert for send to targeted users in an alarm operation within a building.
[0015]
FIG.3 depicts system correspondence with user at a distant location.
[0016]
FIG.4 depicts the infrastructure of the system.
[0017]
FIG.5 is a flow chart demonstrating a method for an alarm operation.
[0018]
FIG.6 is a flow chart demonstrating a method for an alarm operation in a building on basis of time based path tracking.

Description of Embodiment

[0019]
Exemplary embodiments of the invention are discussed in detail below. While specific exemplary embodiments are discussed, it should be understood that they serve illustration purposes only.
[0020]
Time and Location Based Monitoring and Alarm Operation
[0021]
As depicted in **FIG.1**, building **100** is installed with elevator system **110**, elevator cars **113-1** and **113-2** commute between ground floor level **101-0** and a plurality of floor levels **101** – including floor level **101-2**. Elevator doors **112-2-1** and **112-2-2** are disposed at floor level **101-2**.
[0022]
Gateway **168** is configured to receive signals/data transmitted by a plurality of encompassed sensors, including: occupancy sensors **161-1** and **161-2**occupancy detection within unit **108-2**; slave **164** feedback signals/data correspond to connected state system **190** on/off mode; and from communicatively connected devices, including: door sensor **122-2-1** detecting door **104-2** opening/closing; home device **192** as an air conditioner feedback signals/data correspond to on/off operative mode; external device **193** as a safe detecting opening/closing. Said signals/data are received by gateway **168** and transported to processing system **170** – encompassing application server **171** and memory **172** – via communications network **130**.
[0023]
Control gateway **120** is configured to receive information comprising signals/data transmitted by a plurality of communicatively connected systems and devices, including: elevator system **110**, floor level **101-2** installed occupancy sensors **121-2-1** and **121-2-2**, door sensors **122-2-1** and **122-2-2**, beacon **123-2**, as well as, beacon **123-0** installed at floor level **101-0**. In another set up procedure, gateway **168** and control gateway **120** comprise a wireless router, allowing direct connection to mobility **166**. In this example, gateway **168** or control gateway **120** sends an IP address to mobility **166**; user **180** enters their WiFi SSID and password via the App to connect to gateway **168** or control gateway **120**. A secure cryptographic key may be issued to enable secured pairing; Bluetooth pairing, direct USB connection, or DTMF may also be used to configure mobility **166**.
[0024]
In embodiment one, users as inhabitants **180-1** and **180-3** carrying mobility **166-1** and identification entity **165**, respectively, step out of monitored unit **108-2** – triggering door sensor **122-2-1** to send a signal upon door **104-2** opening, and occupancy sensor **121-2-1** to send a signal upon detecting occupancy in waiting lobby **102-2**. Through prompting a message gateway **168** requests a response

message from user as inhabitant **180-1** mobility **166-1**: gateway **168** does not receives a user as inhabitant **180-1** mobility **166-1** sent short-range wireless response message. Upon the lapse of a time period, which exceeds a preconfigured first threshold, processing system **170** ascertains a deactivated alarm operation and activates an alarm operation pertaining to unit **108-2**. In furtherance, gateway **168** sends a wired/wireless signal upon activation of the alarm operation, wherein slave **164** is a relay comprising a unique identifier and a communication component (not shown) receiving the gateway **168** sent wired/wireless signal and switches off state system **190**. During an activated alarm operation, given occupancy sensors **161-1** or **161-2** detect occupancy, while a response message from mobility **166-1** is not received by gateway **168**, processing system **170** will trigger an alert and send a message to user as inhabitant **180-1** mobility **166-1** and staff **181** digital device **169**.

[0025]

In embodiment two, user as inhabitant **180-3** carrying identification entity **165** steps out of unit **108-2**, while user as inhabitant **180-1** carrying mobility **166-1** stays: user as inhabitant **180-1** mobility **166-1** sends a short-range wireless message within a time period of the preconfigured first threshold in response to gateway **168** prompted quest message: an alarm operation pertaining to unit **108-2** is not activated.

[0026]

Time Based Path Surveillance

[0027]

FIG.2 illustrates one aspect of a building as location **203**: control gateway **220** is communicatively connected with a plurality of occupancy sensors **221**, door sensors **222**, beacons **223**, as well as, elevator system **210** – installed and operative within location **203**. Each point of detected occupancy constitutes to tracked user traversal path with respect to time (“clock time”) adopted by cloud service node located processing system **270**.

[0028]

In embodiment three, user **280-4** as trespasser lingering in waiting lobby **202-1** for a time period exceeding a preconfigured second threshold is detected by occupancy sensor **221-2-1**. Processing system **270** sends an alert to the receiving nodes, comprising: a text message to staff **281** digital device **269** requesting staff **281** to respond to the message and visit waiting lobby **202-1** within a preconfigured time period; and, a text message informing a potential incident to mobility **266-1** carried by user **280-1** as sole inhabitant of unit **208-1**; as well as, an alert signal to elevator system **210**, which receives the alert signal, evades landing elevator cars on floor level **201-1** and opening elevator doors **212-2-1** within a preconfigured time period. Staff **281** digital device **269** is configured to send the pairing records to processing system **270** upon the lapse of the time period of a received alert, which do not include pairing between digital device **269** and beacon **223-1**: processing system **270** sends an alert to a receiving node, comprising a building administrator client computer (not shown).

[0029]

In embodiment four, user **280-4** as trespasser arriving at waiting lobby **202-0** and traversing through stairs territories at floor levels **201-0**, **201-1**, and **201-2** – is sequentially detected by occupancy sensors **221-0-2**, **221-1-2**, and **221-2-2**. User **280-4** opens emergency door **205-2** – triggering door sensor **222-2-2** to transmit a signal at time t_0, and is detected by occupancy sensor **221-2-1** at time t_1 when entering waiting lobby **201-2**. On the other hand, user **280-1** as inhabitant of unit **208-2** enters waiting lobby **201-2** through elevator doors **212-2-1** imminently before time t_0. Users **280-1** and **280-4** traverse toward normally closed door **204-2** – door sensor **222-2-1** transmits a signal upon detecting opening at t_2. At t_3, door sensor **222-2-1** senses closing; whereas, occupancy sensor **221-2-1** detects

non-occupancy. Processing system **270** receives the signals/data of two separate time based user traversal paths entering unit **208-2**, and sends an alert to staff **281** digital device **269**, as well as, user **280-1** mobility **266-1**.

[0030]

In embodiment five, staff **281** at the building entrance (not shown) is requested by the building administrator to visit unit **208-2** at time t_4. However, since time t_4 after a time period Δt_v, which exceeds a preconfigured third threshold (comprising a preconfigured travel time period stored in memory**272** characterized for door **204-2** corresponding to traveling from the building entrance to unit **208-2**), processing system **270** received information pertaining to tracked traversal path of staff **281**, comprising: (1) staff **281** digital device **269** pairing records not encompassing pairing with beacon **223-2** at floor level **201-2**; (2) occupancy sensor **221-2-1** not detecting occupancy from control gateway **220**; (3) door sensor **222-2-1** not detecting door **204-2** opening from control gateway **220**. Processing system **270** sends an alert to a plurality of receiving nodes, including a building administrator client computer (not shown).

[0031]

In embodiment six, information pertaining to a triggered alert on floor level **201-1** is sent by processing system **270** to elevator system **210**; wherein, elevator system **210** receives said commanding message and evades floor landing and/or opening of elevator doors **212-1-1** on floor level **201-1**.

[0032]

FIG.3 presents an exemplary embodiment of environment **300** – comprising the predefined circular geo-fence area **350**, with a radius corresponding to the maximum offset between the computed center-of-mass being the monitored home **308** and the furthest edge of geo-fence boundary of geo-fence area **350**. Control gateway **320** installed location **303** is outside geo-fence area **352**.

[0033]

In embodiment seven, mobility **366-2** – carried by user **380-2** as sole inhabitant of home **308** – periodically sends the concurrent geo-location, or Global Positioning System (“GPS”) coordinates, to processing system **370** via communications network **330**. At instantaneous time t_1, user **380-2** is within geo-fence area **352**, at distance d_1 travelling away from home **308**; at instantaneous time t_2, user **380-2** is within geo-fence area **351**, at distance d_2 from home **308**:

[0034]

$$v = \frac{(d_2 - d_1)}{(t_2 - t_1)}$$

[0035]

where, v is the directional velocity of user **380-2**.

[0036]

Arrival time t_a of user **380-2** at home **308**, is as follows:

[0037]

$$t_a = t_c + \Delta t_a + \Delta t_l$$

[0038]

where, t_c is the concurrent time; whereas, lead time period Δt_a can be projected, using:

[0039]

$$\Delta t_a = \gamma \cdot \frac{d}{v}$$

[0040]

where, γ represents a preconfigured factor pertinent to the uncertain preconditions affecting lead time period Δt_a, such as time of the day, the unique identifier of mobility **366-2** and characteristics of user **380-2** or home **308**, etc. Other mathematic formulae, statistical analyses and methods may seem

fit in different situations where appropriate and therefore can also be applied for projection of the arrival time t_a of user **380-2** at home **308**.

[0041]

Mobility **366-2** carried by user **380-2** as inhabitant of home **308** arrives at location **303**, user **380-2** mobility **366-2** establishes pairing with beacon **323** through finding and establishing a recognized wireless communication link; whereas, pairing disconnects when the communication link becomes out of range as user **380-2** departs from location **303**. In one embodiment, user **380-2** mobility **366-2** adopts the processing system **370** clock/timer**374** clock time and sends the concurrent geo-location at location **303**, pairing records – comprising clock time based data of pairing, pairing disconnection and beacon **323** unique identifier – to processing system **370** via communications network **330**; as another possibility, processing system **370** receives the information from control gateway **320**, or beacon **323**. Processing system **370** stores the time span of stay of user **380-2** at location **303** in memory **372** with respect to clock/timer **374** clock time in according with the pairing records as: user **380-2** lead time duration Δt_l . Location **303** can be a building with an address, or a moving vehicle such as an automobile or an airplane having network communication capacity. A map may be applied by mobility **366-2** via an App to identify the geo-location of location **303**.

[0042]

Upon user **380-2** arriving at home **308**, user **380-2** mobility **366-2** performs pairing with wireless router equipped gateway **368**. Established pairing is recorded with respect to the clock time as user **380-2** arrival time t_a at home **308** in the gateway **368** memory (not shown) and sent to processing system **370** – which records user **380-2** arrival time t_a in memory **372**.

[0043]

To continually reassure the accuracy of projecting user **380-2** arrival time t_a at home **308**, processing system **370** enacts an onboarding process for projection of user **380-2** lead time duration Δt_l through prompting questions to learn about the relatedness between user **380-2** and location **303**. After pairing with location **303** disposed beacon **323**, user **380-2** mobility **366-2** may relate the control gateway **320** and/or beacon **323** unique identifier to exemplary questions, including:

[0044]

What do you do here?

[0045]

How long will you be here?

[0046]

The address here?

[0047]

Exemplary questions as shown may be presented through a mobility **366-2** App. As another possibility, mobility **366-2** prompts the query through an audio apparatus; user **380-2** may key in a text reply such as:

[0048]

“I work here at 123 Queen’s Road”

[0049]

or, verbally provide an answer, which is processed using voice recognition technology. The processing may occur on mobility **366-2**, and/or in a remote server coupled to mobility **366-2** – for example, cloud located processing system **370** in a client-server architecture – after mobility **366-2**records and sends the reply via communications network **330**.

[0050]

Processing system **370** is programmed to derive at least one pattern to the characteristics of location **303** over a time period, comprising: location **303** address, geo-location, relationship with user **380-2**, user **380-2** activity, typical/average user **380-2** lead time duration Δt_l, as well as, typical/average user **380-2** lead time period Δt_a between departing from location **303** and arriving at home **308**. Processing system **370** is also equipped with the processing components (hardware and software) with speed and data capacity to derive one or more patterns related to one or more characteristics of a plurality of locations **303** on basis of collected data from the corresponding beacons **323** and user provided answers sent by one or more mobilities **366**.

[0051]

Via an App, user **380-2** mobility **366-2** at location **303** establishes a statistical time log profile. The pairing records are as follows:

[0052]

[Table 1:pairing records pertinent to location303]

Date	GPS coordinates	location 303 beacon 323 unique identifier / time pairing / time pairing disconnection	gateway 368 unique identifier / time pairing
2015-1-3	45, 0	f7126da6-4fa8 / 21:30 / 22:15	bc50b27a / 22:30
2015-1-10	45, 0	f7126da6-4fa8 / 21:25 / 22:10	bc50b27a / 22:25
2015-1-17	45, 0	f7126da6-4fa8 / 21:35 / 22:20	bc50b27a / 22:35

[0053]

Given concurrent time t_c is 21:28 on 2015-1-24, user **380-2** mobility **366-2** receives location **303** beacon **323** unique identifier “f7126da6-4fa8”; the App processes the data. User **380-2** mobility **366-2** sends to processing system **370** the phone serial number, and time log as follows:

[0054]

[Table 2:time log example]

	Address of location	GPS coordinates	Δt_l (min)	Δt_a (min)	t_a
time log	123 Queen’s Road	45, 0	45	15	22:28

[0055]

Alternatively, user **380-2** mobility **366-2** sends the data shown in Table 1 to processing system **370**, which processes the data and obtains the time log, encompassing: (1) address of location **303**; (2) user **380-2** geo-location; (3) lead time duration Δt_l at location **303**; (4) lead time period Δt_a; (5) projected user **380-2** arrival time t_a.

[0056]

In embodiment eight, mobility **366-1** – carried by user **380-1** as sole inhabitant of home **308** traverses beyond geo-fence area **350** and into geo-fence area **351** – is configured to send its geo-location at a preconfigured frequency to processing system **370** via communications network **330**. User **380-1** time log exceeds a preconfigured forth threshold: an alarm operation pertaining to home **308** is activated by processing system **370**. Gateway **368**sends a wireless signal upon alarm operation activation and received by home device **392**, wherein its operating mode switches from on to off.

[0057]

In the event that gateway **368** collects sensor signals/data pertinent to occupancy sensor **361** detecting occupancy, or door sensor **322** detecting opening/closing of normally closed door **304**: gateway **368** sends a signal to processing system **370**, which immediately triggers an alert providing user **380-1** time log exceeds the preconfigured forth threshold and a concurrent visit time

period is not in effect; alternatively, processing system **370**does not immediately trigger an alert providing user **380-1** time log is less than the preconfigured forth threshold or a concurrent visit time period is in effect –through prompting a message, gateway **368** requests a response message from user as inhabitant **380-1** mobility **366-1** or user as visitor **380-2** mobility **366-2**. A short-range wireless response message will be sent by mobility **366-1** or mobility **366-2**; failure of the response message receiving by gateway **368** within a time period of the preconfigured first threshold will result in satisfaction of set alert trigger condition – processing system **370** triggers an alert.

[0058]

In embodiment nine, user as inhabitant **380-1** of home **308** establishes a visit time period, comprising: a starting date with one or more specific time periods in each of a span of days in accordance with the clock time; user **380-2** as authorized visitor ("visitor") carrying mobility **366-2**, and user **380-3** as visitor carrying identification entity **365,** are authorized to visit home **308** during the visit time periods. An alarm operation is normally activated for unattended home **308** during said days; in the event of occupancy sensor **361** in home **308** detecting occupancy, through prompting a message gateway **368** requests a response message from said user as inhabitant **380-1** mobility **366-1**, and/or, user **380-2** as visitor mobility **366-2**; wherein, user as inhabitant **380-1** mobility **366-1** time log is less than a preconfigured forth threshold.

[0059]

Processing system **370** will not trigger an alert, comprising: (1) short-range wireless response message sent by mobility **366-1**; (2) short-range wireless response message sent by mobility **366-2**, or identification entity **365**, wherein the clock time is within a visit time period. Home **308**monitoring gateway **368** receives and transports to processing system **370** the collected signals/data: the alarm operation is deactivated.

[0060]

Upon the lapse of a visit time period, gateway **368** prompts a message to mobility **366-2**, or, an audio message through speaker **362** to request user**380-2** to depart from home **308**. It is also possible that gateway **368** prompts a message to user as inhabitant **380-1** mobility **366-1** requesting for extension of the elapsed visit time period.

[0061]

FIG.4 illustrates a networking schematic diagram of a preferred embodiment of the present invention system **400**.

[0062]

Processing system **470** may be internet accessible cloud service node located, comprising memory **472**, digital processor mounted application server**471** – monitoring building **403** and/or home **408** through receiving and rerouting signals/data via communications network **430**. A wide variety of commercially available computer servers can be used in conjunction with appropriate software to function as processing system **470** for receiving and processing said devices sent signals/data. The wireless digital alarm data may be processed into alert information for dispersal to further receiving parties as discussed herein. An emergency entity, such as police, fire department, and/or rescue squads, may also receive alert information.

[0063]

Memory **472** can be any device, including magnetic, optical or solid-state memory for storing signals/data relevant to a user or administrator of system **400**. A library of predefined geo-fence boundaries, the polling interval at constant or variable frequency directing data-logging between processing system **470** with mobility **466** and digital device **469**, and preconfigured thresholds comprising time periods and distances, are stored in memory **472** and retrieved by application

server **471**. Memory **472** can be located at a cloud service node working with or within processing system**470**, or other service nodes: such as a node of home **408** or building **403**; a node comprising user mobility **466**, or staff digital device **469**.

[0064]

Geo-location system **460** is a terrestrial or satellite based positioning system; including the Beidou Navigation System, Differential GPS ("DGPS"), Eurofix DGPS, Global Positioning System ("GPS"), Global Navigation Satellite System ("GNSS"). In other positioning systems, geo-location system**460** comprises cellular communication towers, or systems providing reference points, transmit wireless radio frequency ("RF") signals/data received by user mobility **466** and staff digital device **469**.

[0065]

Identification entity **465** is typically an integrated circuit ("IC") card comprising a battery, memory for storing a unique identifier, and a transmitter for transmitting wireless signals comprising unique identifier to control gateway **420** and gateway **468** via a short-range wireless communication link. Typical short-range communication protocols include Bluetooth, WiFi (IEEE 802.11b), WiMax (IEEE 802.16) and ZigBee (IEEE 802.15.4).

[0066]

Communications network **430** uses a combination of wireless and landline communication infrastructure such as a cellular telecommunication system and the internet, including broadband, WiMax, fixed line PSTN, etc. Communication may be established through various mediums, such as a modem, which provides a TCP/IP communication channel to processing system **470**.

[0067]

Communications network **430** provides two-way data-logging between processing system **470** and telematics devices; wherein, processing system **470** transmits the wireless digital alarm data in a formatted text message to a plurality of user mobilities **466**, and staff digital devices **469**, which may be any device capable of receiving SMS type data, or any wireless digital data, comprising digital cellular telephone, pager, personal communications systems ("PCS"), enhanced specialized mobile radios ("ESMRs"), wireless electronic mail receivers (e.g., the Blackberry® and Treo® devices), multimedia Internet enabled cellular telephones (e.g., the iPhone®), GPS receivers and similar personal electronic devices which include a programmable processor and memory, and communication transceiver capable of connecting to a wired/wireless network. In furtherance, digital device **469** also comprises a network linked electronic device with computing capacity such as a microcomputer, an internet server, a portable client device of PSTN, or a static device operative of e-mail account of the premise's owner or agent. The alarm user may receive an alert notification on mobility **466** and digital device **469**. Control gateway **420** and gateway **468** are also configured for communicating with mobility **466** and digital device **469** using a short-range wireless communication protocol.

[0068]

In building **403**, control gateway **420** communicates with elevator system **410** via a communication link, and links with communications network **430**through a network port. Control gateway **420** encompasses a memory storing unique identifiers of the communicatively linked sensors and devices, comprising: occupancy sensor **421**, door sensor **422** disposed at the normally closed entrance door of home **408**, beacon **423**.

[0069]

Gateway **468** encompasses a memory stored unique identifier, and communication component such as a wireless module (not shown) for short-range wireless communication with mobility **466**, identification entity **465**, wired/wireless communication with a plurality of disparate components,

comprising: door sensor **422**, home device **492**, and external device **493**. An RJ45 or Ethernet port is possibly mounted within gateway **468** for linkage with communications network **430**. A single housing (not shown) may encompass at least gateway **468**, occupancy sensor **461**, speaker **462**, climate sensor **463**, slave **464** and pulser **467**.

[0070]

Beacon **423** includes a short-range wireless transceiver, or an access point with wired/wireless network connectivity, comprising: a memory stored unique identifier identifiable by processing system **470**; a wireless module for short-range wireless communication with a plurality of identification entities **465**, mobilities **466**, and digital devices **469**; network port for connectivity with control gateway **420** via LAN; network port for connection to an internet connected router.

[0071]

Processing system **470** receives: occupancy sensor **461** transmitted wired/wireless signals/data when detecting occupancy through gateway **468**, and occupancy sensor **421** transmitted wired/wireless signals/data when detecting occupancy within building **403** through control gateway **420**. In an exemplary embodiment, occupancy sensor **421** and occupancy sensor **461** – comprising a communication component; a memory stored unique identifier; a passive infrared ("PIR") receiver, and/or an image capturing device for capturing images and transmitting captured images – wherein processing system **470** detects occupancy using at least one image processing method.

[0072]

In one embodiment, external device **493** is a normally closed entity such as a repository, or a safe, having a memory stored unique identifier and a communication component to transmit a wired/wireless signal to gateway **468** upon open/closing. Slave **464** comprising a unique identifier is a relay with a communication component (not shown) for receiving gateway **468** sent wired/wireless signals/data, to connect and disconnect power for control of the on/off mode of state system **490**, and transmit the feedback signals/data pertinent to the on/off mode of state system **490** to gateway **468**.

[0073]

Pulser **427** transmits pulsed wired/wireless signals/data comprising a unique identifier to processing system **470** through communications network **430**. Pulser **427** may be an independent component, or a software app imbedded in gateway **468**/control gateway **420**.

[0074]

Processing system **470** sends selected signals/data via a communication link with the control unit (not shown) of elevator system **410** to override landing and/or doors opening/closing of the serving elevators (not shown) in building **403**.

[0075]

Home Alarm Operation

[0076]

In one aspect of the present invention, processing system **470** receives and processes signals/data sent by gateway **468**, mobility **466**, identification entity **465**, to determine activation and deactivation of an alarm operation in compliance with an established alarm policy based on a set of criteria, to determine that an alert trigger condition is fulfilled in home **408**, and to send the alert information to receiving nodes in accordance with the alert trigger process. **FIG.5** shows method **500**, comprising the following steps.

[0077]

Step **501**: Alarm operation policy, alarm operation activation and deactivation policy, alert trigger policy are established by the administrator and stored in processing system **470** as alarm policy. Data-logging is established for interchange of signals/data transmitted and received between processing

system **470** and other nodes, comprising: (1) user as inhabitant or user as visitor mobility **466** of home **408**; (2) staff digital device **469**; (3) gateway **468** monitoring home **408**.

[0078]

Step **502**: Detection of a pulling event, comprising (1) door sensor **422** detecting home **408** normally closed entrance door opening/closing; (2) control gateway **420** detecting mobility **466**/identification entity **465** in building **403** common use territory; (3) mobility **466** having the smallest user as inhabitant time log exceeding the preconfigured forth threshold; (4) the lapse of a visit time period.

[0079]

Step **503**: Gateway **468** prompts a message requesting a response message from at least one user mobility **466** upon the pulling event. If gateway **468** does not receive a user mobility **466** sent response message within a time period of the preconfigured first threshold, go to step **504**; otherwise, go to step **501** for continuation of the monitoring process.

[0080]

Step **504**: Processing system **470** arms the system by activating an alarm operation; processing system **470** monitors home **408** through receiving gateway **468** sent signals/data pertinent to a plurality of sensors/devices, verifies concurrent or last received geo-location of user as inhabitant mobility **466**, and projects a time log.

[0081]

Step **505**: Detection of a pushing event, comprising 1. door sensor **422** detecting home **408** normally closed entrance door opening/closing; 2. occupancy sensor **461** detecting occupancy in home **408**; 3. mobility **466** having the smallest user as inhabitant time log crossing below the preconfigured forth threshold; 4. user as inhabitant authorizing extension of a lapsed visit time period through mobility **466**; 5. gateway **468** detecting pairing with user as inhabitant or user as visitor mobility **466**.

[0082]

Step **506**: Gateway **468** prompts a message requesting a response message from user mobility **466** upon the pushing event, or within a time span of the projected arrival time t_a corresponding to the pertinent time log. If gateway **468** receives user as inhabitant mobility **466** sent message or, message corresponding with user as visitor mobility **466** within a visit time period, and within a time of the preconfigured first threshold, go to step **507**; otherwise, go to step **508**.

[0083]

Step **507**: Processing system **470** disarms the system by deactivating the alarm operation; go to step **501**, the monitoring process continues.

[0084]

Step **508**: Processing system **470** performs the alert trigger process mandate for home **408** and sends the information to a receiving node, including user as inhabitant mobility **466**, and/or staff digital device **469**.

[0085]

Building Environment Alarm Operation

[0086]

A method in the present invention for monitoring building **403** encompassing unit **408**, comprising: processing system **470** receives signals/data sent by control gateway **420**, as well as, mobility **466** and digital device **469** of users related to building **403**. Processing system **470** processes the information in accordance with an established alarm policy, to determine that an alert trigger condition is fulfilled, and sends the alert to the receiving nodes in accordance with an alert trigger process. **FIG.6** shows a flowchart of method **600** for an alarm operation, comprising the following steps.

[0087]
Step **601**: Alarm operation policy, alert trigger policy are established by the administrator and stored in processing system **470** as alarm policy. Data-logging is established for interchange of signals/data transmitted and received between processing system **470** and other nodes, including: (1) mobility **466** carried by user as inhabitant of unit **408**; (2) staff digital device **469**; (3) control gateway **420** in building **403**; (4) elevator system **410**operative in building **403**.
[0088]
Step **602**: Processing system **470** – tracking a user traversal path by processing signals/data sent from a plurality of occupancy sensors **421** and door sensors **422**, user mobility **466** or visitor identification entity **465**, and signals/data received from elevator system **410** – go to step **604** if the received signals/data satisfy the set alert trigger conditions; otherwise, go to step **603** for continuation of the monitoring process.
[0089]
Step **604**: Processing system **470** performs the alert trigger process and sends the information to staff digital device **469**, and user as inhabitant mobility **466** of a particular unit **408**.
[0090]
Step **605**: Processing system **470** performs the alert trigger process mandate of building **403**.
[0091]
A. Alarm Policy Establishment:
[0092]
Home **408** Alarm Policy:
[0093]
User as inhabitant is authorized to set the alarm policy, enter and stay at home **408** without time constraints; user as visitor is permitted for entry and stay at home **408** with preconfigured time constraints on date and span during each visit time period. While authority limits are set by the administrator for all users; user as management staff and user as visitor are deprived of such authority.
[0094]
Building **403** Alarm Policy:
[0095]
The administrator establishes an alarm policy for building **403**, comprising criteria of information processing procedure and priority, modification, deletion and the like. In the alarm operation process, the traversal paths pertaining to all users must comply with preconfigured time constraints in accordance with an established alarm policy.
[0096]
B. Activation and Deactivation of Alarm Operation:
[0097]
Home **408** Alarm Operation:
[0098]
User as inhabitant may establish policy conditions; as gateway **468** received signals/data satisfy one or more of the following conditions, processing system **470** determines to activate an alarm operation in step **502**.
[0099]
Upon a detected pulling event, gateway **468 470** prompts a message to request response message from one or more selected user as inhabitant mobilities **466**.
[0100]

The alarm operation is deactivated after gateway **468** receives a response message within a time period of the preconfigured first threshold upon a pushing event, including: (1) signals/data sent by user as inhabitant mobility **466** / identification entity **465**; (2) signals/data sent by user as visitor mobility **466** / identification entity **465**, wherein the concurrent clock time is within a visit time period established by user as inhabitant, or the administrator.

[0101]

Building **403** Alarm Operation:

[0102]

Activation and deactivation of an alarm operation pertaining to building **403** may be performed through administrative authorization by processing system **470**.

[0103]

C. Alert Trigger Policy Establishment:

[0104]

Home **408** Alert Trigger Conditions:

[0105]

Detected occupancy at any time during an activated alarm operation, wherein aforementioned response message is not received by gateway **468**within a time period of the preconfigured first threshold.

[0106]

Building **403** Alert Trigger Conditions:

[0107]

The alert trigger conditions, comprising: (1) duration of detected occupancy at any particular location within building **403** exceeding the preconfigured second threshold; (2) door sensor **422** pertaining to a particular unit **408** within building **403** not detecting opening/closing, within a time period of the preconfigured third threshold; (3) staff digital device **469** pairing records not encompassing pairing with one or more beacons **423** within a preconfigured time period of a particular clock time; (4) merger of two tracked user traversal paths for entry into one unit **408** located within building **403**.

[0108]

Alert Trigger Policy

[0109]

The alert trigger process comprises: (1) processing system **470** notifies a user via an instant communication message to mobility **466** or digital device **469**; (2) notification via Email; (3) notification via an automatic telephone voice; (4) notification via a multimedia message; (5) activation of a siren; (6) recording a processed alert trigger to memory **472**.

[0110]

In one embodiment, alert trigger conditions are satisfied during a deactivated alarm operation, comprising: (1) door sensor **422** detecting home **408**normally closed entrance door opening/closing, external device **493** – comprising a safe repository with sensor and signal transmitter – transmits a signal pertaining to opening/closing to communicatively connected gateway **468** within a time period smaller than a preconfigured fifth threshold; (2) pulser **467** configured to periodically send wired/wireless signals/data at a preconfigured frequency to gateway **468** for ascertainment of signal transmissions to processing system **470** – signals/data are disrupted.

[0111]

The following embodiment relates to a method comprising system **400** output to received sensor data. In **FIG.4**, gateway **468** periodically collects data from climate sensor **463** – a temperature sensor detecting state system **490** controlled climate attribute as indoor temperature of monitored home **408**;

wherein state system **490** is particularly a distinct central Heating Venting Air-Conditioning ("HVAC") system. The desired state system **490** state in a deactivated alarm operation may be a setpoint temperature of a heated or air-conditioned room, apartment, house, chosen as "comfortable" state by a user; whereas, the desired state system **490** state in an activated alarm operation is a setback temperature for energy saving. In other possibilities, climate sensor **463** can be a humidity sensor detecting indoor relative humidity, gas detector detecting carbon monoxide or other gases, smoke detector detecting smoke, multi-sensor detecting hot water temperature and volume, etc.; whereas, state system **490** is a hot water heater, humidifier, siren, energy storage of electric vehicles, etc.

[0112]

During an activated alarm operation, gateway **468** compares the climate attribute data collected from climate sensor **463** with the memory stored processing system **470** sent effective setback climate attribute, or sends the collected climate attribute data to processing system **470** for determining whether it is above/below the effective setback climate attribute and receives a commanding signal: gateway **468** sends a corresponding signal to slave **464**, which switches state system **490** on/off through power connection and/or disconnection. Gateway **468** retains a memory stored setback climate attribute and replaces it with a new effective setback climate attribute sent by processing system **470**, which projects or calculates an effective climate attribute in accordance with the time log of at least one user as inhabitant carrying mobility **466**. User may be shown the setback climate attribute through mobility **466**; whereas, gateway **468** may send feedback signals/data to processing system **470** if slave **464** is triggered on.

[0113]

Another embodiment comprises a method for maintaining desired state system **490** states on basis of system **400** sensor data. During an activated alarm operation at 6:00p.m., climate sensor **463** data is 16ºC; gateway **468** replaces the memory stored setback temperature 16ºC with processing system **470** sent effective setback temperature 22ºC and sends a signal to slave **464**, which switches on state system **490** for an arriving user. Indoor temperature of home **408** reaches 22ºC at 6:30p.m. – the alarm operation is deactivated a few minutes afterwards while setpoint temperature 23ºC is maintained by state system **490** for the arrived user, who sends to processing system **470** via gateway **468** setpoint temperature 19ºC for a time period from 10:30p.m. to 7:00a.m.

[0114]

At 10:30p.m., gateway **468** retrieves from its memory stored processing system **470** sent setpoint temperature 19ºC, which is below climate sensor **463** sent temperature 23ºC**;** gateway **468** sends a signal to slave **464** for deactivating state system **490**.

[0115]

In another embodiment, comprising: (1) door sensor **422** detecting home **408** normally closed entrance door opening/closing during an activated alarm operation; (2) during certain hours of the day, gateway **468** sending a wired/wireless signal; (3) home device **492** receiving the wired/wireless signal and switches on to a setting or operative intensity in accordance with user identity before the entrance door is opened at all, or before the user is physically or visually exposed to any home **408** territory. As one possibility, home device **492** is a light fixture brightened to yield a scene characterized for an incoming user identified through the projected arrival time t_a. Alternatively, gateway **468** sends a signal to home device **492** as long as the clock time is within a certain time span of the day, regardless of the alarm operation status.

[0116]

One with ordinary skill in the art will agree that the embodiments presented herein are merely exemplary, therefore aspects of those embodiments may vary without departing from the spirit and scope of the invention, which is defined in the claims.

Claims

[Claim 1]
A method of monitoring conditions in a space, comprising:
establishing a communication link between a network connected monitoring device and one or more user mobile devices through communicative pairing;
receiving one or more user mobile devices and user identification entities signals through the monitoring device;
receiving user mobile device pairing records comprising pairing and pairing disconnection with the monitoring device, and a corresponding user mobile device unique identifier;
receiving user mobile device pairing records comprising pairing and pairing disconnection with a beacon disposed at a location, and a corresponding beacon unique identifier;
recording the pairing records in a memory;
activating/deactivating an alarm operation;
triggering an alert;
wherein a processing system includes detecting a pulling event during a deactivated alarm operation that comprises at least one of:
(i) detecting a user mobile device or user identification entity at a location through a beacon, after detecting opening/closing of a normally closed door disposed at a shortest distance from the monitoring device; or,
(ii) detecting the lapse of a visit time period with respect to the concurrent time;or,
(iii) receiving user mobile device sent pairing records comprising pairing disconnection with the monitoring device; or,
(iv) detecting a smallest user time log, among a plurality of user time logs of users as inhabitants, exceeding a preconfigured threshold;
generating a state signal;
transmitting the state signal to a user as inhabitant mobile device, when requesting authorization to resume a lapsed visit time period;
transmitting the state signal to the monitoring device.
[Claim 2]
The method of claim 1, wherein the monitoring device detecting step includes a pulling event during a deactivated alarm operation, that comprises at least one of:
(i) receiving the state signal; or,
(ii) detecting opening/closing of the normally closed door; or,
(iii) detecting pairing disconnection with a user mobile device; or,
(iv) detecting the lapse of a visit time period with respect to the concurrent time;
generating a secondary state signal;
transmitting the secondary state signal to a selected user mobile device.
[Claim 3]
The method according to claim 1, further comprising:
receiving the secondary state signal;
generating an arming signal for the secondary state signal;
activating an alarm operation;
transmitting the arming signal to the monitoring device.
[Claim 4]
The method according to claim 2, wherein the monitoring device, further comprising:
generating an overriding signal for the arming signal;
transmitting the overriding signal to:

(a) an activated electrical device receiving the overriding signal and deactivating within a preconfigured time period, or, a deactivated electrical device receiving the overriding signal and activating within a preconfigured time period; and/or,
(b) an electric door lock receiving the overriding signal remains in the locked state precluding being unlocked; and/or,
(c) a relay slave receiving the overriding signal and deactivating an activated power connected system within a preconfigured time period, or, receiving the overriding signal and activating a deactivated power connected system within a preconfigured time period.

[Claim 5]

The method of claim 1, wherein the processing system detecting a pushing event during an activated alarm operation, comprising:
receiving a user as inhabitant mobile device sent message authorizing to resume a lapsed visit time period; or,
receiving user mobile device sent pairing records comprising pairing with the monitoring device; or,
detecting a smallest user time log, among a plurality of user time logs of users as inhabitants, crossing below a preconfigured threshold, and transmitting said smallest user time log, comprising the corresponding projected user arrival time to the monitoring device.

[Claim 6]

The method of claim 5, wherein the monitoring device detecting a pushing event during an activated alarm operation, comprises:
detecting occupancy; or, detecting opening/closing of a normally closed door;
detecting pairing with a user mobile device;
generating a returning signal;
transmitting the returning signal to the user mobile device.

[Claim 7]

The method according to claim 6, wherein the processing system deactivating an alarm operation, comprises:
receiving the returning signal;
deactivating the alarm operation.

[Claim 8]

The method according to claim 6, further comprising:
transmitting the returning signal upon detecting the normally closed door opening/closing, in a selected time period of the day, wherein within a time span from the user time log comprised projected user arrival time or an effective visit time period, to:
(a) a deactivated electrical device, wherein receiving the returning signal and activating; and/or,
(b) an electric door lock, wherein receiving the returning signal and switches to a locked/unlocked state allowing being unlocked; and/or,
(c) a relay slave, wherein receiving the returning signal and activating a power connected deactivated system within a preconfigured time period.

[Claim 9]

The method of triggering an alert during an activated alarm operation according to claim 6, comprising:
the monitoring device detecting occupancy, or opening/closing of the normally closed door, not receiving a response message within a preconfigured time period from a user as inhabitant mobile device or a user as visitor mobile device, wherein a concurrent visit time period is in effect and the monitoring device not concurrently paired with a user as inhabitant mobile device or a user as visitor mobile device;
the monitoring device detecting occupancy, or pairing with a user as visitor mobile device, not receiving a response message within the preconfigured time period from a user as inhabitant mobile

device, or, the processing system not receiving a user as inhabitant mobile device sent message authorizing to resume a lapsed visit time period within a preconfigured time period, wherein a concurrent visit time period is not in effect;
the monitoring device detecting opening/closing of the normally closed door, not concurrently paired with a user as inhabitant mobile device or a user as visitor mobile device, not receiving a response message within the preconfigured time period from a user as inhabitant mobile device, wherein a concurrent visit time period is not in effect; or,
the monitoring device detecting occupancy, or opening/closing of the normally closed door, not concurrently paired with a user as visitor mobile device, wherein a smallest user time log, among a plurality of user time logs of users as inhabitants, exceeded the preconfigured threshold, and a concurrent visit time period is not in effect;
the monitoring device generating a secondary state signal and sending it to the processing system;
the processing system triggering an alert.
[Claim 10]
The method of claim 1, wherein the user time log, further comprises:
the geo-location data of user as inhabitant; or,
the address of a location; or, the projected user arrival time at the monitoring device disposed space;
the projected user arrival time comprising the lead time duration pertinent to a user as inhabitant, including:
obtaining the unique identifier of a beacon disposed at a location; or,
recording user mobile device pairing records comprising pairing and pairing disconnection with a beacon; or,
providing questions to a user about the location;
obtaining user provided answers to the questions in text and/or voice; or,
deriving at least one pattern related to at least one characteristic of the location, wherein said at least one characteristic including the geo-location and user activity, and, projecting a typical/average time of stay of the user as inhabitant at the location.
[Claim 11]
A method of monitoring conditions by a processing system in a building related to a plurality of users, including at least at least one staff and at least one visitor, comprising:
establishing a communication link with one or more user mobile devices, staff digital devices through communicative pairing;
activating and deactivating an alarm operation in accordance with administrative authorization;
receiving from staff digital device pairing records comprising pairing and pairing disconnection with a plurality of beacons disposed at a location, and corresponding unique identifiers;
receiving from user mobile digital device pairing records comprising pairing and pairing disconnection with at least one monitoring device and one or more beacons disposed at a plurality of locations, and the corresponding unique identifiers;
triggering an alert in accordance with user as staff digital device pairing records not including pairing with one or more distinct beacons within a preconfigured time period, or preconfigured time period since receiving an alert message; or,
triggering an alert in accordance with a detected event during an activated alarm operation;
generating an activity signal corresponding to an entity, including:
(a). a normally closed door disposed with a door sensor detecting opening/closing;
(b). an elevator door disposed on a landing floor corresponding to a landing elevator car;
(c) an occupancy sensor detecting occupancy;
generating a secondary activity signal for a selected activity signal corresponding to detected occupancy in a building territory;

recording the secondary activity signal and defining the concurrent time as the reporting time;
counting a maneuvering time duration commencing from the reporting time to the time of an activity signal corresponding to an entity disposed at a shortest distance from the occupancy sensor pertinent to said secondary activity signal;
triggering an alert in accordance with a maneuvering time duration exceeding the preconfigured time period, wherein the occupancy sensor pertinent to the secondary activity signal, comprising:
(a) disposed not at a shortest distance from a door, an elevator door, or a parking garage exit; or,
(b) disposed at a shortest distance from a door or an elevator door without a corresponding activity signal; or,
(c) disposed at a shortest distance from an elevator door with a corresponding activity signal for an elevator car landed on the floor level of said building territory departing without passenger boarding the elevator car.

[Claim 12]

A system for implementing the method according to claim 1, further comprising:
at least one monitoring device disposed in a space;
one or more beacons disposed at a location;
a processing system communicatively linked with at least one monitoring device;
the processing system communicatively linked with one or more beacons.

[Claim 13]

The system according to claim 12, wherein the monitoring device further comprises:
a wireless module enabling signals/data transport through a short-range wireless communication link with at least one user identification entity, at least one user mobile device, at least one door sensor, at least one electrical device;
an interface for receiving sensor signals/data;
an RJ45 or other wired or wireless Ethernet interface for linkage with a network, including the PSTN, LAN, and the internet;
an occupancy sensor generating a signal upon detecting occupancy;
one or more climate sensors including a digital temperature sensing module or a thermistor, or, a gas sensor, or, a hot water temperature sensor, or a hot water volume sensor, or, a humidity sensor, or, a smoke sensor, collecting indoor climate attribute data comprising: the indoor temperature, or, concentration of a gas in air, or, hot water temperature, or, hot water volume, or, relative humidity, or, concentration of combustion particulates in air;
a processing module for processing data;
a memory for storing data.

[Claim 14]

The system according to claim 13, wherein the monitoring device is configured to:
pair with one or more user mobile devices through a short-range wireless communication link;
receive signals/data sent from said one or more user mobile devices;
send to the processing system signals/data collected from sensors, and user mobile devices.

[Claim 15]

The system according to claim 14, wherein the user mobile device is configured to:
pair with the monitoring device and establish a short-range wireless communication link;
receive signals/data sent from the monitoring device; or,
pair with a beacon disposed at a location, comprising a building or a vehicle;
receive signals/data sent from the processing system through the network;
send geo-location data to the processing system in accordance with a preconfigured frequency;
send the pairing records to the processing system;

provide questions to a user about a location disposed with at least one beacon comprising a unique identifier;
receive user provided answers to the questions;
analyze the data and said answers to obtain a user time log;
send the user time log to the processing system.

[Claim 16]

The system according to claim 12 comprising:
at least one application server having computing and data processing capability, connected to the network with the process and software that allows interactive processing of information receiving from one or more of the user mobile devices, staff digital devices, monitoring devices, and beacons;
a memory working with or within the application server for storing data, pairing records and other information;
a clock/timer providing the clock time to the monitoring device, user mobile device and staff digital device;
receiving signals/data sent from sensors, or at least one of a relay slave, and user mobile devices, through the monitoring device;
receiving user mobile devices sent data, comprising any one or combination of the geo-location data, user time log and pairing records;
receiving data collected from one or more beacons disposed at a location;
providing questions to a user about the location;
receiving user provided answers to the questions;
analyzing the data and answers to obtain a user time log;
storing the monitoring device sent signals/data in the memory;
storing in the memory user as inhabitant mobile device sent information, including the user time log;
receiving user as visitor mobile device sent information, including the response message;
storing in the memory one or more preconfigured thresholds pertinent to the user time log;
storing in the memory a plurality of preconfigured thresholds comprising multiple number of time periods;
storing in the memory one or more user as inhabitant defined visit time periods pertinent to a communicatively linked monitoring device.

[Claim 17]

The method according to claim 1 further comprising receiving and processing user mobile device sent user time log or geo-location data.

[Claim 18]

The method according to claim 1 wherein the pairing records comprising pairing and pairing disconnection are recorded with respect to time.

[Claim 19]

The method according to claim 2 further comprising the monitoring device transmitting the secondary state signal to the processing system, wherein a concurrent visit time period is in effect and not receiving a response message within a preconfigured time period from the selected user mobile device; or, a concurrent visit time period is not in effect and not receiving a response message within a preconfigured time period from the selected user mobile device.

[Claim 20]

The method according to claim 6 further comprising the monitoring device transmitting the returning signal to the processing system, wherein a concurrent visit time period is in effect and receiving a response message within a preconfigured time period from a user as inhabitant mobile device, or, a user as visitor mobile device; or, a concurrent visit time period is not in effect and receiving a response message within a preconfigured time period from a user as inhabitant mobile device.