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(54) Title: METHOD AND APPARATUS FOR FORWARDING INFORMATION TO A PUBLIC-SAFETY OFFICER

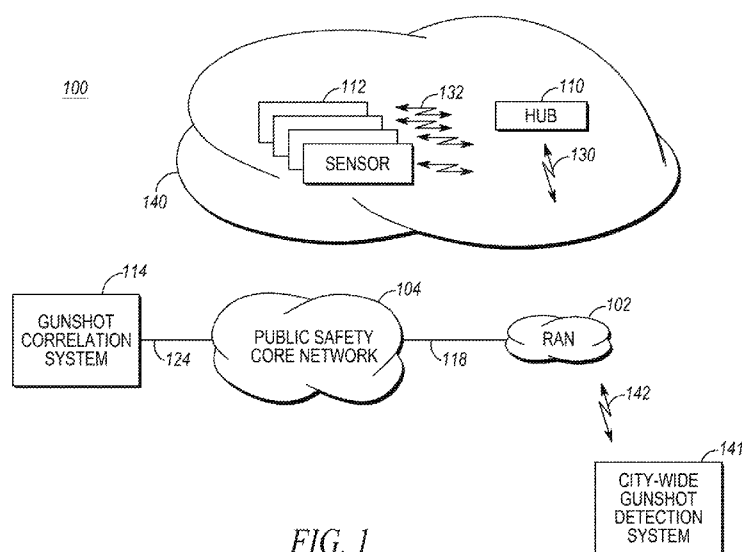


FIG. 1

(57) Abstract: A method and apparatus for providing gunshot information to public-safety officers is provided herein. During operation gunshot information is obtained from officers' personal-area networks. Gunshot information is also obtained by a wide-area (e.g., city wide) gunshot detection system. Analysis is performed to determine if any officers fired their weapons, a number of individuals involved in firing their weapons, along with locations where weapons were fired, and this information is provided to public-safety officers in the area.

METHOD AND APPARATUS FOR FORWARDING INFORMATION TO A PUBLIC-SAFETY OFFICER

Field of the Invention

[0001] The present invention generally relates to forwarding information, and more particularly to a method and apparatus for forwarding gunshot information to public-safety officers.

Background of the Invention

[0002] Various types of gunshot detection systems are known in the art. For example, next-generation public safety officers will be equipped with sensors that determine various physical and environmental conditions surrounding the public-safety officer. These conditions are generally reported back to a dispatch operator so that appropriate action may be taken. For example, future police officers may have a sensor that determines when a gun is drawn and/or fired. Upon detecting that an officer has drawn/fired their gun, a notification may be sent back to the dispatch operator so that, for example, other officers in the area may be automatically notified of the situation.

[0003] City-wide gunshot detection systems are also known. These systems “listen” for gunshots and attempt to determine a location of any gunshot heard. An indication that a gunshot has been heard, along with an estimated location can be sent to a dispatch operator so that, for example, officers in the area may be automatically notified that gunshots have been detected in a particular area.

[0004] A problem with the above-described systems is that these systems operate in a binary fashion, simply providing notifications of gunshots to the dispatch operator, who forwards them to officers in the area. When many

shots are fired, it may be overwhelming for officers receiving gunshot data to obtain an accurate picture of what is unfolding. For example, an officer may be provided information that two public-safety officers have fired their weapons, and that a total of six gunshots have been heard by a city-wide detection system. It is not clear to anyone receiving this information as to whether or not other non-public-safety individuals have fired weapons, or how many individuals have fired their weapons. A more accurate picture of the incident scene would greatly help officers being dispatched to the scene. Therefore a need exists for a method and apparatus for forwarding gunshot information to public-safety officers that better paints a picture of what is unfolding at an incident scene. .

Brief Description of the Several Views of the Drawings

[0005] The accompanying figures where like reference numerals refer to identical or functionally similar elements throughout the separate views, and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and to explain various principles and advantages all in accordance with the present invention.

[0006] FIG. 1 depicts an example communication system for reporting gunshot information.

[0007] FIG. 2 depicts a more-detailed view of the personal-area network of FIG. 1.

[0008] FIG. 3 illustrates a wide-area gunshot detection system.

[0009] FIG. 4 is a block diagram of the gunshot correlation system of FIG. 1 and FIG. 2.

[0010] FIG. 5 is a message flow diagram for the system of FIG. 1.

[0011] FIG. 6 is a flow chart showing operation of the gunshot correlation system of FIG. 4.

[0012] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions and/or relative positioning of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of various embodiments of the present invention. Also, common but well-understood elements that are useful or necessary in a commercially feasible embodiment are often not depicted in order to facilitate a less obstructed view of these various embodiments of the present invention. It will further be appreciated that certain actions and/or steps may be described or depicted in a particular order of occurrence while those skilled in the art will understand that such specificity with respect to sequence is not actually required.

Detailed Description

[0013] In order to address the above, mentioned need, a method and apparatus for providing gunshot information to public-safety officers is provided herein. During operation gunshot information is obtained from officers' personal-area networks. Gunshot information is also obtained by a wide-area (e.g., city wide) gunshot detection system. Analysis is performed to determine if any officers fired their weapons, a number of individuals involved in firing their weapons, along with locations where weapons were fired, and this information is provided to public-safety officers in the area.

[0014] As an example of the above, assume that a city-wide gunshot detection system has reported that four gunshots were heard, and provided the locations for the gunshots. Also assume that a public-safety officer fired their weapon three times. The above system will correlate all the received information to determine that the public-safety officer fired three times, and an

unknown person has fired one time. The above information and the locations of where each person fired their weapon will be provided to other officers.

[0015] FIG. 1 depicts an example communication system 100 that includes one or more radio access networks (RANs) 102, a public-safety core network 104, hub 110, local sensors 112, a gunshot correlation system 114, city-wide (wide area) gunshot detection system 141, and communication links 118, 124, 132, and 142. In a preferred embodiment of the present invention, hub 110 and sensors 112 form a body-area network, or a local area network 140, with communication links 132 between sensors 112 and hub 110 taking place utilizing a short-range communication system protocol such as a Bluetooth communication system protocol.

[0016] Each RAN 102 includes typical RAN elements such as base stations, base station controllers (BSCs), routers, switches, and the like, arranged, connected, and programmed to provide wireless service to user equipment (e.g., hub 110, and the like) in a manner known to those of skill in the relevant art.

[0017] The public-safety core network 104 may include one or more packet-switched networks and/or one or more circuit-switched networks, and in general provides one or more public-safety agencies with any necessary computing and communication needs, transmitting any necessary public-safety-related data and communications.

[0018] The hub 110 may be any suitable computing and communication devices configured to engage in wireless communication with the RANs 102 over the air interface as is known to those in the relevant art. Moreover, one or more hub 110 are further configured to engage in wired and/or wireless communication with one or more local sensor 112 via the communication link 132. Hub 110 will be configured to determine when to forward information via RANs 102 based on a combination of sensor 112 inputs.

[0019] Sensors 112 may comprise any device capable of generating a current context. For example, sensors 112 preferably comprise at least one gunshot detector, at least one gun drawn detector, and at least one GPS receiver capable of determining a location of the user device. Other sensors may include a clock, calendar, environmental sensors (e.g. a thermometer capable of determining an ambient temperature, humidity, presence of dispersed chemicals, radiation detector, etc.), an accelerometer, a barometer, speech recognition circuitry, a user's electronic calendar, short-range communication circuitry (e.g., Bluetooth™ circuitry) to determine what other electronic devices are near. . . , etc.

[0020] Wide-area gunshot detection system 141 preferably comprises stationary sensors located on, for example, light poles within an area. The sensors are specially designed to detect the report of a gun being fired and a time of any detected gunshot. This information can be provided to gunshot correlation system 114 so that location information may be obtained for any gunshot detected. Such a system, for example, comprises Shotspotter® manufactured by SSI, Inc. Such a system uses multiple collaborative acoustic sensors that activate when gunfire occurs, providing comprehensive outdoor coverage over complex urban geographies. When there is a shooting, sensors report this information and software triangulates and pinpoints the precise location of each round fired.

[0021] Finally, gunshot correlation system 114 is part of a computer-aided-dispatch center, manned by an operator providing necessary dispatch operations. Gunshot correlation system 114 comprises a graphical user interface that provides the dispatch operator necessary information about public-safety officers. As discussed above, this information may originate from sensors 112 providing information to hub 110, which forwards the information to RAN 102 and ultimately to gunshot correlation system 114. Additionally, this information may originate from gunshot detection system 141 providing the information to RAN 102 and ultimately to gunshot correlation system 114.

[0022] Gunshot correlation system 114 is configured to obtain gunshot information from detection system 141 and sensors 112 and to determine a number of individuals firing their weapons along with their locations. Information such as an identity of any public-safety officers firing their weapons is also determined. Gunshot correlation system 114 then provides this information to public-safety officers. For example, gunshot correlation system 114 may provide information such as, but not limited to:

- A number of police officers who fired their weapon;
- A location of police officers who fired their weapons;
- A number of other individuals who fired their weapon; and
- A location of the other individuals who fired their weapons.

[0023] The above information may be displayed graphically on a map by officers receiving the information.

[0024] FIG. 2 depicts a more-detailed view of the personal-area network 140 of FIG. 1. Personal-area network comprises a local-area network that has a range of, for example 10 feet. As shown in FIG. 2, various sensors 112 are shown attached to equipment utilized by a public-safety officer. In this particular example, a bio-sensor 201 is located within a police vest, a voice detector 202 is located within a police microphone, a handcuff deployment sensor 203 is located with a handcuff pouch, a gun-draw sensor 204 is located within a holster. Several gunshot detectors 205 and 206 may be provided. Gunshot detector (microphone) 205 is provided to listen to ambient noise and determine if any gunshots within the area have been heard, while gunshot detector 206 may be attached to a gun and determine if the gun itself has been fired.

[0025] As discussed above, sensors and hub 110 form a personal-area network (LAN) 140. LAN 140 (what is it on the picture) preferably comprises a Bluetooth piconet. Sensors and hub 110 are considered Bluetooth devices in that they operate using a Bluetooth, a short range wireless communications technology at the 2.4 GHz band, commercially available from the "Bluetooth special interest group". Sensors and hub 110 are connected via Bluetooth

technology in an ad hoc fashion forming a piconet. Hub 110 serves as a master device while sensors serve as slave devices. Sensors notify hub 110 of a sensed condition by sending a local status alert transmitted from the sensor as a Bluetooth message. Hub 110 in turn, may forward the local status alert over a wide-area network (e.g., RAN/Core Network) to gunshot correlation system 114. In alternate embodiments of the present invention, hub 110 may forward the local status alert to mobile and non-mobile peers (shift supervisor, peers in the field, etc), or to the public via social media. Such a system is fully described in US Patent Application No. 14/747567, entitled, **METHOD AND APPARATUS FOR FORWARDING LOCAL-ALERT MESSAGES WITHIN A COMMUNICATION SYSTEM**,

[0026] FIG. 3 illustrates gunshot detection system 141. As shown, a plurality of gunshot detectors 301 are deployed around city streets 302. Gunshot detectors 301 are preferably stationary and attached to infrastructure such as buildings, light poles, parking meters, . . . , etc. Detectors 301 provide information on any gunshot detected (e.g., time and location) to RAN 102, which in turn provides the information to gunshot correlation system 114.

[0027] FIG. 4 is a block diagram of the gunshot correlation system of FIG. 1. As shown, system 114 may include transmitter 401, receiver 402 (which may be wired or wireless), display 406, and logic circuitry 403. In other implementations, system 114 may include more, fewer, or different components.

[0028] Transmitter 401 and receiver 402 may be well known long-range transceivers that utilize any number of network system protocols. For example, transmitter 401 and receiver 402 may be configured to a private 802.11 network, a next-generation cellular communications protocol operated by a cellular service provider, or any public-safety protocol such as an APCO 25 network or the FirstNet broadband network. Although only a single transmitter and receiver are shown in FIG. 4, one of ordinary skill in the art will recognize that multiple transmitters and receivers may exist in system 114 to

provide simultaneous communications using any number of communication system protocols.

[0029] Logic circuitry 403 comprises a digital signal processor (DSP), general purpose microprocessor, a programmable logic device, or application specific integrated circuit (ASIC) and is configured to determine an identity (friend or potential foe) of individuals who have fired their weapon, along with a location of each individual who has fired their weapon.

[0030] GUI 406 provides a way of conveying (e.g., displaying) sensor information to a user. In a particular embodiment, a status of each sensor 201-206 may be displayed for a user along with the status of any acoustic sensor 301. The status may indicate whether or not the sensor is detecting a dangerous condition, the sensor is in a sleep mode, and/or whether or not the sensor is disarmed. GUI 406 may also display a map of the locations of where all gunshots have been detected.

[0031] FIG. 4 provides for an apparatus comprising a receiver 402 that receives a first gunshot detection notification from a first gunshot detection system 140 (personal area network 140 functions as a gunshot detection system), the receiver 402 also receives second gunshot detection notification from a second gunshot detection system 141. Processor 403 uses the first and the second gunshot detection notification to determine a source of the gunshot (i.e., from a public-safety officer or not). This may entail determining information such as a location of police officers who fired their weapons, a location of the other individuals who fired their weapons. Transmitter 401 provides (transmits) the information to at least one public-safety officer.

[0032] An apparatus is therefore provided wherein a receiver has as a first gunshot detection notification as an input and a second gunshot detection notification as an input, wherein the first gunshot detection notification is input from a first gunshot detection system and the second gunshot detection notification is input from a second gunshot detection system. The receivers

pass this information onto a processor. The processor has information on the first and the second gunshot detection notifications as an input and outputting information on a source of the gunshot.

[0033] As discussed, the first gunshot detection system comprises a body-area network or a personal-area network and the second gunshot detection system comprises a wide-area gunshot detection system. Also, the receiver comprises a wireless receiver and the transmitter comprises a wireless transmitter.

[0034] FIG. 5 is a message-flow diagram showing operation of the system of FIG. 1. As shown, an officer's weapon sensor may provide shot data (including but not limiting to location, time, gunshot sound characteristics) to system 114. In addition other officer's sensors may report "shot detected" information to system 114. The shot detected may be acoustically detected from a distance away, fired by another. Finally, area-wide detection system 141 may provide "shot detected" information to system 114. As discussed above, such information may comprise a location of the sensor reporting that a gunshot was detected along with a time the gunshot was detected.

[0035] System 114 attempts to paint an accurate picture of the location of everyone firing a weapon, along with whether or not the person firing the weapon is a friend (another officer) or potential foe (i.e., not another officer). The information on the gunshots detected is then provided to a dispatch center and at least to other officers who may be interested in obtaining the information. As discussed, this information may comprise, for example the fact that two police officers have fired their weapons, and three non-police officers have fired their weapons. The locations of everyone involved may also be provided.

[0036] Logic circuitry 403 may instruct transmitter 401 to transmit different alerts depending on gunshot source so different actions can be triggered at the officer's body-area network. For example, a different tone may be played

by a speaker when an officer's weapon is fired as opposed to a non-officer's weapon being fired.

[0037] FIG. 6 is a flow chart showing operation of the gunshot correlation system of FIG. 4. The logic flow begins at step 601 where receiver 402 receives a first gunshot detection notification 130 from a first gunshot detection system 140. At step 603 a second gunshot detection notification 142 is received from a second gunshot detection system 141. Processor 403 uses the first and the second gunshot detection notification to determine if the source of the gunshot was from any public-safety officer. This may entail determining at least a location of police officers who fired their weapons and a location of the other individuals who fired their weapons (step 605). Transmitter 401 is utilized to provide the information to at least one public-safety officer.

[0038] As discussed above, the first gunshot detection system comprises a body-area network or a personal-area network while the second gunshot detection system comprises a wide-area gunshot detection system. Additionally, the step of receiving the first and the second gunshot detection notifications comprises the step of receiving the first and the second gunshot detection notification via an over-the-air transmission. In a similar manner the step of providing the information to at least one public-safety officer comprises the step of wirelessly transmitting the information.

[0039] As an example of the above, imagine that a shot was detected (by PAN, or city-wide gunshot detection system or both of them). The above system determines who shot? (i.e., an officer or a civilian). To answer the above question the above system uses several notifications from several gunshot detection systems. For example, the officer's weapon and a city-wide system. The system correlates the multiple notifications to determine if an officer or a foe shot.

[0040] For example when officer John's weapon reports that his gun was fired at 11:00:00 AM at GPS location (X,Y) and the gunshot was detected via a city-wide system at 11:00:01 AM (1 second later) at GPS location (X, Y + 1 mile) it means that the detected gunshot is the one that was fired by officer John (taking into account sound speed the gunshot caused by the officer will be heard 1 mile away with 1 second delay). Gunshot characteristics reported from the independent reports can be correlated. For example, the processor can compare the acoustic signatures of each gunshot to determine if they are similar.

[0041] As another example, assume a gunshot was detected by the wide-area system at 12:00:00AM but there was no report that any officer used a gun just before 12:00:00AM. This means that the detected gunshot was caused by a potential foe, not an officer, because if it had been an officer who used a gun it would have been reported from his weapon via the PAN or LAN.

[0042] In the foregoing specification, specific embodiments have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present teachings.

[0043] Those skilled in the art will further recognize that references to specific implementation embodiments such as "circuitry" may equally be accomplished via either on general purpose computing apparatus (e.g., CPU) or specialized processing apparatus (e.g., DSP) executing software instructions stored in non-transitory computer-readable memory. It will also be understood that the terms and expressions used herein have the ordinary technical meaning as is accorded to such terms and expressions by persons skilled in the technical field as set forth above except where different specific meanings have otherwise been set forth herein.

[0044] The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those claims as issued.

[0045] Moreover in this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises," "comprising," "has," "having," "includes," "including," "contains," "containing" or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises, has, includes, contains a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises ...a", "has ...a", "includes ...a", "contains ...a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises, has, includes, contains the element. The terms "a" and "an" are defined as one or more unless explicitly stated otherwise herein. The terms "substantially", "essentially", "approximately", "about" or any other version thereof, are defined as being close to as understood by one of ordinary skill in the art, and in one non-limiting embodiment the term is defined to be within 10%, in another embodiment within 5%, in another embodiment within 1% and in another embodiment within 0.5%. The term "coupled" as used herein is defined as connected, although not necessarily directly and not necessarily mechanically. A device or structure that is "configured" in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

[0046] It will be appreciated that some embodiments may be comprised of one or more generic or specialized processors (or “processing devices”) such as microprocessors, digital signal processors, customized processors and field programmable gate arrays (FPGAs) and unique stored program instructions (including both software and firmware) that control the one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of the method and/or apparatus described herein. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used.

[0047] Moreover, an embodiment can be implemented as a computer-readable storage medium having computer readable code stored thereon for programming a computer (e.g., comprising a processor) to perform a method as described and claimed herein. Examples of such computer-readable storage mediums include, but are not limited to, a hard disk, a CD-ROM, an optical storage device, a magnetic storage device, a ROM (Read Only Memory), a PROM (Programmable Read Only Memory), an EPROM (Erasable Programmable Read Only Memory), an EEPROM (Electrically Erasable Programmable Read Only Memory) and a Flash memory. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

[0048] The Abstract of the Disclosure is provided to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen

that various features are grouped together in various embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separately claimed subject matter.

[0036] What is claimed is:

CLAIMS

1. A method comprising the steps of:

receiving a first gunshot detection notification from a first gunshot detection system;

receiving a second gunshot detection notification from a second gunshot detection system;

using the first and the second gunshot detection notification to determine if the source of the gunshot was from any public-safety officer; and

providing information to a public-safety officer on the source of the gunshot.

2. The method of claim 1 wherein the first and the second gunshot detection notification comprises a location, a time of gun usage, and/or a gunshot acoustic characteristics.

3. The method of claim 1 wherein the first gunshot detection system comprises a body-area network or a personal-area network.

4. The method of claim 3 wherein the second gunshot detection system comprises a wide-area gunshot detection system.

5. The method of claim 4 wherein the step of receiving the first and the second gunshot detection notification comprises the step of receiving the first and the second gunshot detection notification via an over-the-air transmission.

6. The method of claim 5 wherein the step of providing the information comprises the step of wirelessly transmitting the information.

7. An apparatus comprising:

a receiver receiving a first gunshot detection notification from a first gunshot detection system;

the receiver receiving a second gunshot detection notification from a second gunshot detection system;

a processor using the first and the second gunshot detection notification to determine if the source of the gunshot was from any public-safety officer; and

providing information to a public-safety officer on the source of the gunshot.

8. The apparatus of claim 7 wherein the first gunshot detection system comprises a body-area network or a personal-area network.

9. The apparatus of claim 8 wherein the second gunshot detection system comprises a wide-area gunshot detection system.

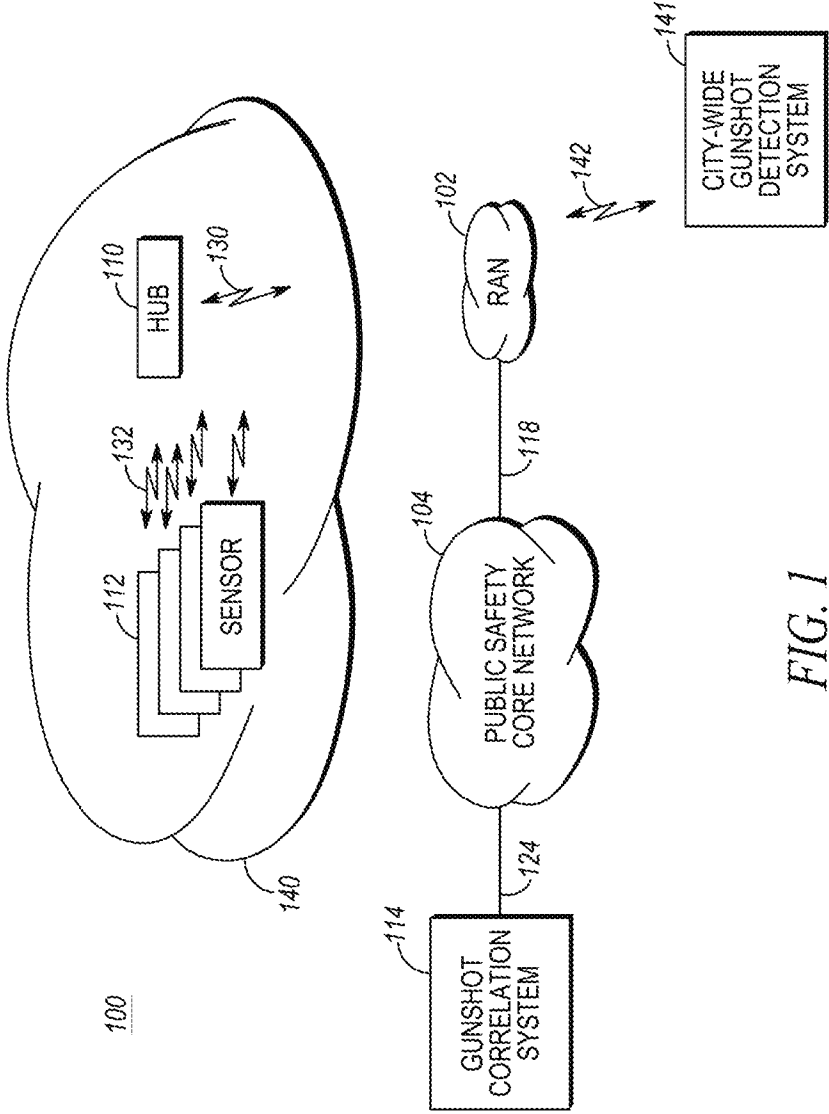
10. The apparatus of claim 9 wherein the receiver comprises a wireless receiver.

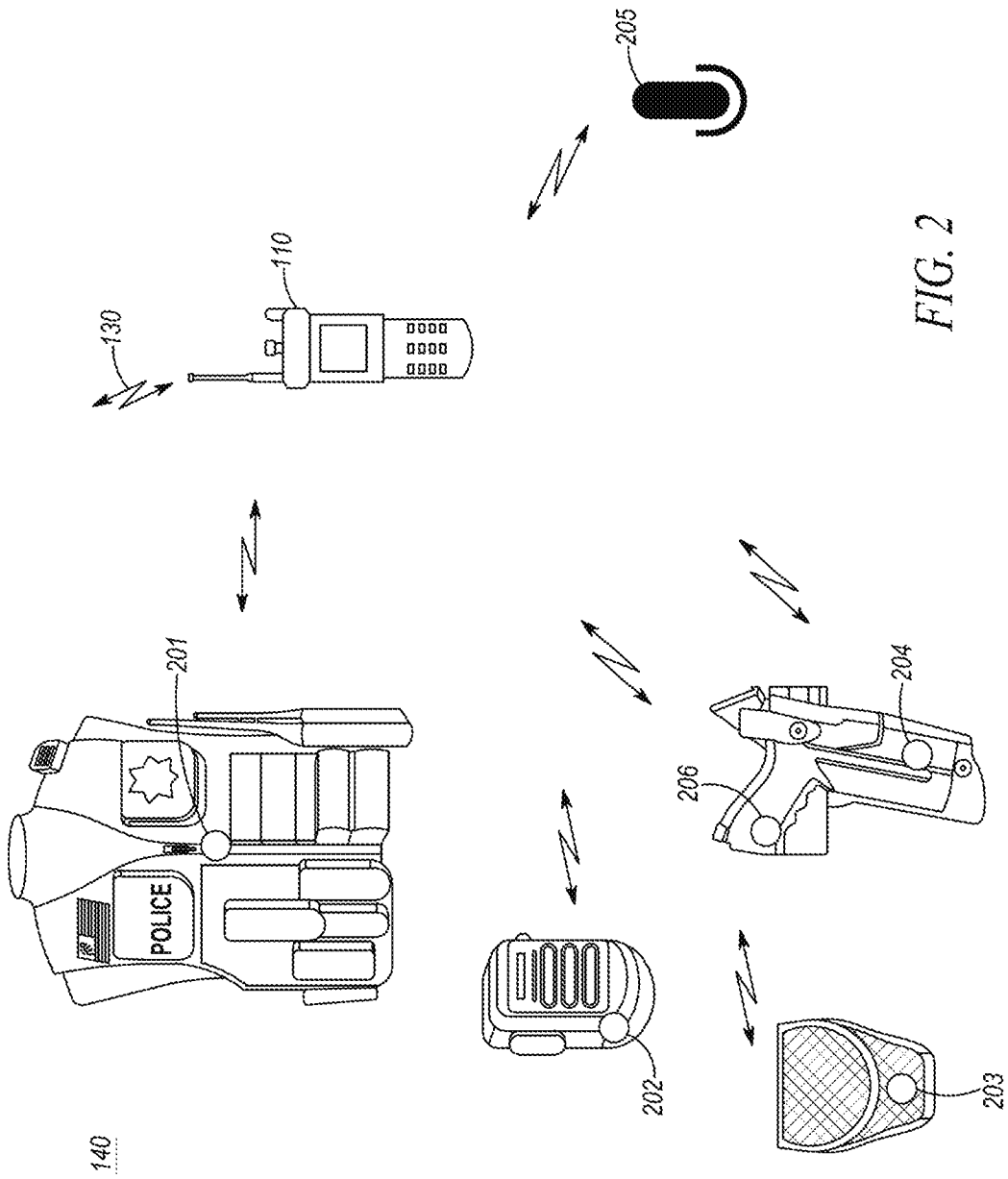
11. The apparatus of claim 10 wherein the transmitter comprises a wireless transmitter.

12. An apparatus comprising:

a receiver having a first gunshot detection notification and a second gunshot detection notification as inputs, wherein the first gunshot detection notification is input from a first gunshot detection system and the second gunshot detection notification is input from a second gunshot detection system;

a processor having information on the first and the second gunshot detection notifications as an input and outputting information on a source of the gunshot.





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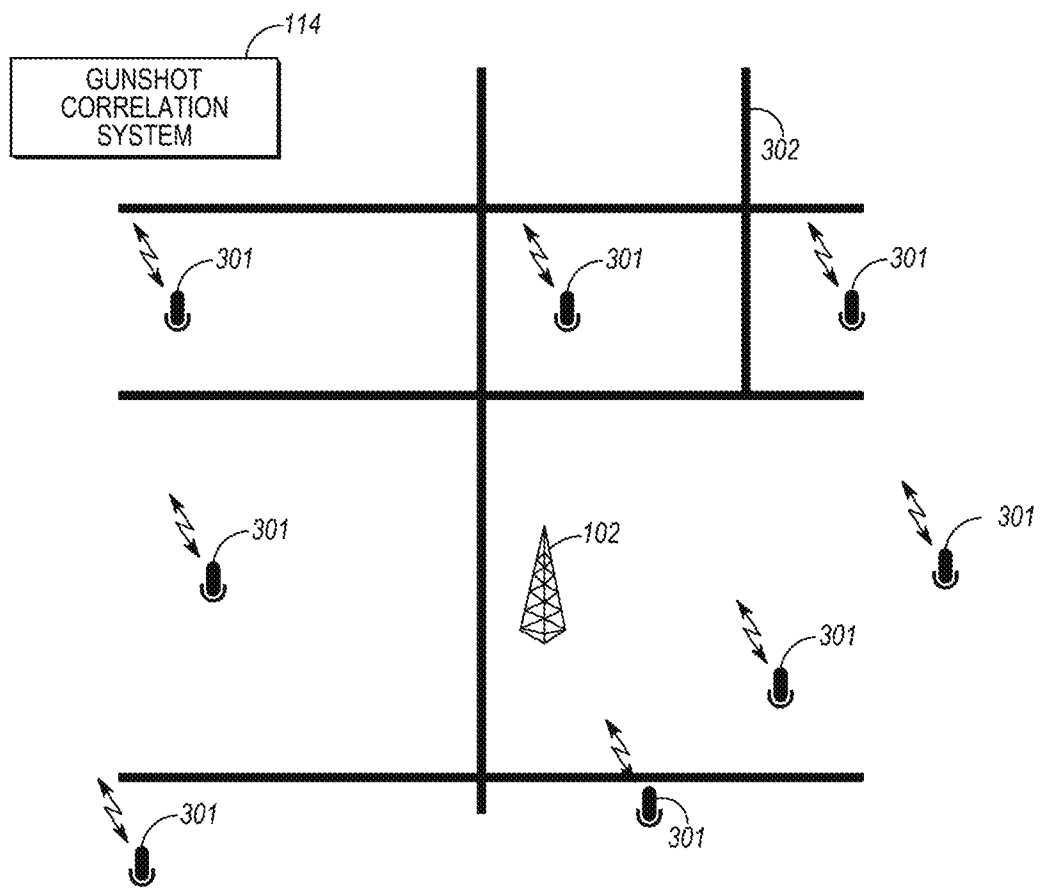


FIG. 3

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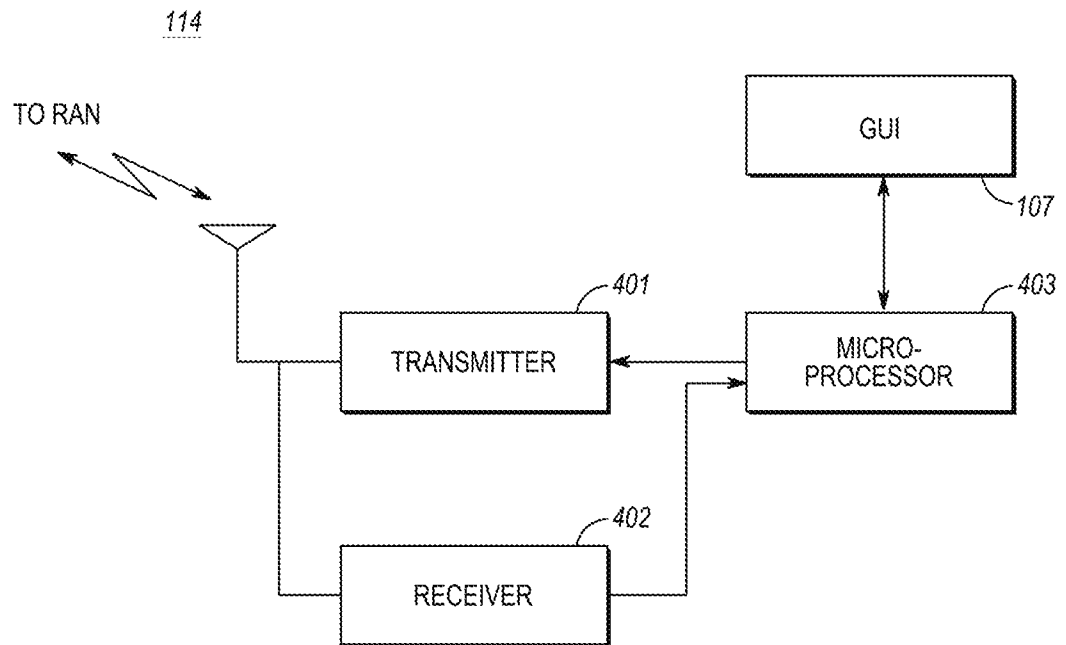


FIG. 4

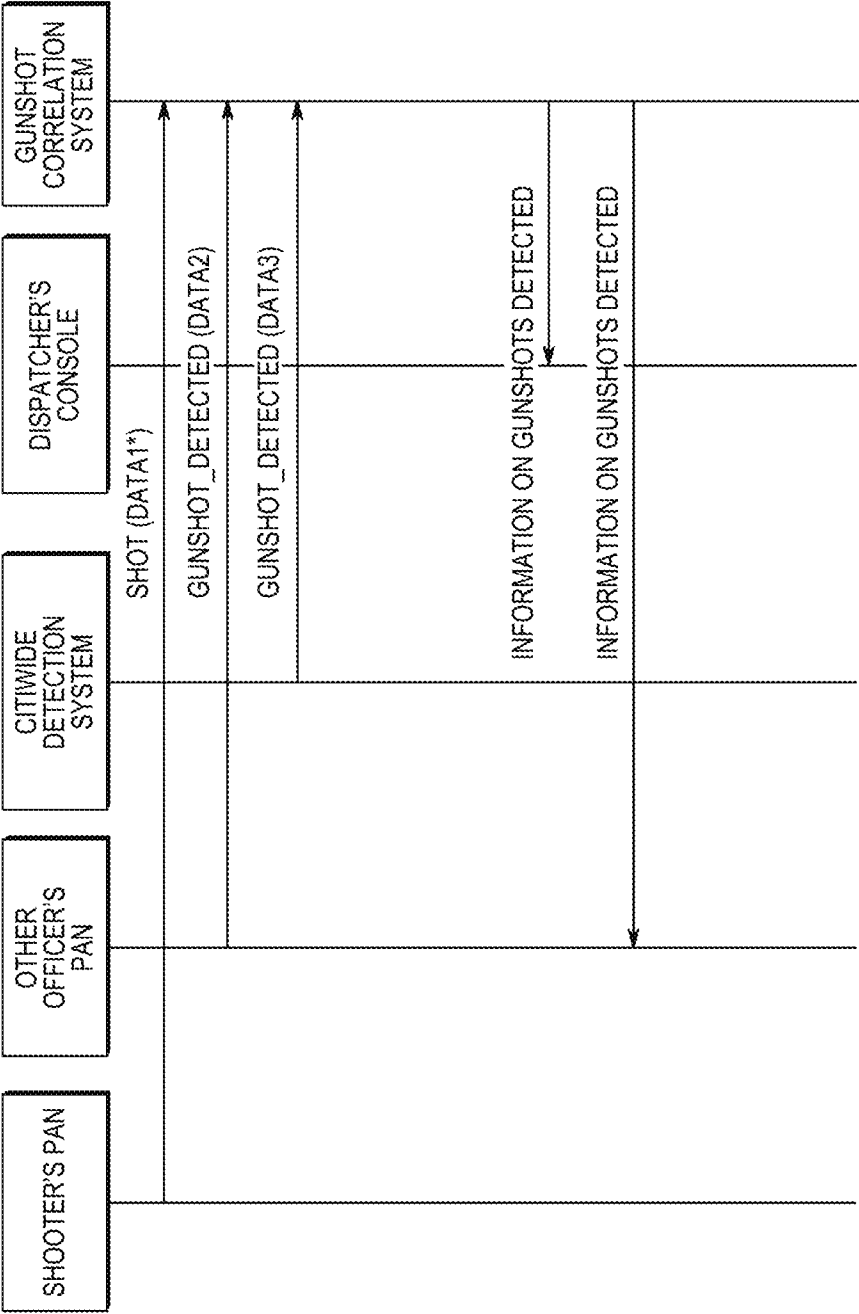


FIG. 5

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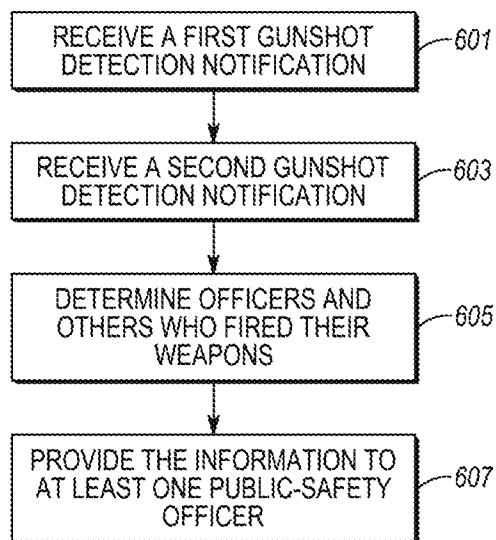


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/PL2015/050057

A. CLASSIFICATION OF SUBJECT MATTER

INV. G01S5/18

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/182837 A1 (CALHOUN ROBERT B [US] ET AL) 19 July 2012 (2012-07-19) paragraphs [0003] - [0013] paragraphs [0022] - [0039] -----	1-12
X	US 2010/226210 A1 (KORDIS THOMAS F [US] ET AL) 9 September 2010 (2010-09-09) paragraphs [0093] - [0104] paragraphs [0128] - [0158] -----	1-12
X	US 2008/165047 A1 (FISHER KEN S [US] ET AL) 10 July 2008 (2008-07-10) paragraph [0014] paragraphs [0025] - [0038] paragraphs [0043] - [0046] ----- -/-	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

8 July 2016

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2015/050057

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Information on patent family members

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