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(54) SYSTEM AND METHOD FOR PERFORMING OBJECT ASSOCIATION AT A TRADESHOW USING A LOCATION TRACKING SYSTEM

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(52) **U.S. Cl.** **705/1**

(57) **ABSTRACT**

The illustrative embodiment of the present invention provides a method of recording and using object associations determined by a location system at a tradeshow. Object locations are determined based on signals generated from object identifiers attached to the tradeshow attendees and forwarded to an electronic device interfaced with a network. The origin of the signal is calculated by a location determining module based on a number of factors such as the known position of the receivers receiving the signal, the historical recorded position of the attendee, the characteristics of the receivers receiving the signal (i.e. the range), the strength of the received signal, the type of signal, and whether or not the signal was repeated. Once the location of the attendee has been determined, the location determining module consults a database to determine associations between the located attendee and other persons, objects, exhibits or specified locations based on proximity to the located attendee. Once an association is determined, it is stored and the duration of the association is subsequently recorded. The data from the identified associations may then be leveraged in a number of ways as input data for a variety of applications, such as software which generates sales leads and targeted advertising to tradeshow attendees based on their current location.

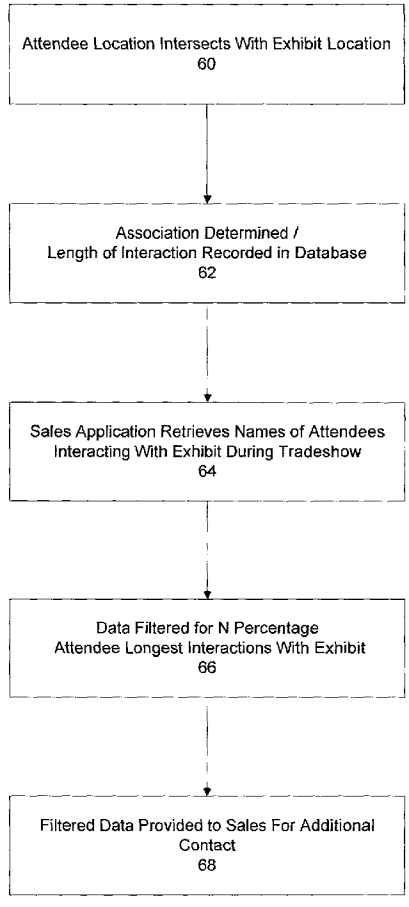


Figure 1A

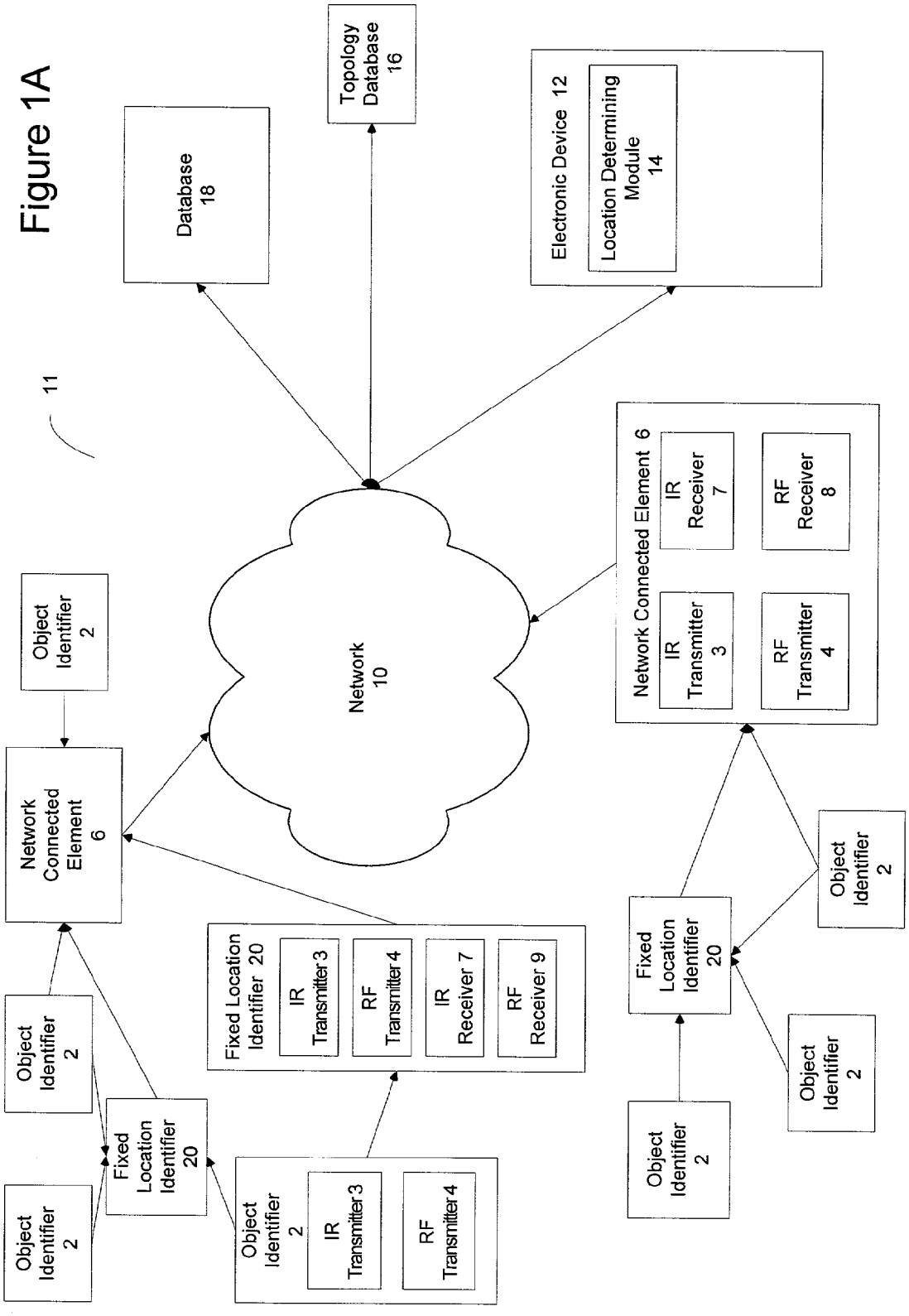

11
Database 18
Topology Database 16
Electronic Device 12
Location Determining Module 14
Network 10
Network Connected Element 6
IR Receiver 7
RF Receiver 8
IR Transmitter 3
RF Transmitter 4
Object Identifier 2
Network Connected Element 6
Fixed Location Identifier 20
IR Transmitter 3
RF Transmitter 4
IR Receiver 7
RF Receiver 9
Object Identifier 2
Fixed Location Identifier 20
Object Identifier 2
Object Identifier 2
IR Transmitter 3
RF Transmitter 4
Object Identifier 2
Fixed Location Identifier 20
Object Identifier 2
Object Identifier 2

Figure 1B

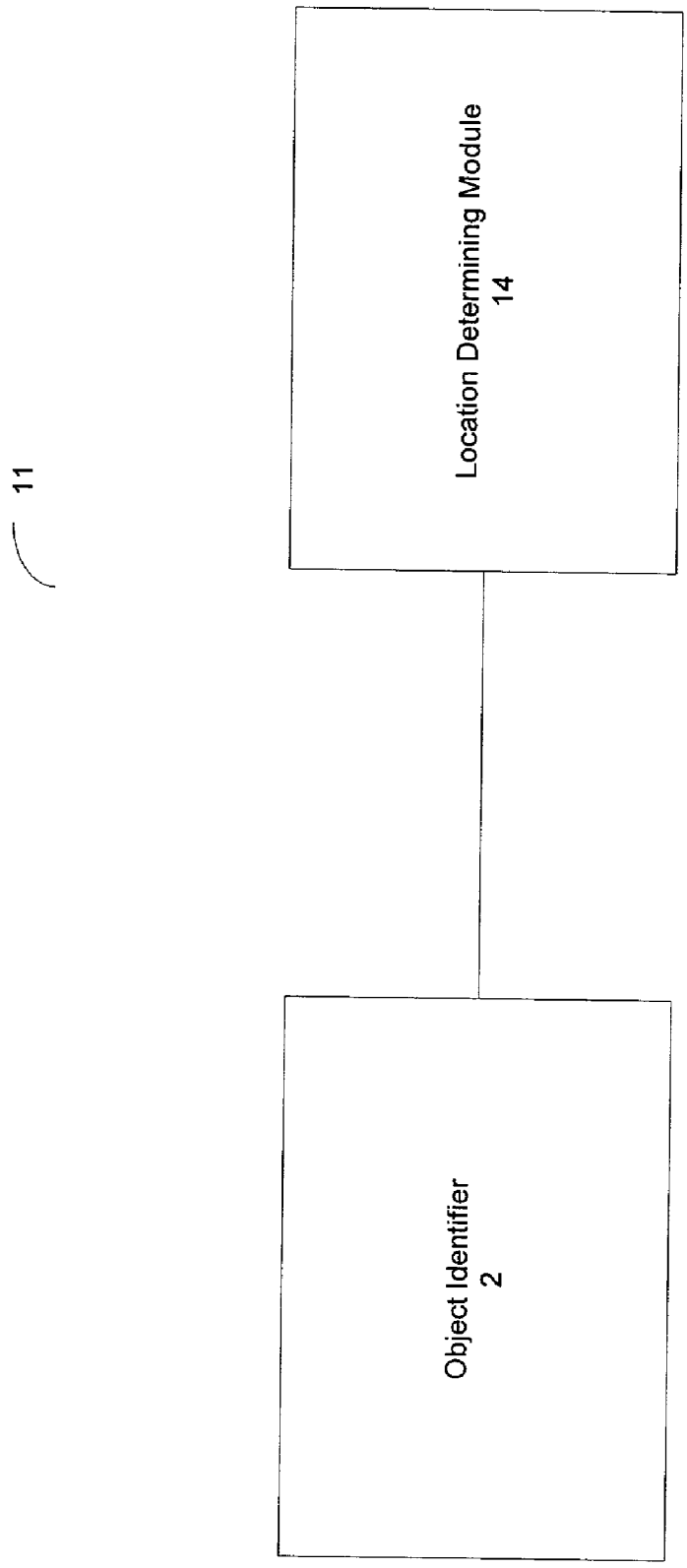


Figure 2B

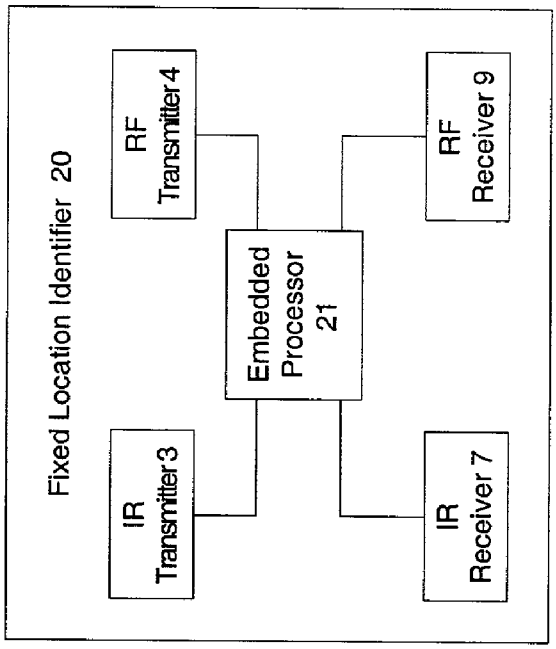


Figure 2A

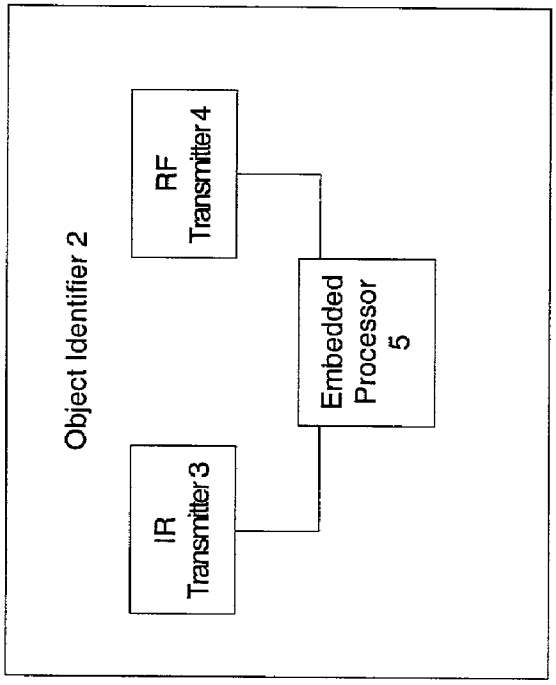


Figure 3

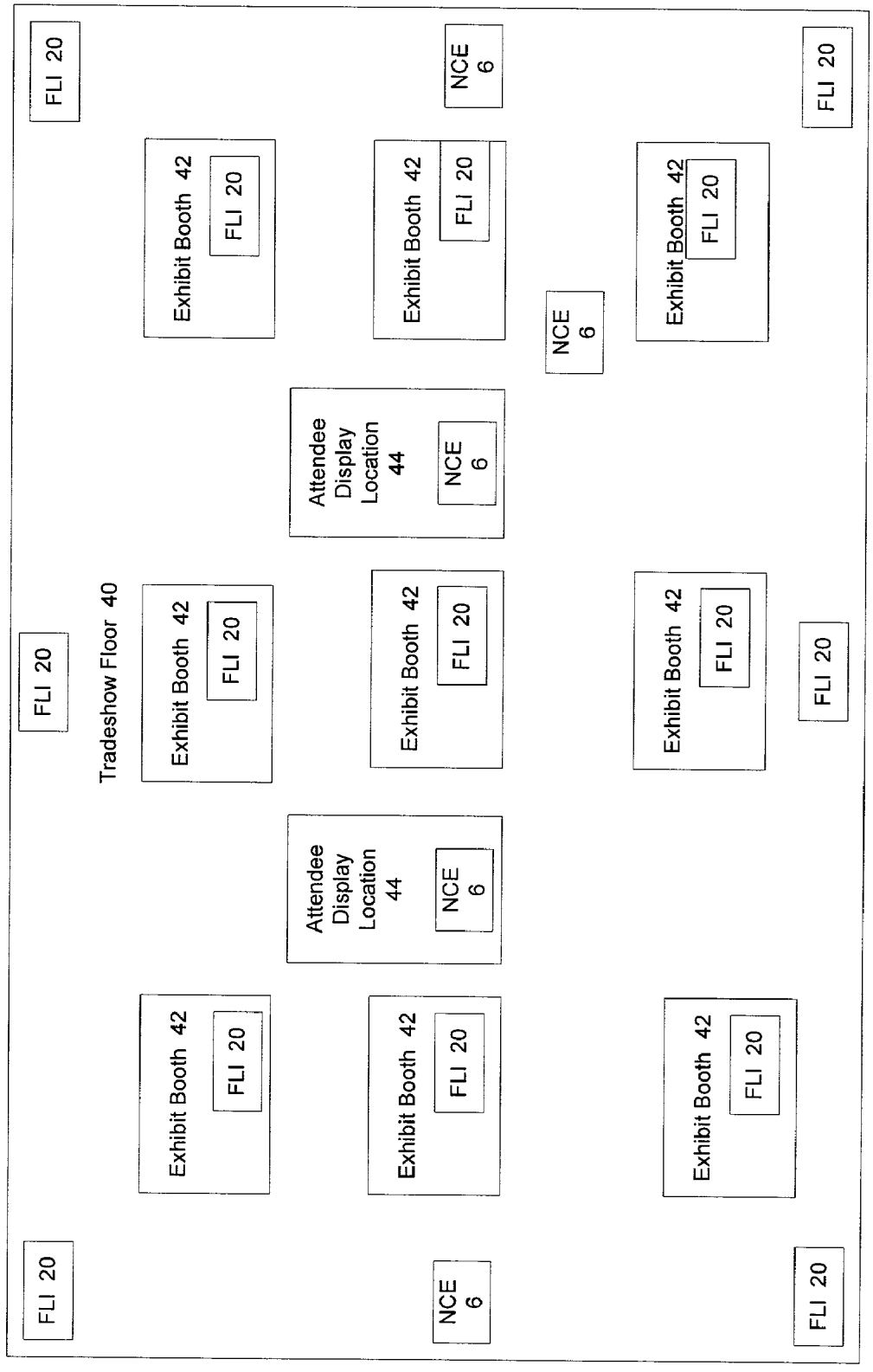
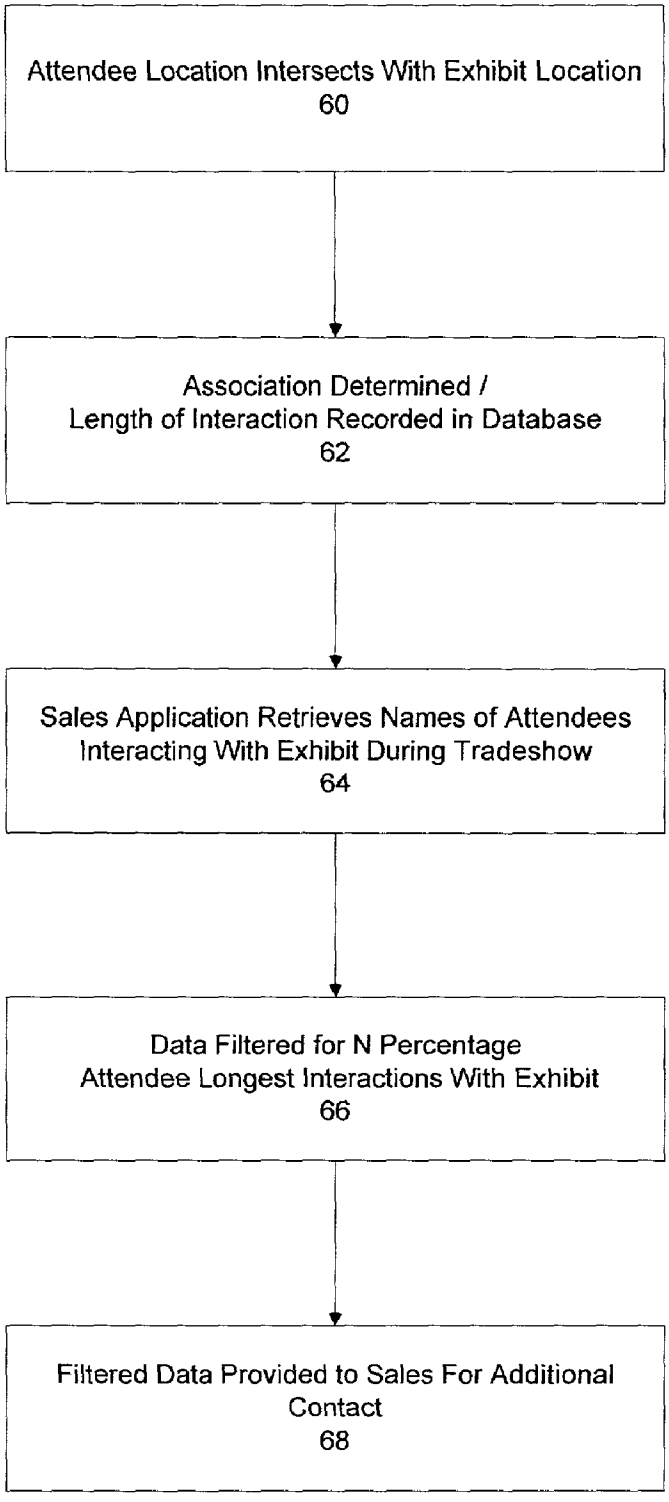

Tradeshow Floor 40
FLI 20
Exhibit Booth 42
Attendee Display Location 44
NCE 6

Figure 4


Attendee Location Intersects With Exhibit Location
60
Association Determined /
Length of Interaction Recorded in Database
62
Sales Application Retrieves Names of Attendees
Interacting With Exhibit During Tradeshow
64
Data Filtered for N Percentage
Attendee Longest Interactions With Exhibit
66
Filtered Data Provided to Sales For Additional
Contact
68

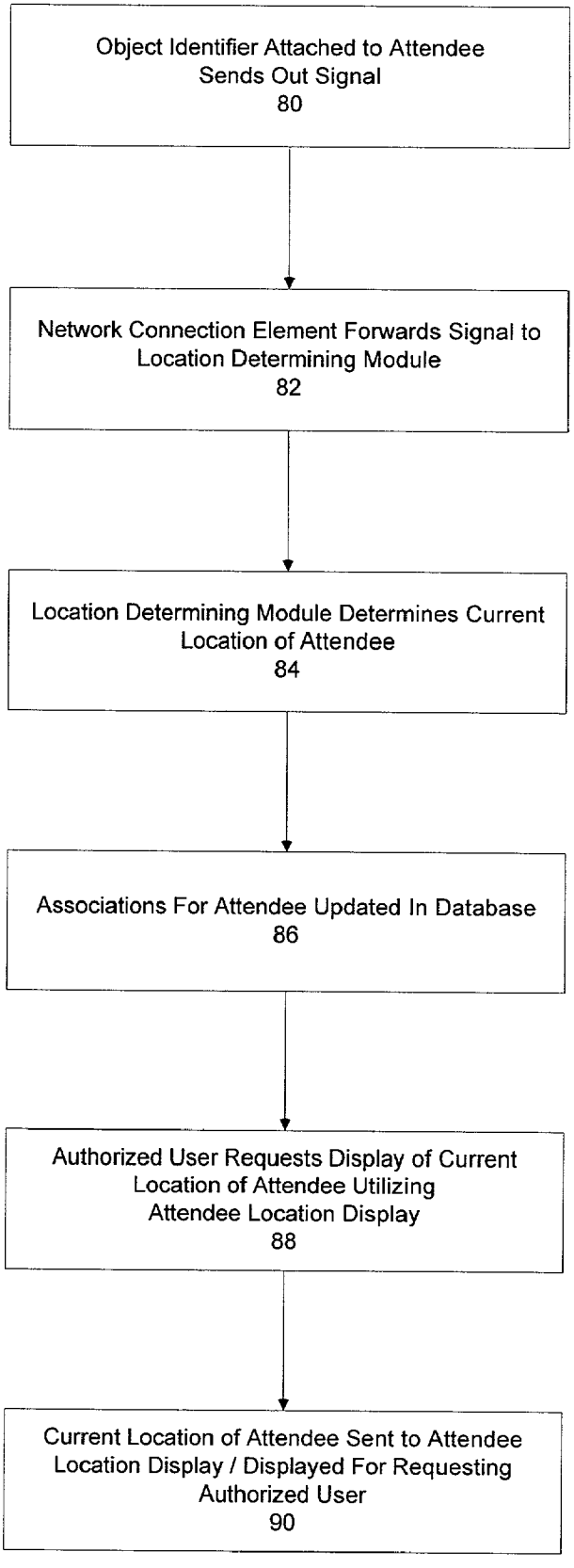

Object Identifier Attached to Attendee Sends Out Signal
80
Network Connection Element Forwards Signal to Location Determining Module
82
Location Determining Module Determines Current Location of Attendee
84
Associations For Attendee Updated In Database
86
Authorized User Requests Display of Current Location of Attendee Utilizing Attendee Location Display
88
Current Location of Attendee Sent to Attendee Location Display / Displayed For Requesting Authorized User
90

Figure 5

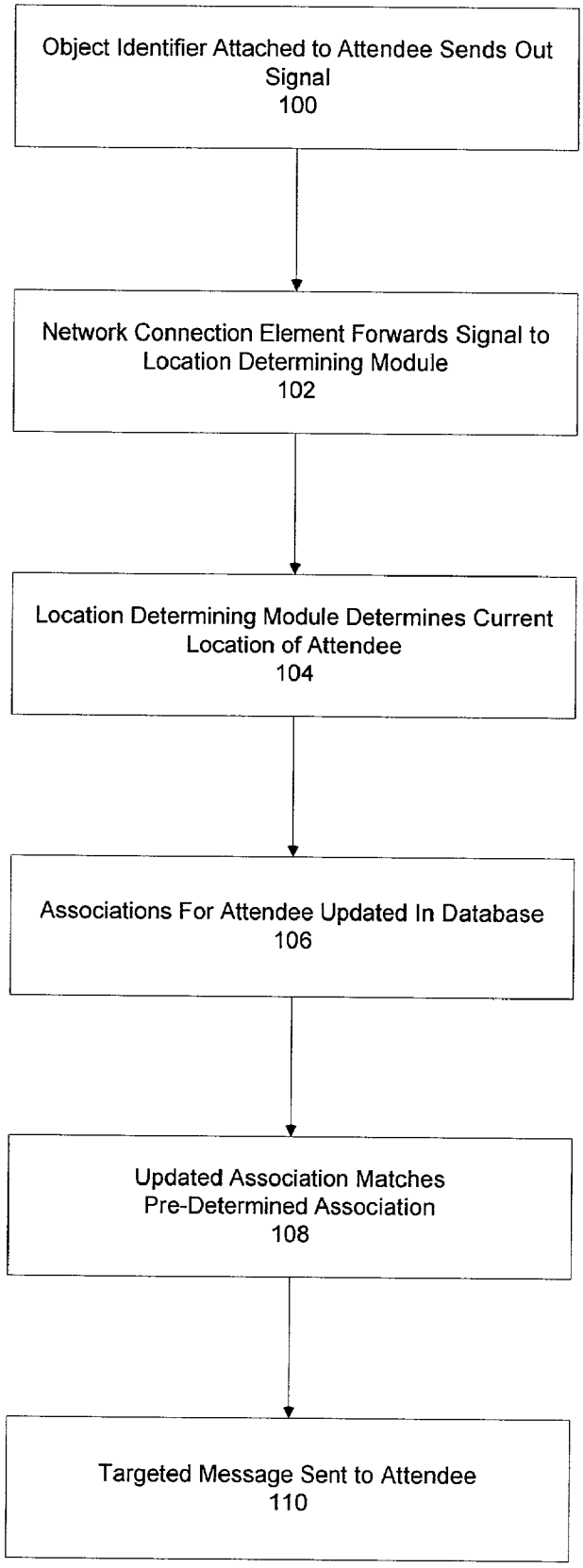

Object Identifier Attached to Attendee Sends Out Signal
100
Network Connection Element Forwards Signal to Location Determining Module
102
Location Determining Module Determines Current Location of Attendee
104
Associations For Attendee Updated In Database
106
Updated Association Matches Pre-Determined Association
108
Targeted Message Sent to Attendee
110

Figure 6

SYSTEM AND METHOD FOR PERFORMING OBJECT ASSOCIATION AT A TRADESHOW USING A LOCATION TRACKING SYSTEM

REFERENCE TO RELATED APPLICATIONS

[0001] The present invention claims priority to a U.S. Provisional Patent Application, Serial No. 60/274,544, filed Mar. 9, 2001, entitled Location System and the contents of that application are incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The illustrative embodiment of the present invention relates generally to a location tracking system and more particularly to performing object association at a tradeshow or exposition using a location tracking system.

BACKGROUND

[0003] Tradeshows and expositions usually involve multiple companies and products. They represent both advertising and selling opportunities. People interested in a company are exposed to a company's products. Since the tradeshow or exhibition are usually held in a convention center, the attendees represent a near-captive audience that is ideal for advertisers. Products may be demonstrated and new types of advertisements may be debuted to see how effectively they capture the audience's attention. Speeches by company officers and officials are sometimes given and the level of attendence and interest in the speech may be an important guage of the public's interest in the company. If a company has a booth at the tradeshow/exposition, the booth may be staffed with salespeople who have an opportunity to either sell or explain a company's products. If a sale isn't consummated with a customer who expresses interest in a product at the booth, the salesperson may be able to follow up with the customer later to finish the sales process.

[0004] Unfortunately, there are a number of problems that hamper the effectiveness of using tradeshows and expositions for sales and advertising purposes. The shows are often quite crowded with the number of people expressing interest at a company booth far exceeding the ability of a limited number of salespeople available to handle the inquiries. When people express a passing interest in a product but are not willing to purchase it immediately, it is often difficult to acquire the contact information necessary for a follow up sales opportunity, either because other potential customers are waiting or because the attendee expressing interest does not want to provide the information. When a large number of people attend a speech given by a company officer or official, there is often no mechanism available to find out who attended. If a competitor is attending a booth or a speech, they are often able to do so in anonymity. Similarly, it is often difficult to tell how well advertisements are working without resorting to subjective observations from company employees or random feedback from attendees.

[0005] Conventional methods of generating sales leads from tradeshows rely heavily on information provided by attendees at the time of registration. While the registration information allows for follow-up contact with individuals who attended the show, it does not provide a means of tracking the attendees movements at the shows. Where the tradeshow is a large one with different types of vendors, it is impossible to assess which company the attendee was most interested in based on the registration information. Accordingly, a follow up sales contact based solely on registration information is often quite inefficient. Unfortunately, conventional methods of tracking participants at tradeshows do not provide an automatic mechanism for tracking the movements of attendees.

BRIEF SUMMARY OF THE INVENTION

[0006] The illustrative embodiment of the present invention provides a method of determining and tracking movements of tradeshow attendees using a location system. The interactions of the tradeshow attendees with other objects and locations is also tracked using the location system. Object identifiers equipped with a transmitting component are attached to attendees and broadcast a transmission signal which includes a unique identifier. The transmission signal broadcast by the object identifiers is received by a network connected element. The signal from the object identifier is forwarded over a network by the network connected element to an electronic device. A location determining module analyzes a variety of factors including the unique identifier, the location of all of the the network connected elements receiving the signal, the receiver characteristics of the receivers of the network connected elements, and the historical location of the attendee in order to determine the current location of the attendee. Those skilled in the art will recognize the fact that different combinations of factors may be utilized to determine location without departing from the scope of the present invention. Once the location of the object has been determined, the location determining module consults a database to determine associations between the located attendee and other objects or locations such as exhibits, booths and other attendees. The associations are based on the other objects or locations proximity to the located object. Once an association is determined, it is stored and the duration of the association is subsequently recorded. This information may then be utilized in real-time while the tradeshow is ongoing or at a later date or time.

[0007] In one embodiment of the present invention, a location system includes a network with at least one network connected element and is interfaced with an electronic device. The network connected element has at least one transceiver giving it the ability to transmit and receive signals. An object identifier assigned to a person transmits a signal bearing a unique identifier which is received by the network connected element. The network connected element appends a header to the signal and forwards it over the network to the electronic device. The system also includes a database which is interfaced with the network and which is used to store object associations. The object associations record the interaction of attendees with other people, objects and locations that are located within a defined distance of the attendees. A location determining module is also interfaced with the network and uses the unique identifier sent to the electronic device and the location of the network connected element receiving the signal to calculate the location of the person assigned to the object identifier. The calculated location is checked against the stored location of other people, objects and locations in order to identify associations. Any identified associations are stored in the database.

[0008] In another embodiment, a method of determining object associations which utilizes a location system is practiced over a network. The network is interfaced with an

electronic device and a network connected element. An object identifier assigned to a person broadcasts a signal containing a unique identifier which is received by the network connected element. The signal is forwarded to the electronic device. A location determining module calculates the location of the object identifier and the person to which it is assigned using the known location of the network connected element and the unique identifier extracted from the signal retrieved from the object identifier signal. The calculated position of the object is compared against the position of other people, objects and locations of interest in order to determine associations. Identified associations are stored in a database interfaced with the network. In one aspect of the invention, the associations are made available as input data to other applications executing on the network. In an additional aspect of the invention, a fixed location identifier which is not interfaced with the network is used to receive and transmit signals from the object identifier to the network connected element. The known location of the fixed location identifier and its receiver characteristics provide additional data to the location determining module which is used to determine the location of the object identifier and the person to which it is assigned.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1A** depicts a block diagram of an environment suitable for practicing an illustrative embodiment of the present invention;

[0010] **FIG. 1B** depicts a block diagram of an alternate environment suitable for practicing an illustrative embodiment of the present invention not utilizing a network;

[0011] **FIG. 2A** depicts a block diagram of an object identifier used by the illustrative embodiment of the present invention;

[0012] **FIG. 2B** depicts a block diagram of a fixed location identifier used by the illustrative embodiment of the present invention;

[0013] **FIG. 3** depicts a block diagram of the layout of a tradeshow practicing an illustrative embodiment of the present invention;

[0014] **FIG. 4** is a flowchart of the sequence of steps followed by the illustrative embodiment of the present invention to programmatically generate sales leads as a result of object associations determined by the illustrative embodiment of the present invention;

[0015] **FIG. 5** is a flowchart of the sequence of steps followed by the illustrative embodiment of the present invention to broadcast targeted messages to a tradeshow attendee as a result of object association determined by the illustrative embodiment of the present invention; and

[0016] **FIG. 6** is a flowchart of the sequence of steps followed by the illustrative embodiment of the present invention to display the location of tradeshow attendees in real-time as a result of object associations determined by the illustrative embodiment of the present invention

DETAILED DESCRIPTION

[0017] The illustrative embodiment of the present invention provides a method of recording object associations using a location system. The object association are formed between a person, such as a tradeshow attendee, and other people, objects and locations. Object locations are determined based on signals generated from object identifier devices assigned to people and forwarded to an electronic device interfaced with a network. The origin of the signal is calculated based on the known position of the receiving devices receiving the signal, the historical recorded position of the person, the characteristics of the receiving devices receiving the signal (i.e. the range), the strength of the received signal, the type of signal, and whether or not the signal was repeated. Once the location of the person has been determined, the location determining module consults a database to determine associations between the located person and other people, objects or locations based on the other people, objects and locations proximity to the located person. Once an association is determined, it is stored and the duration of the association is subsequently recorded. The identified associations may then be leveraged in a number of ways by other applications interfaced with the network, such as by being used to generate sales leads and determine the effectiveness of advertising based on the identified associations.

[0018] **FIG. 1A** depicts a location system **11** suitable for practicing an illustrative embodiment of the present invention. A plurality of object identifier devices **2** are attached, either directly or indirectly, to tradeshow attendees and include an infrared (IR) transmitter **3** and a radio frequency (RF) transmitter **4** which are used to generate a signal which is sent to a network connected element **6**. The signal includes a unique identifier identifying the object identifier (and by extension the person to which it is attached). The network connected element **6** includes an IR transmitter **3**, an RF transmitter **4**, an IR receiver **7** and an RF receiver **8**. The IR receiver **7** is capable of receiving an IR signal generated by the object identifier **2**. The RF receiver **8** is capable of receiving an RF signal generated by the object identifier **2**. The network connected element **6** is interfaced with a network **10** and forwards the signal received from the object identifier **2** to an electronic device **12** which is also interfaced with the network **10**. The interface between the network connected element **6** and the network **10** may be a physical interface in the case of a wired network, or a wireless interface in the case of a wireless network. The electronic device **12** may be a desktop computer system, PDA, handheld wireless device, laptop, web server or other device interfaced with the network **10**. The network **10** may be a local area network (LAN), a wide area network (WAN), the Internet, an intranet, or a metropolitan network. The network **10** may be a wireless network such as a Bluetooth network, a cellular network, a GSM based network or some other type of network. Although the object identifier **2** and network connected element **6** have been described as including IR and RF transmitters **3** and **4** and receivers **7** and **8**, those skilled in the art will recognized that other types of transmitters such as ultrasound (US) may be used, either alone or in combination with the implementation depicted herein, without departing from the scope of the present invention.

[0019] The electronic device **12** includes a location determining module **14** which is used to locate the object identifer **2** and the corresponding person to which the object identifier is attached. The location determining module **14** may be located anywhere it has access to the network **10**. Although the location determining module **14** will usually be imple-

mented as a software component, the location determining module **14** may also be implemented by being hard-wired into a device. The location determining module **14** uses the unique identifer from the signal of the object identifier **2** in the calculation of the current location of the object identifier. The location determining module **14** calculates the origin of the signal based on the known position of the receivers receiving the signal (which is retrieved from a topology database **16** which is also interfaced with the network **10**), the historical recorded position of the object, the characteristics of the receivers receiving the signal (i.e. the range) (which are retrieved from a database **18** also interfaced with the network), the strength of the received signal, the type of signal, and whether or not the signal was repeated (which are determined by analyzing information contained in the signal received from the network connected element **6**). Both the topology database **16** and database **18** may be located in any of a number of locations interfaced with the network, including on the electronic device **12**. Once a calculation of the location of the object identifier **2** has been made, the location of the object identifier and the corresponding tradeshow attendee may be analyzed to see if it reveals object associations. The process of analyzing the calculated location of the object identifiers is described in more detail below. Any identified associations are stored in the database **18**.

[**0020**] In one aspect of the illustrative embodiment of the present invention, a fixed location identifier **20** is also present in the location system. The fixed location identifier **20** is not interfaced with the network **10** and includes an IR transmitter **3**, an RF transmitter **4**, an IR receiver **7** and an RF receiver **9**. The IR receiver **7** is capable of receiving an IR signal generated by the object identifier **2**, while the RF receiver **8** is capable of receiving an RF signal generated by the object identifier **2**. The RF receiver **9** on the fixed location identifier **20** may have a different receiving range than the RF receiver **8** on the network connected element **6**. The location of the fixed location identifier **20** is stored in the topology database **16**. After receiving a signal from the object identifier **2**, the fixed location identifier appends its own identifier to the signal and tranmsits it to a network connected element **6**. When the signal eventually reaches the location determining module **14**, the location determining module uses the range characteristics of the fixed location identifier **20** to help locate the object identifier **2**. In other words, if the location determining module receives notification from both a fixed location identifier **20** and a network connected element **6** that both have received an RF signal, the signal can only have originated from a spot that is within both receivers receiving range. Those skilled in the art will recognize that many alternate implementations are possible within the scope of the present invention. The object identifier **2** may use different types and combinations of transmitters. Similarly, the object identifier **2** may include a receiving component capable of receiving signals from the network connected element **6**, may be interfaced with the network **10**, and may hold the location determining module **14**. The location determining module **14** may appear in any of a number of locations interfaced with the network **10** and is not limited to being stored on the electronic device **12**.

[**0021**] A non-networked form of the illustrative embodiment of the present invention may also be implemented. **FIG. 1B** depicts a block diagram of location system **11** suitable for determining object association without relying on the use of a network. An object identifier **2** transmits a signal directly to the location resolving module **14** which in this implementation includes stored data allowing it to associate objects and locations. The object identifier **2** transmits the signal using a transceiver to transmit a signal. In alternative embodiments, a transmitter, transponder or similar device may be used. Those skilled in the art will recognize that different types of components capable of transmitting and receiving signals may be used in place of the transmitters and receivers depicted herein. For example, a transceiver may be substituted for a receiver without departing from the scope of the present invention. The location determining module **14** may include any structure suitable for determining location. Examples include any device with intelligence to determine the location of one or more object identifiers **2**. According to various embodiments of the invention, the location determining module **14** may be an electronic device. The electronic device may take multiple forms and may include, a processor, a computer, a personal digital assistant, a communications device, such as a cellular phone, a network appliance, a web server, a receiver, a transmitter, a different device capable of manipulating information, or any combination of these devices.

[**0022**] According to various embodiments of the invention, the location determining module **14** may be capable of performing additional functionality, such as receiving requests for information, providing information, storing information, commanding actions in response to location information, associating objects with other objects or with locations, establishing privacy conditions regarding availability of location information, interfacing directly with various network types, and the like. According to further embodiments of the invention, the location determining module **14** includes multiple, distributed receivers, some of which may be connected to a network, and others not connected to a network. According to various embodiments of the invention, the object identifier **10** and location determining module **14** utilize both RF signals and IR signals for the determination of location.

[**0023**] **FIG. 2A** depicts a block diagram of an object identifier **2** used by the illustrative embodiment of the present invention. The object identifier **2** includes an IR transmitter **3** and an RF transmitter **4**. Both transmitters are controlled by an embedded processer **5** which controls the signaling process. The object identifier **2** may be directly attached to a tradeshow attendee by embedding the object identifier in a piece of jewelry. Alternatively, an object identifier may be indirectly attached to a tradeshow attendee by being attached to, or embedded in, a nametag worn by the attendee. As long as the object identifier **2** moves in tandem with the tradeshow attendee, it signals the current location of the attendee. **FIG. 2B** depicts a block diagram of a fixed location identifier **20** used by the illustrative embodiment of the present invention. The fixed location identifier **20** includes an IR transmitter **3** and an RF transmitter **4** which are controlled by an embedded processer **5** which controls the signaling process. Also included in the fixed location identifier **20** are an IR receiver **7** and an RF receiver **9** which are used to receive signals from the object identifier **2**. As previously noted, both the object identifier **2** and the fixed location identifier **20** may use different types of signaling and receiving devices and components without departing from the scope of the present invention.

[0024] The signaling process may make use of both RF and IR signals in alternating combination. According to one embodiment of the invention the RF signal is transmitted every ten seconds and the IR signal is transmitted every twenty seconds. This method provides a substantially consistent IR power level, while varying an RF power level. Varying the RF power level may assist in determining a location of the object identifier **2** by enabling the network connected element **6** to receive less than all of the RF signals. The transmitted signals may also include additional information such as the signal strength being transmitted, the period between transmissions, the length of time of the transmissions, a unique identifier for the object identifier **2**, information received from one or more input devices and/or various status information, such as those pertaining to the components of the object identifier. In one aspect of the invention, the object identifier **2** also contains receivers and the location determining module **14** configures the object identifier over the network **10** by sending transmission parameters (i.e.: alternate signals every 30 seconds). Since IR signals are line-of-sight signals and RF signals travel through walls, the combination of signals may be used by the location determining module **14** to locate signals with greater accuracy than would be possible using either form of signaling alone.

[0025] **FIG. 3** depicts a block diagram of a layout of a tradeshow floor **40** using the illustrative embodiment of the present invention. The tradeshow floor **40** includes multiple exhibit booths **42**. Each of the exhibit booths **42** has a fixed location identifier **20** in the booth. A number of fixed location identifiers **20** are also located around the outskirts of the tradeshow floor to increase the accuracy of determined locations. The fixed location identifiers **20** send a signal to the network connected elements **6** which are interfaced with the network **10**. One feature of the present invention is that the use of the fixed location identifiers **20** enables the use of a reduced number of the more expensive network connected elements **6**. The network connecting elements **6** interface with an existing network **10** on the tradeshow floor **40** and do not require a new network to be set up in order to operate properly. The network **10** to which the network connected element **6** is connected may be a wired or wireless network with the result that the network connected element **6** may or may not be physically connected to the network. The tradeshow floor **40** also includes a pair of attendee display locations **44** at which an authorized user may display the current location of one or a number of tradeshow participants derived from the signals of their attached object identifiers **2**. The process of using the attendee display locations **44** is explained in more detail below.

[0026] The use of the network connected elements **6** and the fixed location identifiers **20** may be illustrated with an example. An object identifier **2** attached to a tradeshow attendee may be configured to emit alternating IR signals and RF signals bearing a unique identifier. If the attendee is located on the far side of an exhibit booth **42** the RF signal (which may travel through walls) may be picked up by a number of receivers located on the network connected elements **6** and fixed location identifiers **20**. However, the alternating IR signal emitted by the object identifier **2** attached to the attendee will only be picked up by receivers in a direct line of sight (since line-of-sight signals do not travel through walls well). The number of receivers receiving the RF signal will vary with the power level (more power causes the signal to go farther and thus be received by more receivers) and the pattern of receivers receiving the signal, the type of signal, and the receiving range of the fixed location identifiers **6** which are frequently configured to have a smaller receiving range than the receivers on the networked connected elements, are all used by the location determining module **14** to determine a location for the attendee. In one embodiment, the fixed location identifier might have a receiving range for RF signals of 6 feet (as opposed to a 20 foot receiving range for the RF receiver **8** for the network connected element **6**) which allows an attendee to be located to within **6** feet of the fixed location identifier **20** when the fixed location identifier receives a signal. The actual receiving ranges of the RF receivers **8** and **9** are an implementation choice, and those skilled in the art will recognize that they may be adjusted without departing from the scope of the present invention.

[0027] Once the location determining module **14** has determined the current location of an attendee, the determined location is compared against the current location of other tradeshow participants, exhibits and pre-determined locations to determine the proximity of the located object to the other participants, exhibits or the pre-determined location. The predetermined location is usually a place of special interest, such as a location where a company officer is giving a speech. If the attendee is within a pre-defined distance of another attendee, exhibit or pre-determined location, the location determining module **14** determines the attendee and the other attendee, exhibit or pre-determined location are interacting, and records an association in the database **18**. Depending upon the implementation, the location determining module **14** may require the association to occur for a minimum period of time before deciding an association is occurring. The association is recorded for beginning time, ending time, duration and alternately for separate occurrences, all of which may be stored in the database **18**. The electronic device **2** holds, or is interfaced with, a variety of software programs to make use of the object associations determined by the location determining module **14**. The software may utilize a JDBC interface located in the location determining module **14** which allows Java applications to send SQL commands to the database **18**. Those skilled in the art will recognize that the location of the various software components utilizing the object associations as input data may change without departing from the scope of the present invention.

[0028] Once the object associations have been determined by the location determining module **14**, the records of the associations may be provided as input data to a variety of software programs and processes. **FIG. 4** is a flowchart of the sequence of steps performed by the illustrative embodiment of the present invention to generate sales leads based upon the object associations determined by the location determining module **14**. The sequence begins when an attendees location is determined to be interacting with an exhibit location of interest to the sales staff (step **60**). The location determining module **14** determines an association has occurred and the association is tracked and recorded for as long as it continues (step **62**). The association that was determined by the location determining module **14** is provided as data input for a sales application which collects the names of attendees who attended a particular exhibit during the tradeshow (step **64**). The data may be filtered by the sales

application so that it filters the data to produce the top n % of attendees who attended the exhibit for the longest time (step **66**). Those skilled in the art will recognize that there are multiple ways to filter the raw data without departing from the scope of the present invention. The filtered data may then be provided to the salesperson for follow up contact (step **68**). Since the attendees who spent the longest amount of time with the exhibit probably have the most interest in the exhibit, the filtered associations provide the salesperson with a more receptive audience for follow up contact than would be available using conventional methods. The associations may be analyzed in real-time while the tradeshow is ongoing, or it may be analyzed after the tradeshow is over.

[**0029**] Sales related applications may use the object association data in a number of ways. In one embodiment, a tradeshow attendee who forms an association with a designated booth, display or item that meets duration criteria is automatically entered in a contest. In another embodiment, advertising campaigns are dynamically changed based upon how long a tradeshow attendee looks at something. Messages may be displayed in the attendee's location offering discounts if purchases are made within specified time periods. Discounts may be changed based on various parameters, including how much inventory is on hand, how an item is selling, time, historical buying patterns of the attendee, and similar factors.

[**0030**] The object association data held in the database **18** may also be used to determine the current location of a tradeshow attendee. **FIG. 5** is a flowchart of the sequence of steps performed by the illustrative embodiment of the present invention to determine and display the current location of tradeshow participants. The sequence begins when an object identifier **2** attached to a participant broadcasts a signal to the network connected element **6** (step **80**). The signal may be forwarded from a fixed location identifier **20** to the network connected element **6**. The network connected element **6** appends a time stamp and its identifier onto the signal and sends it to the electronic device **2** and location determining module **14** (step **82**). Those skilled in the art will recognize that a number of different devices located at different points in the signal path may append the time stamp without departing from the scope of the present invention. The location determining module **14** calculates the position of the tradeshow attendee as outlined above (step **84**). Any associations for the attendee are then updated in the database **18** (step **86**). An authorized participant on the tradeshow floor **40** may then go to the attendee display location **44** and request the current location of a particular attendee (step **88**). The location determining module **14** sends the current location of the attendee to the attendee display location where it is displayed on a map of the tradeshow floor **40**. The request may be to determine the location of one attendee or multiple tradeshow attendees. Alternatively, the display information may be sent to a handheld device held by the tradeshow attendee.

[**0031**] In one embodiment of the present invention, individuals are allowed to opt in and opt out of the location system. By pressing a button on the object identifier, the location is determined but not displayed. This feature allows individuals to prevent their movements from being public knowledge to the other attendees of the tradeshow.

[**0032**] In one embodiment, the object associations are used to verify attendance at continuing education seminars. The attendence of individuals at mandatory training sessions may be verified by the illustrative embodiment of the present invention to make sure the individuals stay for the duration of a seminar. Those individuals staying for the duration of the seminar may be awarded continuing education credit.

[**0033**] The object association data held in the database **18** may also be used to send targeted messages to a tradeshow attendee. **FIG. 6** is a flowchart of the sequence of steps performed by the illustrative embodiment of the present invention to send targeted messages to selected attendees based on existing associations. The sequence begins when an object identifier **2** attached to a participant broadcasts a signal to the network connected element **6** (step **100**). The signal may be forwarded from a fixed location identifier **20** to the network connected element **6**. The network connected element **6** sends the signal to the electronic device **2** and location determining module **14** (step **102**). The location determining module **14** calculates the position of the tradeshow attendee as previously discussed (step **104**). Any associations for the attendee are then updated in the database **18** (step **106**). The identified association may then be programmatically compared against a template of associations. If the determined association matches an association listed in the template (step **108**), a targeted message is broadcast to a device with a receiver located near the attendee (step **110**). In some implementations, the message may be an interactive message requiring a response from the user. Those skilled in the art will recognize that other forms of storing associations of special interest besides a template may be used without departing from the scope of the present invention.

[**0034**] The object association data may be used to determine how long all the attendees looked at a particular exhibit, display or booth, by cumulatively totaling the total number of tradeshow attendees who formed associations with the exhibit, display or booth, and the durations of those associations. This provides a good metric as to the length of time of the average association with the exhibit, display or booth which may be used as a guide to its effectiveness. The information may also be compared to historical data recorded from previous events to guage changes occurring over extended periods of time. Alternatively, the object association data may be used to page or contact a designated person if a specified individual enters a particular booth.

[**0035**] Although many of the examples listed herein have been made with reference to a tradeshow environment, the illustrative embodiment of the present invention may be used to detect object associations in a variety of environments. The illustrative embodiment of the present invention is equally applicable to company meetings, expositions, lectures and other events not ordinarily considered to be identical to tradeshows. Similarly, the word attendee has been used herein to describe an individual with an object identifier attached (directly or indirectly). Those skilled in the art will recognize that the attendance status of the individual bearing the object identifier **2** does not affect the scope of the present invention.

[**0036**] It will thus be seen that the invention attains the objectives stated in the previous description. Since certain changes may be made without departing from the scope of the present invention, it is intended that all matter contained

in the above description or shown in the accompanying drawings be interpreted as illustrative and not in a literal sense. Practitioners of the art will realize that the sequence of steps depicted in the figures may be altered without departing from the scope of the present invention and that the illustrations contained herein are singular examples of a multitude of possible depictions of the present invention.

We claim:

1. A location system including a network with at least one network connected element and electronic device interfaced thereto, said network connected element including at least one signaling component capable of transmitting signals, and at least one receiving component capable of receiving signals, comprising:

a plurality of object identifiers, each said object identifier being a device attached to a person, each said object identifier having at least one signaling component, said signaling component generating a signal with a unique identifier, said signal received by said network connected element and incorporated into a second signal transmitted from said network connected element to said electronic device;

a database holding object associations interfaced with said network, each of said object associations being the interaction of a person to which said object identifier is attached with at least one of a person, object, advertising exhibit, and location, said interaction occurring when said person is within a defined distance at least one of a person, advertising exhibit, and location;

a location determining module interfaced with said network, said location determining module using said unique identifier and programmatically calculating the location of said object identifier and the person which the object identifier is attached using said unique identifier, said calculated location being used to determine an association between said person and at least one of a person, advertising exhibit, and location, the determined association being stored in said database.

2. The system of claim 1 wherein said object identifier includes a receiving component, said receiving component receiving signals transmitted from said network connected element.

3. The system of claim 1, comprising further:

a fixed location identifier not interfaced with said network and located at said advertising exhibit, said fixed location identifier including at least one receiving component receiving transmissions from said object identifier, said receiving component having a different receiving range than the receiving component for said network connected element, and at least one signaling component transmitting a signal to said network connected element, said network connected element incorporating the signal from the fixed location identifier into a signal sent to said electronic device, said location determining module using the receiving range of the receiving component of said fixed location identifier, the receiving range of the receiving component of said network connected element, and the known location of said fixed location identifier in the calculation of said object identifier location.

4. The system of claim 1 wherein the duration of said determined association is stored in said database.

5. The system of claim 4 wherein separate occurrences of said determined associations are stored in said database.

6. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to generate sales leads based on the average time said persons spend interacting with said advertising exhibit.

7. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to generate sales leads based on multiple visits of said persons to said advertising exhibit.

8. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to cumulatively total the number and duration of associations between a plurality of located persons and one of another person, object, advertising exhibit and location.

9. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically notifying a previously designated person upon the determination of a specified association.

10. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to verify attendance of at least one person at an educational course offering.

11. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to cumulatively compare current associations with recorded historical associations from previous events.

12. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to dynamically alter the sales terms of an item, said altered terms displayed to said located person.

13. The system of claim 5 wherein said object identifier is embedded in a name badge of a person.

14. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to enter said located person in a contest.

15. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to transmit information to a located person in response to a request based on their current location.

16. The system of claim 5, comprising further:

an application interfaced with said network, said application programmatically using said determined associations to generate a marketing message to one of said persons upon said located person associating with at least one of a pre-determined person, pre-determined advertising exhibit, and pre-determined location.

17. The system of claim 16 wherein said marketing message is an interactive message allowing a response from said located person.

18. The system of claim 1, comprising further;

a display showing the locations of at least one of a located person, object, exhibit and location.

19. The system of claim 18 wherein said display is located in at least one of a kiosk and a handheld device.

20. The system of claim 18 wherein said located person alters the signal of said object identifier and the location of said located person is omitted from said display.

21. The system of claim 1, wherein said object identifier includes a receiving component and said location determining module is located on said object identifier.

22. The system of claim 1, wherein said object identifier includes a receiving component and is interfaced with said network.

23. In a location system, said location system including a network with an electronic device and a network connected element interfaced thereto, said network connected element including at least one signaling component capable of transmitting signals, and at least one receiving component capable of receiving signals, a method, comprising the steps of:

providing an object identifier attached to a person, said object identifier being a device having at least one transceiver, said transceiver generating a signal with a unique identifier, said signal received by said network connected element;

transmitting a second signal from said network connected element to said electronic device, said second signal incorporating said signal from said object identifier;

calculating programmatically the location of said object identifier and said person to which it is attached using said unique identifier and the location of said network connected element; and

recording associations in a database interfaced with said network, said associations being the interaction of said person with at least one of another person, object, exhibit and a location, said interaction occurring when the calculated location of said person is within a defined distance of at least one of another person, object, exhibit and a location

24. The method of claim 23 wherein said association is with a salesperson.

25. The method of claim 24, comprising the further steps of:

programmatically generating sales leads based on determined associations between a located person and said salesperson.

26. The method of claim 24, comprising the further steps of:

analyzing programmatically the compliance with training procedures of said salesperson.

27. The method of claim 23, comprising the further steps of:

storing pre-defined associations involving a specified person in a location accessible over the network;

matching a determined association involving a specified person with one of said pre-defined associations; and

generating an event based on said matching of associations.

28. The method of claim 27 wherein said event is a warning message sent to said salesperson that a business competitor is attending a sales exhibit.

29. The method of claim 27 wherein said event is the recording of the time of a business competitor associating with a sales exhibit.

30. The method of claim 27 wherein said event is an audible alarm at a designated location.

31. The method of claim 23 wherein the signal generated by said object identifier is at least one of an ultrasound (US), signal an infrared (IR) signal and a radio frequency (RF) signal.

32. The method of claim 23 wherein the signal generated by said object identifier is at least two of an ultrasound (US), signal an infrared (IR) signal and a radio frequency (RF) signal.

33. The method of claim 23, comprising the steps of:

transmitting an IR signal from said object identifier;

transmitting an RF signal from said object identifier;

periodically alternating the transmitting of said IR signal and said RF signal;

calculating the location of the object to which said object identifier is attached based upon the received signal characteristics of said IR signal and said RF signal.

34. The method of claim 23 wherein said network is a wireless network.

35. The method of claim 23 wherein said network is the Internet.

36. The method of claim 23 comprising the further steps of:

providing a fixed location identifier not interfaced with said network, said fixed location identifier including at least one receiving component, said receiving component having a different receiving range than the receiver for said network connected element, and at least one signaling component;

receiving said signal from said object identifier with said fixed location identifier;

transmitting an additional signal from said fixed location identifier to said network connected element, said additional signal incorporating said signal from said object identifier; and

calculating programmatically the location of said object identifier and the corresponding object which it is attached using the receiving range of the receiver of said fixed location identifier and the receiving range of the receiver of said network connected element in the calculation.

37. The method of claim 23, wherein said object identifier includes at least one receiving component, comprising the further step of:

configuring the generation of signals sent by said object identifier by sending instructions from said electronic device to said object identifier over said network.

38. In a location system, said location system including a network with an electronic device and a network connected element interfaced thereto, said network connected element including at least one signaling component capable of trans-

mitting signals, and at least one receiving component capable of receiving signals, a medium holding computer-executable steps for a method, said method comprising the steps of:

providing an object identifier attached to a person, said object identifier being a device having at least one transceiver, said transceiver generating a signal with a unique identifier, said signal received by said network connected element;

transmitting a second signal from said network connected element to said electronic device, said second signal incorporating said signal from said object identifier;

calculating programmatically the location of said object identifier and said person to which it is attached using said unique identifier and the location of said network connected element; and

recording associations in a database interfaced with said network, said associations being the interaction of said person with at least one of another person, object, exhibit and a location, said interaction occurring when the calculated location of said person is within a defined distance of at least one of another person, object, exhibit and a location.

39. The medium of claim 38 wherein said method comprises the further steps of:

storing pre-defined associations involving a specified person in a location accessible over the network;

matching a determined association involving a specified person with one of said pre-defined associations; and

generating an event based on said matching of associations.

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