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(54) **METHOD AND APPARATUS FOR AUTOMATICALLY IDENTIFYING AND ANNOTATING AUDITORY SIGNALS FROM ONE OR MORE PARTIES**

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H04W 4/18 (2009.01)

(52) **U.S. Cl.**
CPC ***H04W 4/18*** (2013.01); *H04M 2250/68* (2013.01)

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CPC H04M 3/53366; H04M 2203/4536; H04M 2203/4563; H04M 2203/552; H04M 11/00; H04M 3/56
USPC 455/413, 412.1, 412.2; 704/251
See application file for complete search history.

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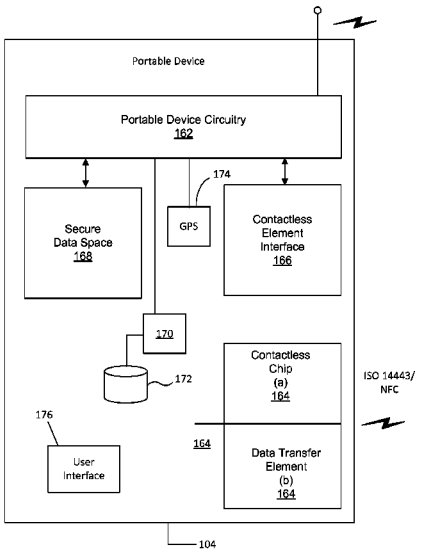
(57) **ABSTRACT**

In one embodiment, a mobile device application automatically identifies and annotates auditory data of a conversation between two or more parties. Digital auditory data is processed to identify mention of specific entities. An identified entity is annotated, based on context and relevance, to list one or more actions possible to perform with or on the identified entity, and the identified entity displayed while the conversation is ongoing. An action is selected by signals from an input interface.

6 Claims, 2 Drawing Sheets



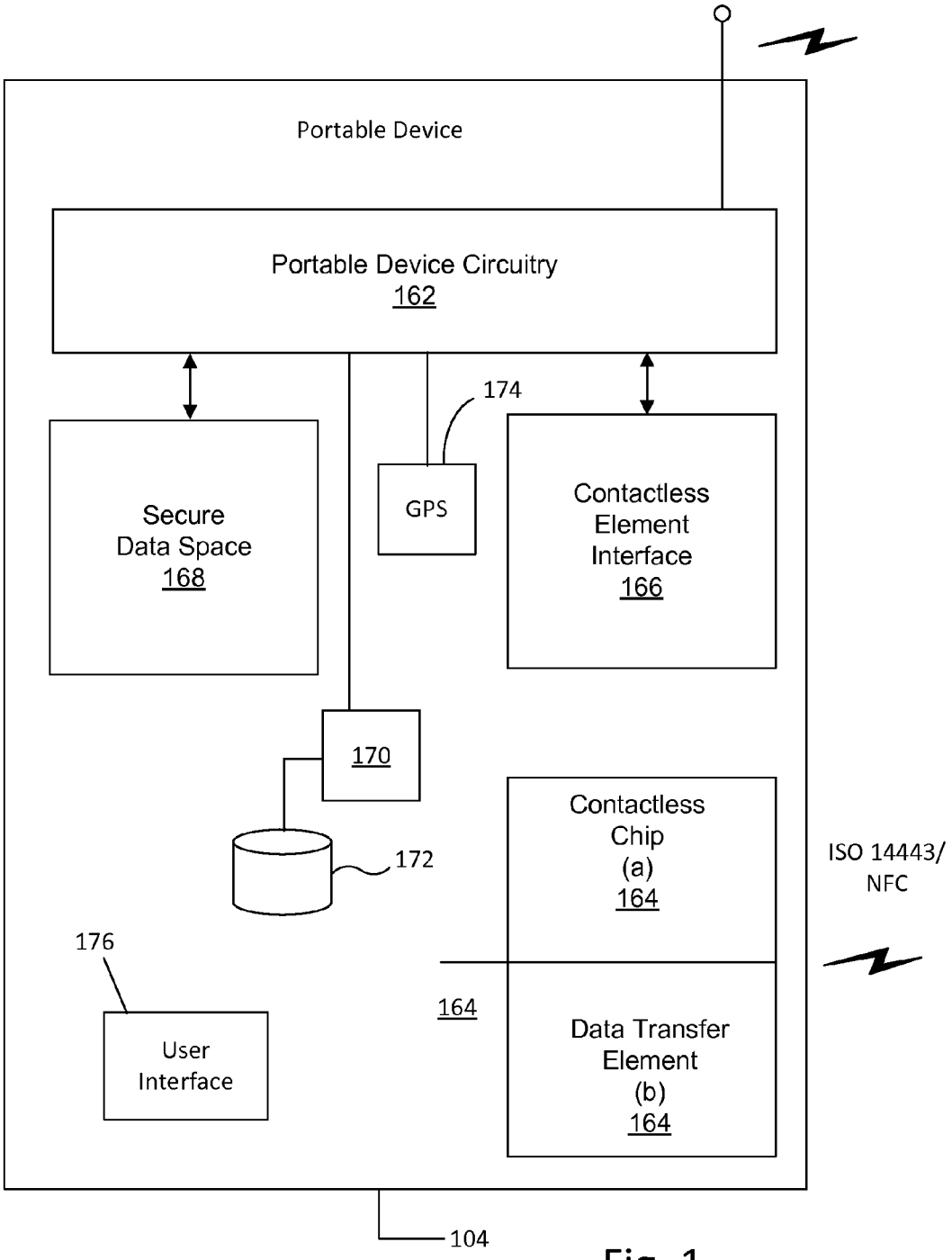

Portable Device
Portable Device Circuitry
162
174
Secure
Data Space
168
GPS
Contactless
Element
Interface
166
170
172
Contactless
Chip
(a)
164
ISO 14443/
NFC
176
164
User
Interface
Data Transfer
Element
(b)
164
104

Fig. 1

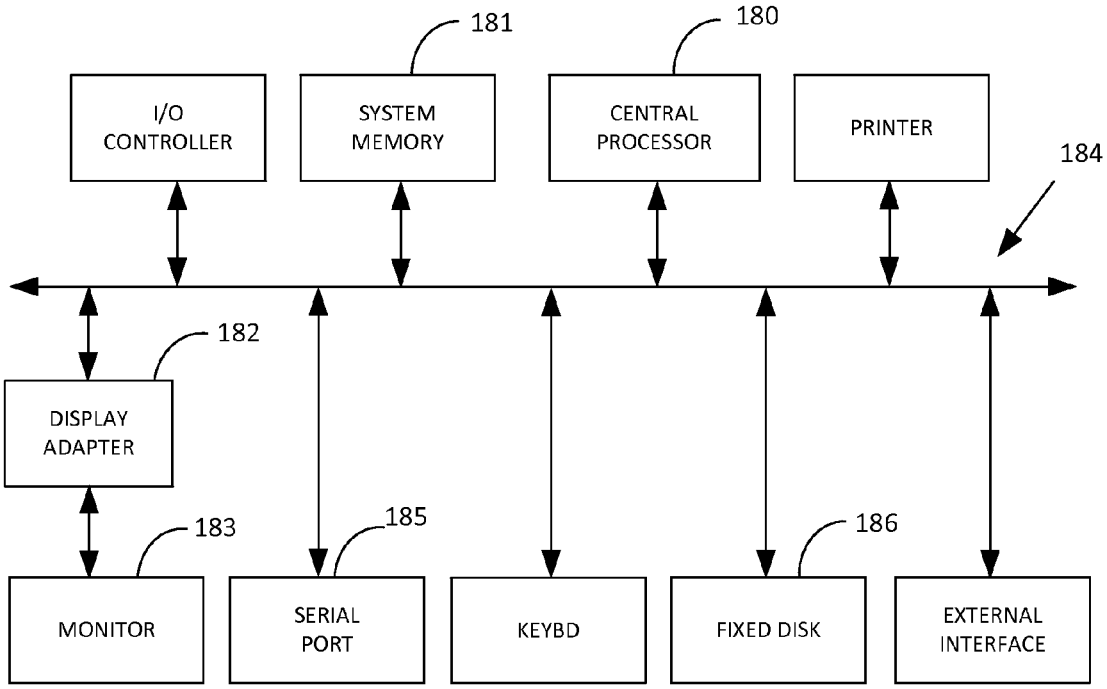

181
180
I/O CONTROLLER
SYSTEM MEMORY
CENTRAL PROCESSOR
PRINTER
184
182
DISPLAY ADAPTER
183
185
186
MONITOR
SERIAL PORT
KEYBD
FIXED DISK
EXTERNAL INTERFACE

FIG. 2

METHOD AND APPARATUS FOR AUTOMATICALLY IDENTIFYING AND ANNOTATING AUDITORY SIGNALS FROM ONE OR MORE PARTIES

RELATED APPLICATIONS

The present application claims the benefit of provisional application No. 61/789,945 entitled "Method and apparatus for automatically identifying and annotating auditory signals from one or more parties" filed Mar. 15, 2013 which is incorporated by reference for all purposes.

TECHNICAL FIELD

The present disclosure relates generally to telecommunications over wireless networks.

BACKGROUND OF THE INVENTION

Users of smart phones and other mobile devices are often given important information during a conversation. Circumstances often make taking notes difficult and the user is will lose the information unless it can be remembered.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of an example portable multifunctional device; and

FIG. **2** is a block diagram illustrating and example server or client computer workstation.

DESCRIPTION OF EXAMPLE EMBODIMENTS

Overview

Embodiments of the invention address the need to identify and annotate auditory data streams with structural information. For example, in a telephone conversation between two parties using cellular smart phones, the phone application would process, either locally or remotely or any combination, the auditory data stream to identify the mention of specific entities, e.g. telephone numbers, email addresses, dates and times, locations, etc. These identified entities are displayed to the parties who may indicate actions to perform with or on that entity, including disregarding due to non-relevance, inaccuracy, imprecision, or other attribute that may be used to train the underlying system on contexts in which those entities are relevant and what additional action, e.g. adding to contacts, calendar, or other applications on the mobile device.

Description

Reference will now be made in detail to various embodiments of the invention. Examples of these embodiments are illustrated in the accompanying drawings. While the invention will be described in conjunction with these embodiments, it will be understood that it is not intended to limit the invention to any embodiment. On the contrary, it is intended to cover alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the various embodiments. However, various embodiments may be practiced without some or all of these specific details. In other

instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention. Further, each appearance of the phrase an "example embodiment" at various places in the specification does not necessarily refer to the same example embodiment.

In an example embodiment the cellular phone application (CPA) utilizes the intervening telecommunications infrastructure to route digital auditory data in real-time to a cloud-based phone recognition and entity identification, annotation and relevance processing which in turn sends selected relevant annotated entities to said CPA for use in interacting with user. In this example embodiment the CPA displays such annotated entities as they are received, which may or may not synchronize in real-time with said auditory stream, either as a result from automated processing (e.g. "A new calendar entry has been created for XX on YY at ZZ") or for subsequent user interaction prior to additional processing, e.g. in a conversation between two users, Bob and Paul, the CPA makes use of Bob's local address book to know the name of the other party, Paul For example, a possible conversation, and the corresponding CPA response would be:

Bob: What number should I call?

Paul: I would call 800-555-1212 and then enter conference code 12345 followed by the hash sign.

Bob: Thanks let me find a pen.

CPA: "Paul mentioned a phone number (800-555-1212); would you like me to record that number?"

1. Ignore, not relevant.
2. No, thank you.
3. Yes, as a new number for Paul.
4. Yes, as number to call.

Bob: <indication of option 4>

Bob: Paul, don't worry, I got it.

CPA: "Paul mentioned what sounded like a meeting code after the telephone number you asked to call, 12345#, would you like me to add that to the telephone number?"

1. Ignore, not relevant
2. No, thank you.
3. Yes, as a meeting code.
4. Yes, as another number.

Bob: <indication of option 3>

Bob: Paul, thanks; I got it. I will talk to you in a couple minutes.

Paul: Bob, talk to you soon.

CPA: Would you like to call telephone number 800-555-1212 meeting code 12345# now or later?

1. Ignore, not relevant
2. No, please remind me later.
3. Yes, please call now.
4. Yes, let's schedule it.

Bob: <indication of option 3>

In an alternative embodiment (AE), the CPA audio stream is monitored by a text-to-speech application, running in the background on the user's handset, that converts the audio signal to text, to create a real-time textual transcript of the conversation upon the AE can act to perform knowledge management functions. This transcript is presented to the user in a visual display similar in layout to a txt chat application such as iMessage, wherein each interchange of the conversation is presented to the viewer in a shaded message 'bubble' with the user's communications aligned along the right edge of the application window, and the remote participant's communications aligned along the left.

Pauses longer than an adjustable time threshold cause new message bubbles to be created. As the conversation pro-

ceeds, the message bubble window continuously scrolls the conversation transcript upwards.

If the user sees a information within a message bubble that the user is desirous to have knowledge management functions performed upon, the user can tap on that message bubble to cause a option-selection dialog to be presented whereby the user can choose the desired function to be performed.

The choices presented are dependent upon the content and the context of the text within the selected message bubble. Some choices may be, for example, to have the AE create a new appointment in the user's calendar app based upon the subject, date and time mentioned in the message bubble, or to check reservation availability at a restaurant based upon the mention of the restaurant's name and a date and time in the message bubble.

In another alternative embodiment (AE2), the system can be used to build and complete an information model via annotated audio stream processing. Using a speech-to-text converter in conjunction with an entity extraction and identification text processing system, a stream of words with associated annotated objects entities is emitted by capturing the speech of parties engaged in knowledge engineering an information model or completing an instance of that model.

In both instances, either a meta-information model or a specific information model, the speech-to-text-to-entities process yields objects that are defined in the model. For example, an interviewer (A) and interviewee (B) engaged in completing a information model corresponding to a police report. In this example, the interviewer (A) would be prompted with lines of inquiry about high priority entities and relationships in the model, e.g. victim, alleged perpetrator, arresting officer, et. al. as well as the relationships amongst those entities (e.g. <arresting officer> may be different from <first officer on scene>). Additionally, as entities are spoken and identified, including pronouns and other alternative indicators of said entities, the identification as well as the disambiguation of entities ("the officer" refers to which previously mentioned <officer> or spoken "he" may refer to victim, perpetrator, officer, et. al.

The information model guides the interview process to continually identify high priority lines of inquiry, disambiguation of entities, relationships, attributes and values, etc. as the interview proceeds; even with relatively long delays in processing the speech to relevant and priorities entities (e.g. several minutes), the dynamic nature of the process allows for prior subjects to be revisited when necessary.

Yet another embodiment involves the incorporation into the system of the AE a fact-checking module. The fact-checking module is a system component that, provides for an additional message-bubble-selection choice: an option to have the system automatically parse and analyze the content of the message bubble so that the system can discern distinguishable facts from the message content, and proceed to automatically search online reference materials for relevant information, and to present that information to the user. This will be particularly useful, for example, to a newspaper reporter doing a phone interview, so that the reporter can check on the factual basis of assertions being made by the interviewee, even while the interview is underway.

FIG. **1** shows an enlarged view of the portable (mobile) multifunctional device **104**. For example, if the portable multifunctional device **104** is a cellular telephone, then the portable device circuitry includes a communication link that may support protocols such as Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Enhanced Data Rates for Global Evolution (EDGE), Universal Mobile Telecommunications Service (UMTS), etc. The communication interface of the device **104** may also/alternately support Wireless Wide Area Network (WWAN), Wireless Local Area Network (WLAN), and/or Wireless Personal Area Network (WPAN), etc.

Device **104** may further include a contactless element **164**, typically implemented in the form of a semiconductor chip **164**(*a*) with an associated wireless data transfer (e.g., data transmission) element **164**(*b*), such as an antenna. Contactless element **164** is associated with (e.g., embedded within) portable device **104** and data such as a coupon or control instructions transmitted via cellular network may be applied to contactless element **164** by means of contactless element interface **166**. Contactless element interface **166** functions to permit the exchange of data and/or control instructions between the portable device circuitry **162** (and hence the cellular network) and contactless element **164**.

The contactless element may also include a Near Field Communication (NFC) module or other near field wireless reader module that allows the portable multifunctional device to communicate with a point of sale terminal (POS) at a merchant location by tapping the portable multifunctional device to a reader.

Contactless element **164** is capable of transferring and receiving data using a near field communications capability (or near field communications medium) typically in accordance with a standardized protocol or data transfer mechanism (identified as ISO 14443/NFC in the figure). Near field communications capability is a short-range communications capability, such as RFID, infra-red, or other data transfer capability that can be used to exchange data between the portable device **104** and a local apparatus by tapping the portable device to the local apparatus, for example located at point-of-sale of a merchant or another location at which coupons are expected to be redeemed. Thus, portable device **104** is capable of communicating and transferring data and/or control instructions via both cellular network and near field communications capability.

Portable device **104** may also include a secure data space **168**, which may be used by the device to store operating parameters and/or other data utilized in operation of the device. The secure data space **168** may be in the form of a chip that is separate and apart from the chip in the contactless element **164**, or alternatively, could be a section of memory in the chip that forms part of the contactless element **164**. Note that the chip in the contactless element **164** may include data storage capability in the form of a memory that may be accessed via interface **166** to permit the implementation of read, write, and erase functions, for example.

In accordance with still other embodiments, the portable device may further include a processor **170** and computer readable storage medium **172** for storing code and configured to direct the processor to perform various tasks. For example, the computer readable storage medium may comprise a magnetic disk drive or a flash memory chip. A smart phone includes an operating system such as Google Android or Apple iOS operating system.

The computer readable storage medium may contain code that is configured to cause a processor of the portable consumer device to receive and recognize a message including a coupon and code that is delivered to the portable device. The computer readable storage medium may also include code that is configured to decrypt an encrypted message including the code that is received by the portable device.

In accordance with certain embodiments, the portable device **104** further includes a Global Positioning System (GPS) element **174**. GPS element **174** is configured to allow determination of the location of the user at any time. In particular, GPS element **174** relies upon signals from a plurality of orbiting satellites in order to allow the user's location to be determined. Location information obtained from the GPS element **174** may in turn be communicated through the antenna to allow monitoring of the user's position. The GPS receiver determines a geographic location for the device by calculating a distance between the device and at least three satellites using low-power radio signals received from the satellites using a technique known as Trilateration, which is known in the art.

The portable multifunctional device includes an input interface **176** such as, for example, a touch screen, keypad (which for present purposes will be understood to include the other buttons, switches and keys referred to or may be implemented as soft keys on the display) for receiving user input, a display component for displaying output information to the user and conventional receive/transmit circuitry. Other suitable input interfaces include a light pen, track ball, data glove, microphone, etc. The portable multifunctional device also includes an input/output interface that may include a keypad, a mouse, a screen, a touch screen, and/or any other type of interface that allows a user of the device to interact with the device.

FIG. **2** is an illustration of basic subsystems in a client or server computer system workstation usable to implement cloud based computing. In FIG. **2**, subsystems are represented by blocks such as central processor **180**, non-transitory system memory **181** consisting of random access memory (RAM) and/or read-only memory (ROM), display adapter **182**, monitor **183**, etc. The subsystems are interconnected via a system bus **184**. Additional subsystems such as a printer, keyboard, fixed disk and others are shown. Peripherals and input/output (I/O) devices can be connected to the computer system by, for example serial port **185**. For example, serial port **185** can be used to connect the computer system to a modem for connection to a network or serial port **185** can be used to interface with a mouse input device. The interconnection via system bus **184** allows central processor **180** to communicate with each subsystem and to control the execution of instructions from system memory **181** or fixed disk **186**, and the exchange of information between subsystems.

Other arrangements of subsystems and interconnections are possible.

Some example embodiments are implemented as program code embodied in a non-transitory computer readable storage medium. The program code is executed by one or more processors to perform the steps described above.

Various example embodiments have been described above. Alternatives and substitutions will now be apparent to persons of skill in the art. For example, embodiments using cellular phone applications are described, however, the principles described herein can be applied to other types of application being executed on mobile devices. Accordingly, it is not intended to limit the invention except as provided by the appended claims.

What is claimed is:

1. A telecommunication system comprising:

one or more processors; and

a computer readable memory storing program code which, when executed by the one or more processors, causes the one or more processors to at least:

after a communication is established by a first electronic communication device and a second electronic communication device, receive, at the telecommunication system, from the first electronic communication device, digital auditory data corresponding to an ongoing conversation between a first person using the first electronic communication device and the second person using a second electronic communication device, the conversation including a plurality of words spoken by the first person and the second person during the ongoing conversation;

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communication device, process the digital auditory data to identify mention of specific entities including one or more of telephone numbers, email addresses, dates, times, locations and proper names, the processing of the digital auditory data including:

identifying high priority of the specific entities;

facilitating disambiguation of the identified high priority specific entities;

identifying an utterance of a first entity in the plurality of words, and determining one or more actions possible to perform with respect to the identified first entity, the one or more actions determined based on context and relevance of the identified first entity with respect to the plurality of words of the conversation;

annotate the identified first entity to create an annotated entity with text listing the one or more actions possible to perform with respect to the identified first entity; and

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communication device, cause a display device of the first electronic communication device to display the annotated entity such that the first electronic communication device,

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communication device, obtains, via an input device of the first electronic communication device, a user interaction from the first person, the user interaction is associated with a selection of an action included in the displayed annotated entity; and

responsive to the user interaction, perform the selected action with respect to the identified entity.

2. The telecommunication system of claim **1**,

which includes a cloud-based phone recognition and entity identification, annotation and relevance processing system.

3. The telecommunication system of claim **1**,

which includes a speech-to-text converter.

4. The telecommunication system of claim **3**, where the program code, when executed, further causes the one or more processors to:

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communication device, cause the display device of the first electronic communication device to display blocks of converted text on the display device, such that the first electronic communication device:

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communi-

cation device, processes user interaction with the input device to select a block of converted text; and

while the conversation is ongoing between the first person using the first electronic communication device and the second person using the second electronic communication device, processes only the selected block of converted text.

5. The telecommunication system of claim **4**, where the program code, when executed, further causes the one or more processors to cause the display device of the first electronic communication device to display the blocks of converted text on the display device, such that the first electronic communication device:

facilitates parsing the selected block of converted text to distinguish facts from message content;

facilitates searching online reference material for information related to a distinguished fact; and

facilitates displaying, via the display device, the information.

6. A telecommunication system comprising:

one or more processors; and

a computer readable memory, coupled to the one or more processors, storing program code which, when executed by the one or more processors, causes the one or more processors to at least:

after a communication is established by a first electronic communication device and a second electronic communication device, receive, at the telecommunication system, from the first electronic communication device, digital auditory data corresponding to an ongoing conversation between a first party using the first electronic communication device and a second party using the second electronic communication device during an interview, wherein the conversation includes a plurality of words spoken by the first party and the second party, and wherein the first party is an interviewer and the second party is an interviewee;

while the conversation is ongoing between the first party using the first electronic communication device and the second party using the second electronic communication device, cause a display device of the first electronic communication device to display initial prompts to the interviewer with initial lines of inquiry about high priority entities and relationships in an information model;

while the conversation is ongoing between the first party using the first electronic communication device and the second party using the second electronic communication device, process the digital auditory data to identify mention of high priority entities and relationships spoken by the first party and the second party during the interview, the processing of the digital auditory data including:

identifying an utterance of a first entity in the plurality of words, determining subsequent lines of inquiry with respect to the identified first entity, and causing the display device to display subsequent prompts to the interviewer to facilitate disambiguation of identified high priority entities,

the subsequent lines of inquiry based on context and relevance of the identified first entity with respect to the plurality of words of the conversation; and

while the conversation is ongoing between the first party using the first electronic communication device and the second party using the second electronic communication device,

cause the display device of the first electronic communication device to display subsequent prompts to the interviewer with the subsequent lines of inquiry with respect to the identified first entity.

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