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A System Providing Tailored Directions within Enclosed Building Structure

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A system providing tailored directions within enclosed building structure

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1. Introduction:

A map is typically used as an aid in finding directions from point A to point B. However, most people do not carry maps with them in their daily travels because they can be cumbersome. Further, most people do not have maps detailing the internal particulars of buildings they enter.

A Global Positioning System (GPS) is a satellite system that transmits signals which, for civilian equipment, allows determination of a current location generally within an accuracy of +/-20 meters. Accordingly, GPS is ineffective for directing people within a building because its accuracy renders it ineffective for directing a person from point to point within and among levels of a building structure. GPS based systems are also inadequate in buildings because the GPS satellite signal does not penetrate buildings.

In emergencies, the problems of the above, even if they were used, are compounded by such factors as panic, the cause of the emergency and its location, and the need to move people in an orderly fashion while not interfering with the efforts of persons responding to the emergency.

Thus, there is a need for a way to assist persons in navigating within an area such as a building.

2. Background:

This paper provides an alternative of overcoming the foregoing and other problems with a system and method for directions. This paper addresses the above problems because it can be readily updated to take into account floor plan modifications. Advantageously, the system operates independent of GPS, thereby providing operation in environments and under conditions in which satellite coverage is unavailable or is blocked by obstructions or shielding (e.g., in buildings, urban environments, next to large obstructions, etc.).

This paper addresses the above problems and provides valuable advantages because it enables a person equipped with an identification, ID, token, a wireless communication token that permits identification of the person to be transmitted to an access point or detector and then to a server to obtain directional information to be displayed for a user. ID tokens may comprise radiofrequency identification, RFID, tags, a Bluetooth or WiFi (IEEE 802.11a,b,g) device which may be

recognized and may communicate with an access point ant then a computer network. For example, a cell phone may contain an NFC, near-field communications, which is an RFID tag. The NFC device could serve as the ID token. If the person carries a device which is a communications device, that device may include an ID taken and the capability of sending a request for directions. For example, when a person desires to obtain directions to an "exit" in a building, a request can be made on the communication device. The request is transmitted to a server using the wireless communication device. The server has the ability to respond to the query. The answer is transmitted a display device in the vicinity of the user. Depending on its capabilities, the display device can either display the answer, or verbalize the answer to the person.

In one situation, a server receives information identifying a current location of a user having a short range wireless ID token. The server identifies a direction of movement to be communicated to a display device to direct the user towards a destination.

In another situation, a server receives the location of an emergency event. The server then determines an evacuation route for relay to the nearest display device which displays the information to the user.

Furthermore, a server tracks a path of movement of a user associated with an ID token. If the user veers off-course, the server re-calculates the path. The server then transmits information to update the path for a nearby display device.

Lastly, the server receives information concerning an obstruction in the path of plotted route. The server accesses the alternate map database, and recalculates the alternate route for the mobile wireless communication device.

In Reference 1, a user is required to carry a two-way communications device and use that device to send requests and receive instructions. In this paper, alternatives suggested, the user may have a simple ID token associated with that user. The ID token may be a passive RFID tag, an NFC equipped phone, or other wireless ID token, but may also be a token that can be recognized visually, e.g. a bar code or two-dimensional bar code, or the user may be recognized through facial characteristics by a camera and vision system.

3. Solution:

Implementation of the tailored direction system using RFID passive tags:

Figure 1: An illustration of the implementation of the system of the tailored direction system.

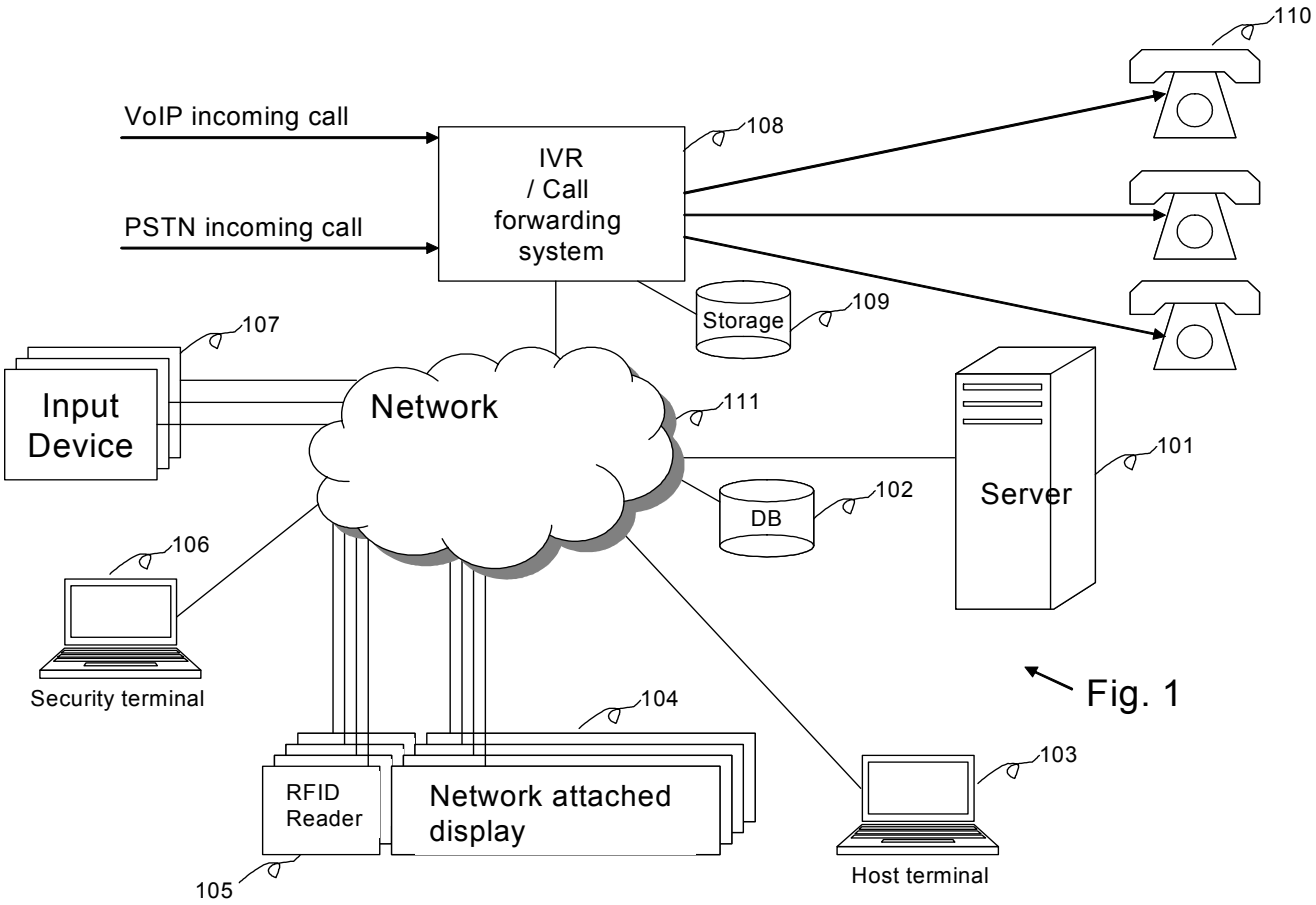


Fig. 1 depicts an example of a preferred implementation of the RFID tailored direction system System. The server (101) can be a server farm with multiple servers or a single server workstation depending on the scale of the implementation. The server will host a calendar server software that contains the information of visiting guests and his/her destination as well as the meeting time. The entry to the calendar can be made either from the host terminal (103) or the security terminal (106). It also runs the RFID direction system that reads the guest, e.g. user, location information from RFID readers (105) and computes the best route information then displays the directional information on the network attached display unit (104) that has affinity to the RFID reader that detected the location of the guest. It stores the guest information, the building maps, calendar data the phone number of the destined location in the database (102).

The guest can choose to enter or change his own information including name and destination on input devices (107) that are installed in multiple locations throughout the building. The receptionist can also enter it manually through the security terminal (106). The location information of the guest that were detected by the RFID readers (105) are used by the server to compute how far or how long will the guest take to the destination and the information is displayed on the network attached display that has affinity to the RFID reader that detected the guest and also notifies the whereabouts of the guest to the host on the host terminal (103). The

guest's name and ID or the phone numbers of the destined location are used to generate a call forwarding map and stored in the IVR (interactive voice response) / Call forwarding system's storage (109). IVR/Call forwarding system answers incoming calls either from IP based VoIP (voice over internet protocol) network or PSTN (public or private switched telephone network) and announces a message to enter the guest name by using the keypad or using speech recognition system and looks up the phone number of the destined location of the guest and forward the call. Also, the event is notified to the server so that the server can display the information about the incoming call when and where the guest is detected. The servers, input devices, RFID readers, direction display units, security terminals, host terminal, database and the IVR/Call forwarding system are connected via building network infrastructure.

Figure 2. Examples of Information shown on display

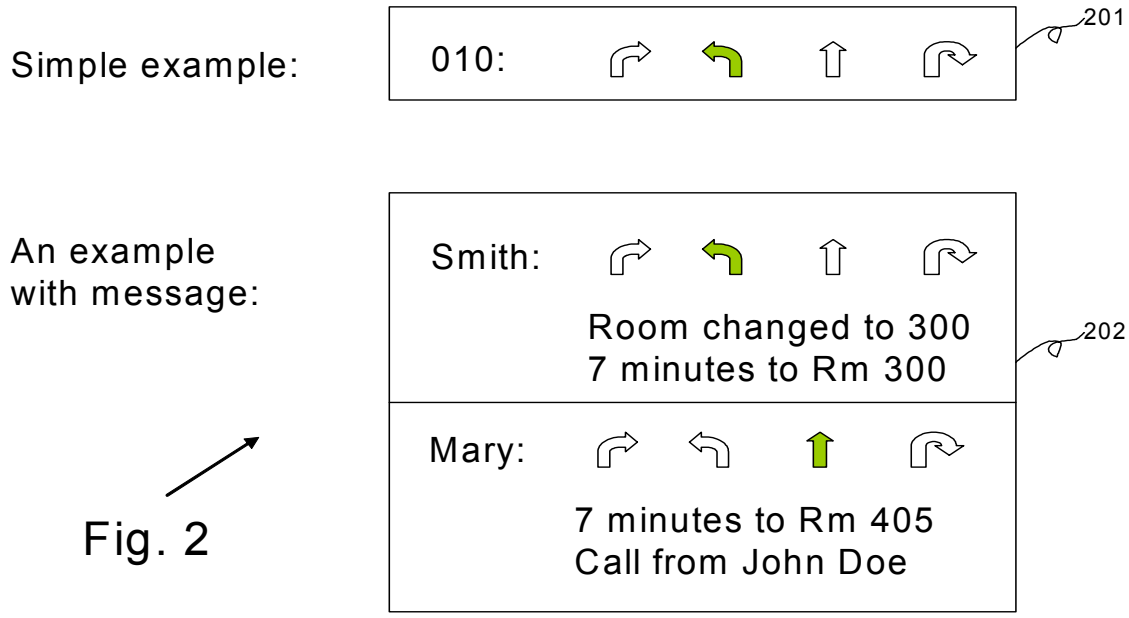


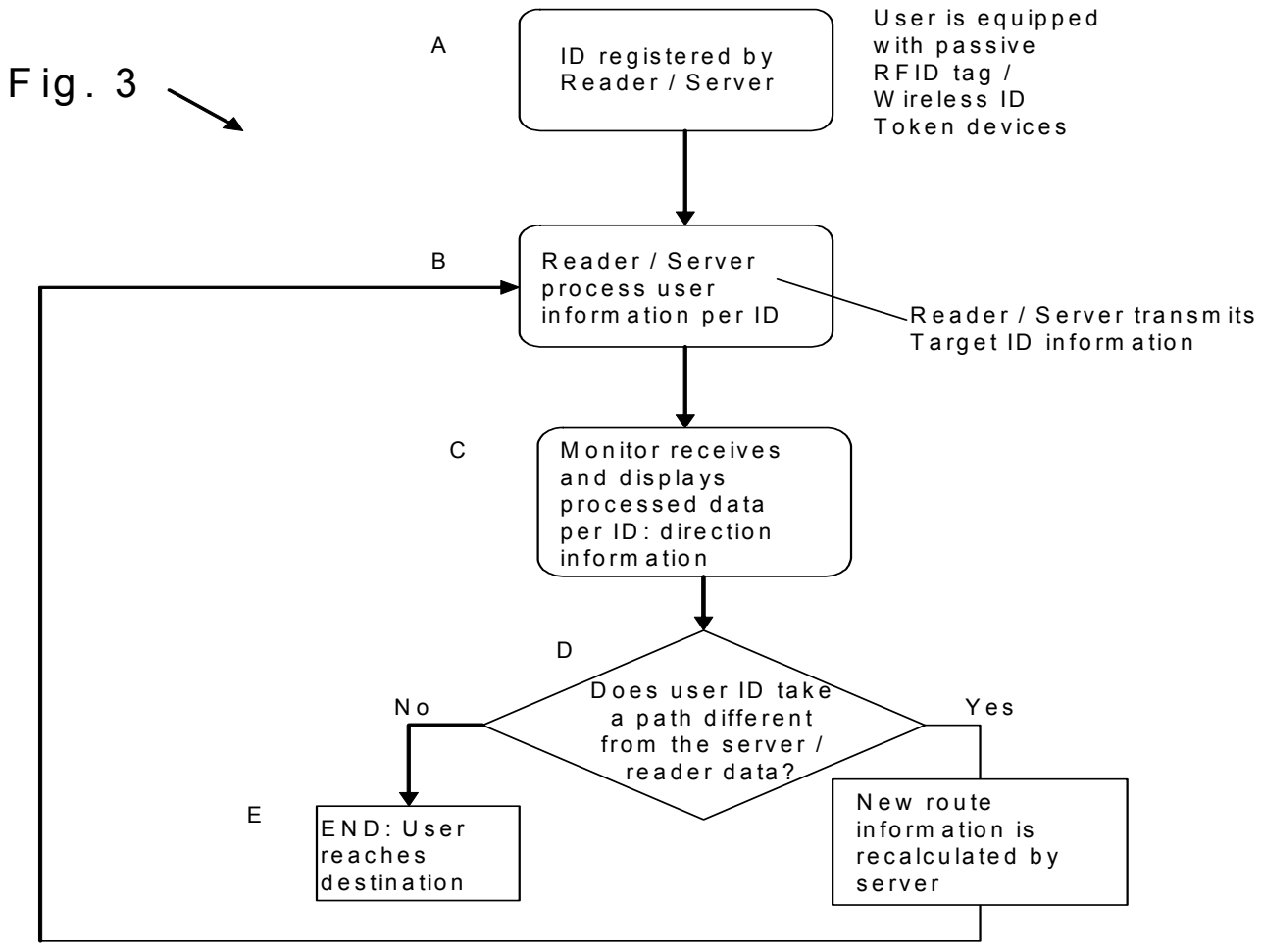
Fig. 2

Fig. 2. depicts a few examples of the information that might be displayed on the network attached display (104). The simple display may have minimal directional information such as turn right/left (on the n^{th} right/left), bear right/left, straight, or turn back. It might display symbolic equivalent signs instead. For simultaneous directions to multiple people, ID (it could also be alias or real name) should be displayed in front of the minimal directional data. An example of such display is shown as 201. A short message can be display to provide additional information such as distance/estimated time to the destination, incoming call information or a short massage from the host with the originator information. 202 illustrates an example of the latter display.

Key to information on display

- Minimum: Directional information
  - Turn right/left (on the #th right/left)
  - Bear right/left
  - Straight,
  - Turn back
- For simultaneous directions to multiple people
  - ID (or alias or real name) in front of the minimum directional data
- For message:
  - ID followed by a short massage with the message originator info
- Additional info:
  - Distance/estimated time to the destination

Figure 3. A flow chart illustrating the method of the tailored direction system.



A: Each user carries a passive RFID or a wireless ID token device. Each passive RFID or wireless ID token device is registered through server / reader database based on user's information

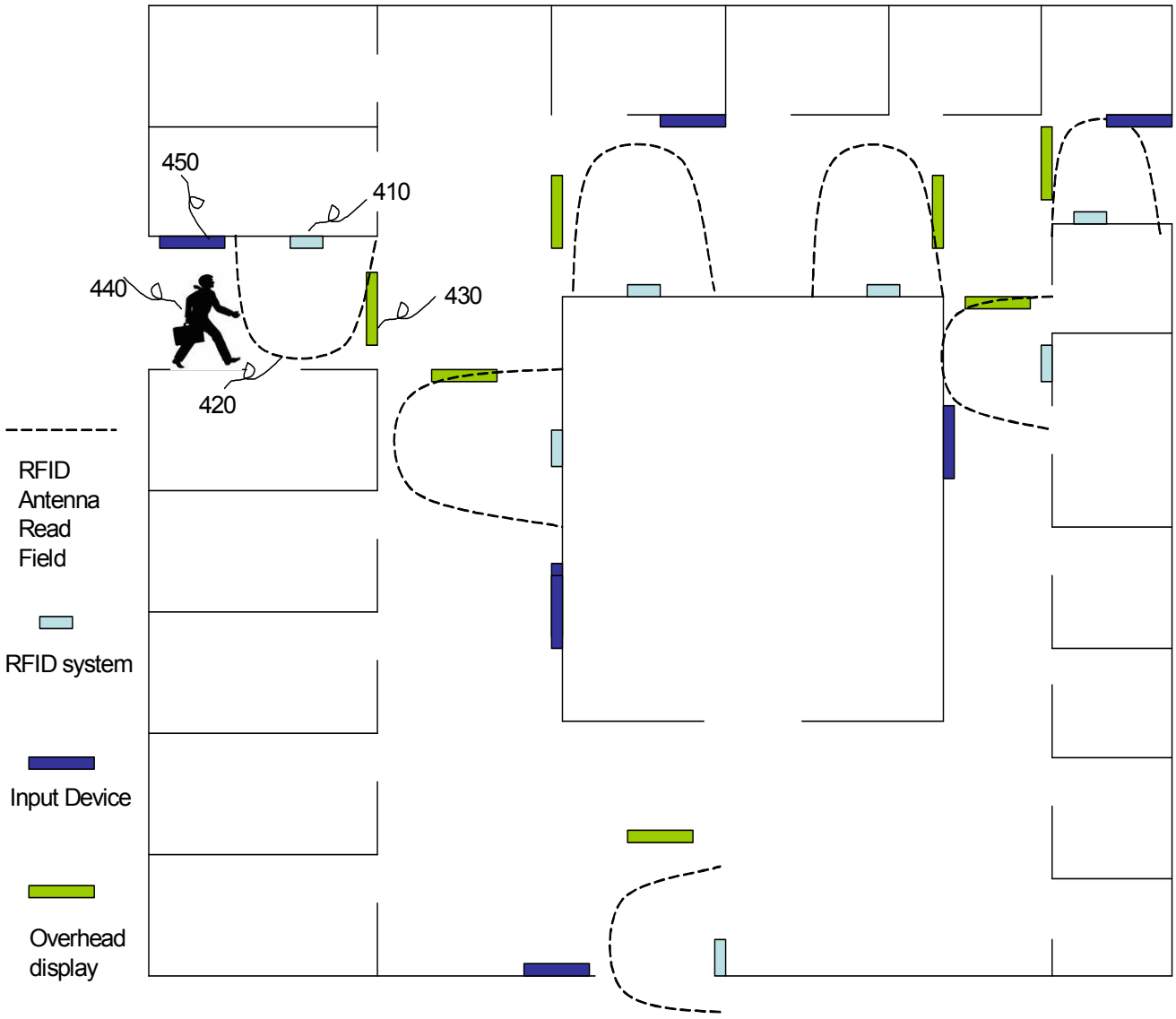
B: When a target RFID or wireless ID token device is detected, information associated with such ID is processed such information is then sent to display devices, information may also include the current location information: e.g. Printer, rest room, conference room or vending machine

C: Monitor displays processed data for the ID, e.g. directional information or name or room number or a map

D: Recalculation of IDs information is processed by server / reader if targeted (user) ID information is changed such as in the case where the target ID takes a path other than that calculated by the server / reader or if the final destination information is changed

E: Monitor shows the target ID has reached the destination

Figure 4. An illustration of the implementation and the deployment of the tailored direction system.



In the above illustration shown, the Radio Frequency Identification (RFID) reader (410), including RFID antennas, generates radio wave to cover an area which is the RFID antenna read field (420). The RFID reader is installed in a hallway right before an intersection of hallways. A network enabled display (430), for example, a LED display, a LCD display, is installed near the RFID reader at an appropriate height (e.g. overhead display hung from ceiling) for easy viewing. A user (440), who can be a visitor or new employee, has a name tag, for example, a passive RFID tag, given by a receptionist or security personnel at the entrance of the building. The user's information, for example, unique number of the passive RFID tag, user's name, user's alias name, destinations, host name, is registered into the RFID Direction System by the receptionist or the security personnel; from now on, the unique number of the passive RFID tag is associated with the user. When the user walks into the RFID antenna read field, the RFID reader reads the unique tag number of the passive RFID tag. The RFID reader then sends the unique ID number

to the server of the RFID Direction System to retrieve all associated information about the particular user, for example, name, alias name, user's current position referred from the fixed location of the RFID reader, user's immediate destination, estimated distance and time to the user's immediate destination. The retrieved information from the system server is displayed on the display (430) to provide directional information, for example, turn right, turn left, go straight, and go back, 50 feet to your next destination, 15 seconds to your next destination, to guide the user toward the user's next destination.

The RFID Direction System allows users to modify existing destinations or search for new destination at a user Input Device (450) which can be touch screen based input device. For example, the user changes the user's schedule, the user needs to find the next meeting conference room, or the user needs to use a restroom. User can enter current position, next destinations to the RFID Direction System via the Input Device which can be a GUI based interface. The RFID Direction System feeds back the route information and displays it on the Input Device in graphical form.

4. Conclusion:

In this paper, a system for providing tailored directions, both navigational and informational, for each patron based on his or her destination and calendar information and identification of the patron detected by various technology such as RFID recognition has been introduced. An example of implementing such system was also suggested. We believe that there are many different ways to achieve the exact same goal. The objective of this paper is to introduce a way to achieve the main idea of giving personally tailored directions to each patron within enclosed building structure.

5. References:

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