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Maestas

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(54) **AI ASSISTANT FOR INTERACTING WITH CUSTOMERS ACROSS MULTIPLE COMMUNICATION MODES**

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H04M 3/51 (2006.01)
H04L 12/58 (2006.01)
H04M 3/42 (2006.01)

(52) **U.S. Cl.**
CPC ***H04M 3/5141*** (2013.01); ***H04L 51/36*** (2013.01); ***H04M 3/5175*** (2013.01); ***H04M 3/5183*** (2013.01); *H04M 3/42221* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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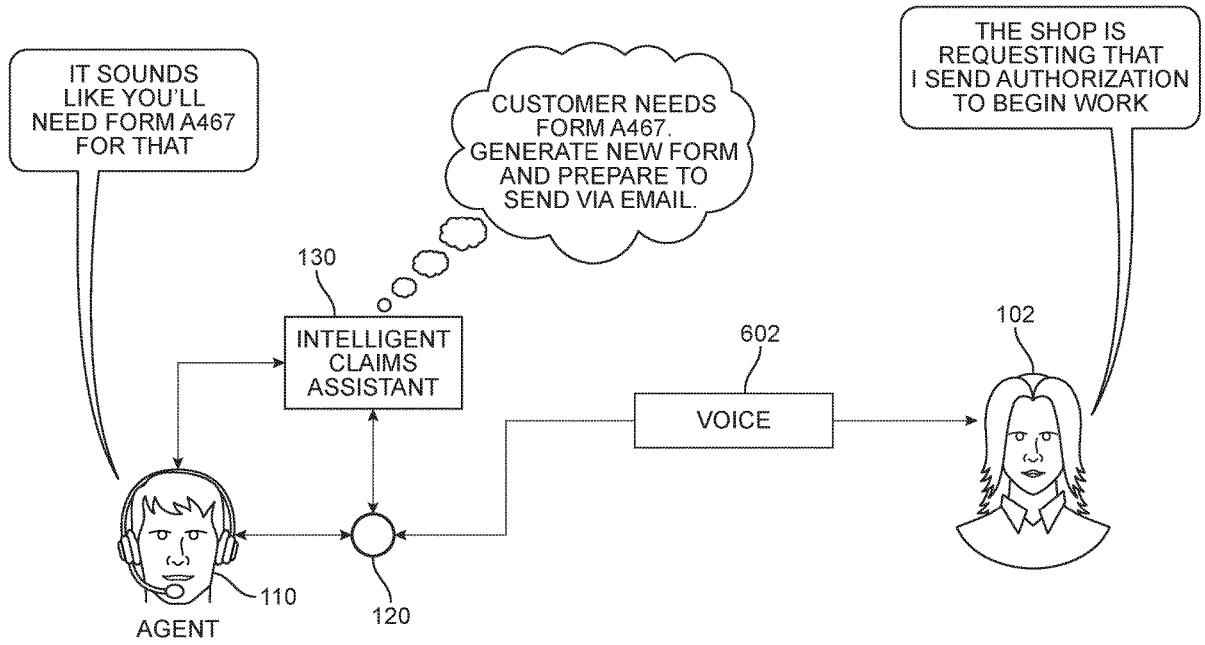
(57) **ABSTRACT**

A system and method for assisting with interactions between agents and customers using an artificially intelligent assistant is disclosed. The artificially intelligent assistant monitors interactions between agents and customers and identifies assistive actions to be taken that increase efficiency of the interaction as well as customer satisfaction. The artificially intelligent agent can also identify new communication modes appropriate for assistive actions, allowing agents to seamlessly communicate with customers over a wide range of different communication modes, such as phone calls, texts, emails and other messaging applications.

22 Claims, 9 Drawing Sheets



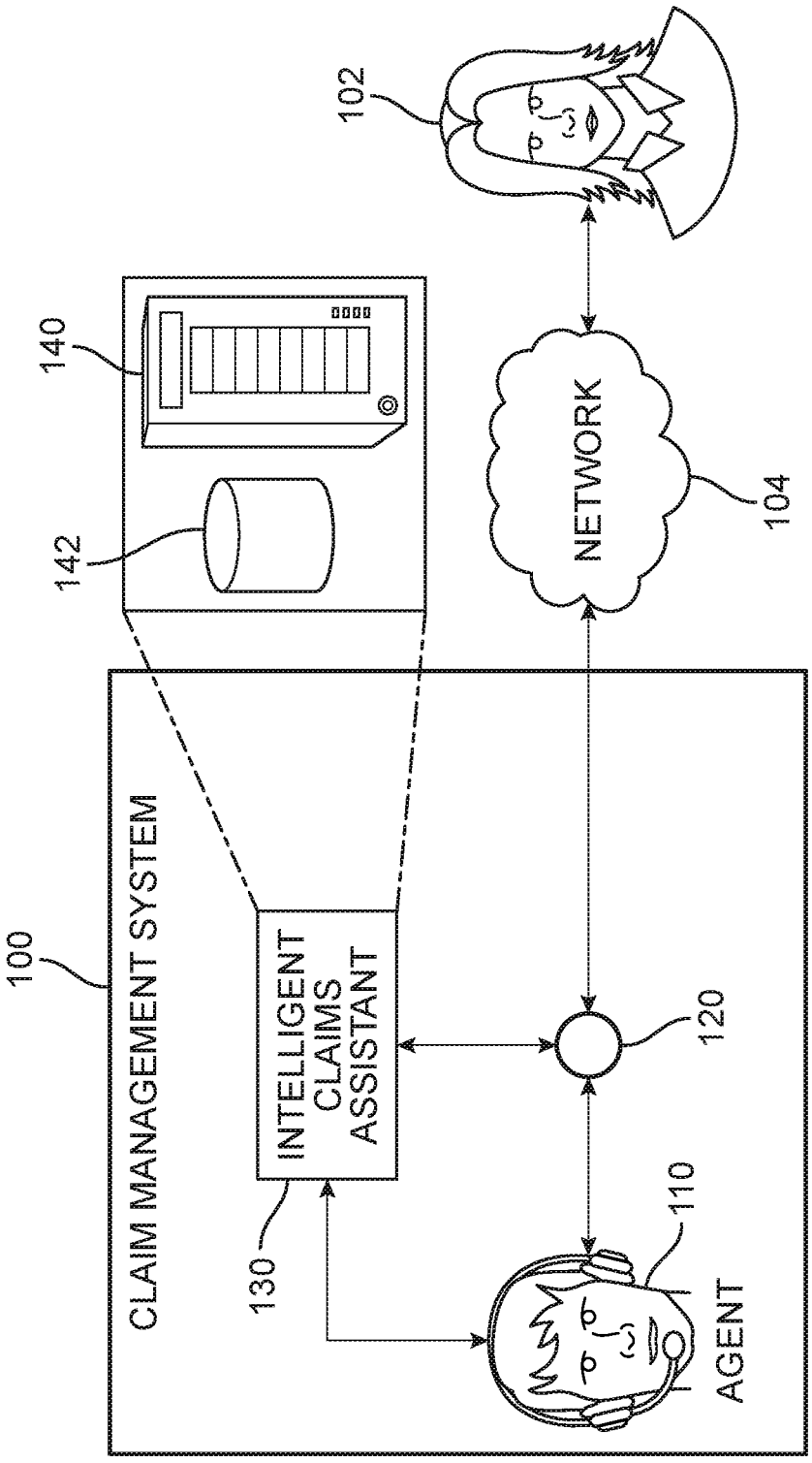

102
140
142
NETWORK
104
100
CLAIM MANAGEMENT SYSTEM
INTELLIGENT CLAIMS ASSISTANT
130
120
110
AGENT

FIG. 1

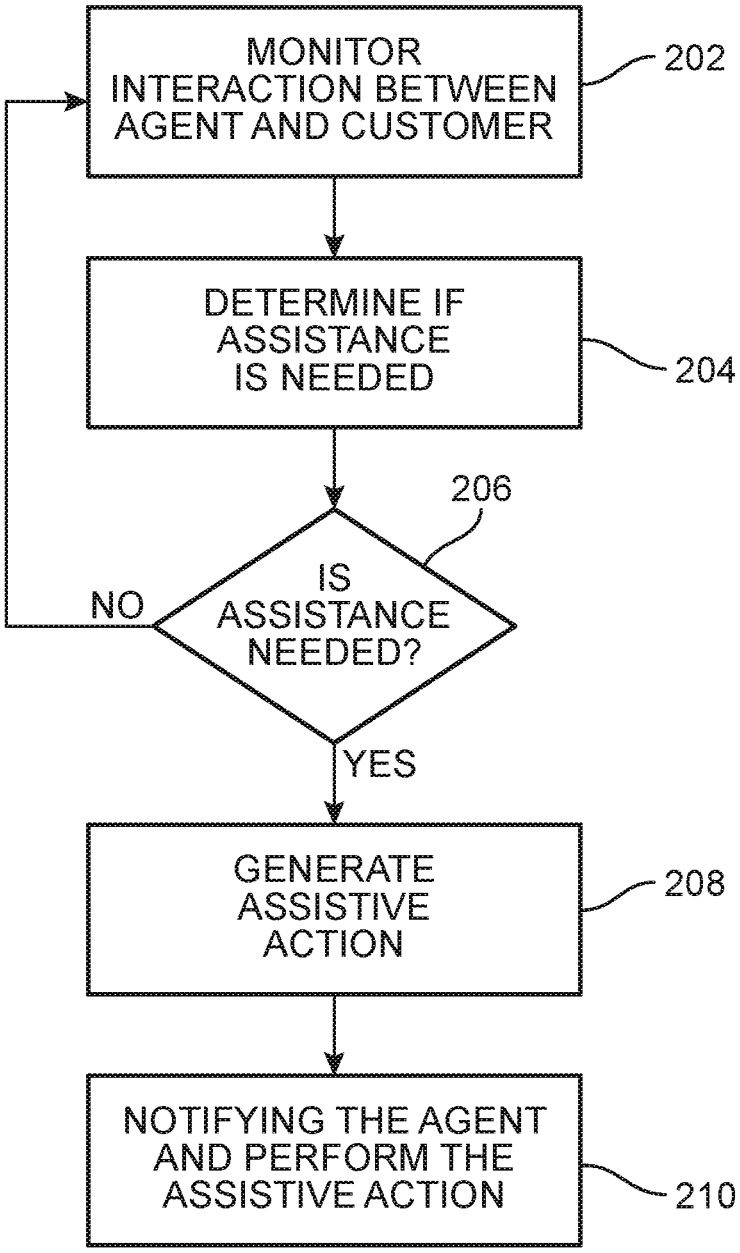

MONITOR INTERACTION BETWEEN AGENT AND CUSTOMER
202
DETERMINE IF ASSISTANCE IS NEEDED
204
206
IS ASSISTANCE NEEDED?
NO
YES
GENERATE ASSISTIVE ACTION
208
NOTIFYING THE AGENT AND PERFORM THE ASSISTIVE ACTION
210

FIG. 2

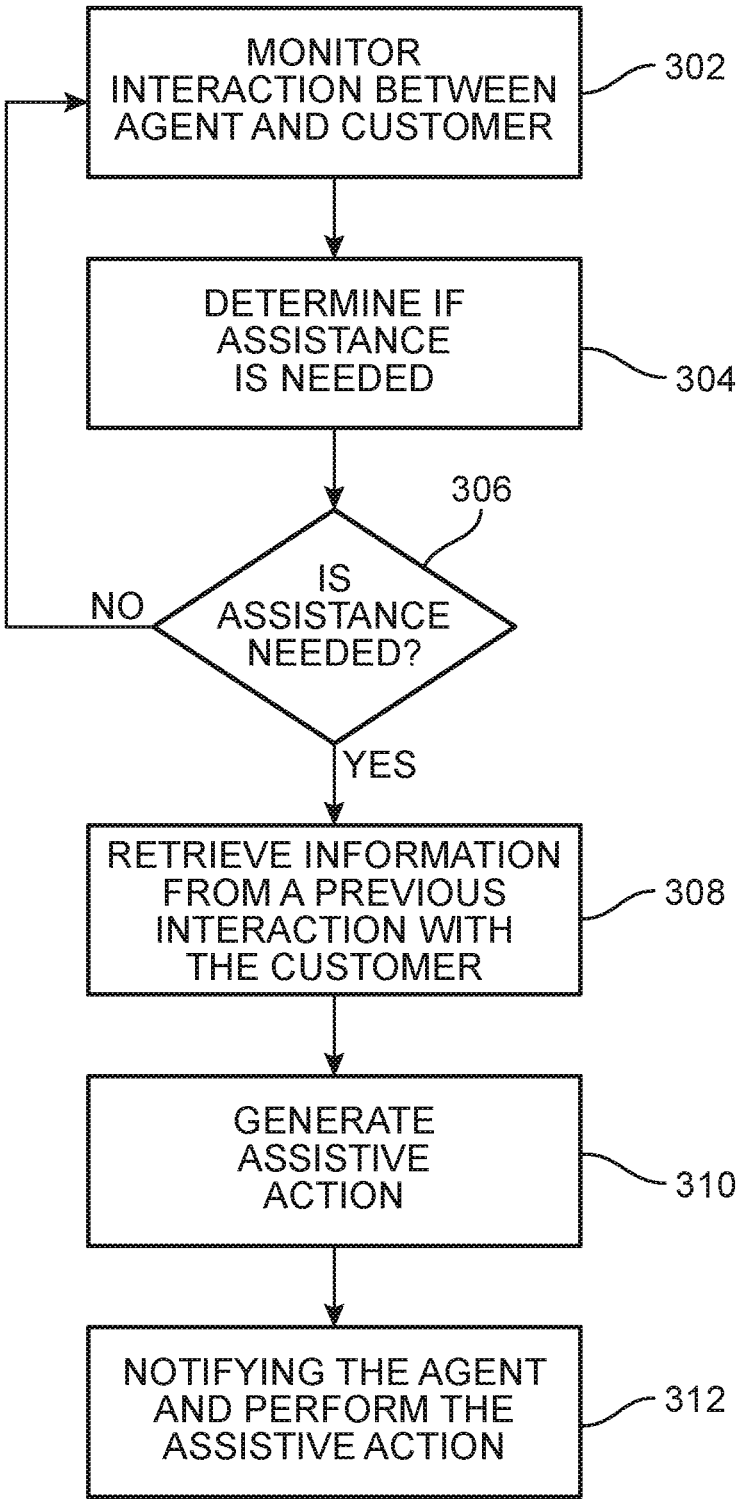

MONITOR INTERACTION BETWEEN AGENT AND CUSTOMER
302
DETERMINE IF ASSISTANCE IS NEEDED
304
306
IS ASSISTANCE NEEDED?
NO
YES
RETRIEVE INFORMATION FROM A PREVIOUS INTERACTION WITH THE CUSTOMER
308
GENERATE ASSISTIVE ACTION
310
NOTIFYING THE AGENT AND PERFORM THE ASSISTIVE ACTION
312

FIG. 3

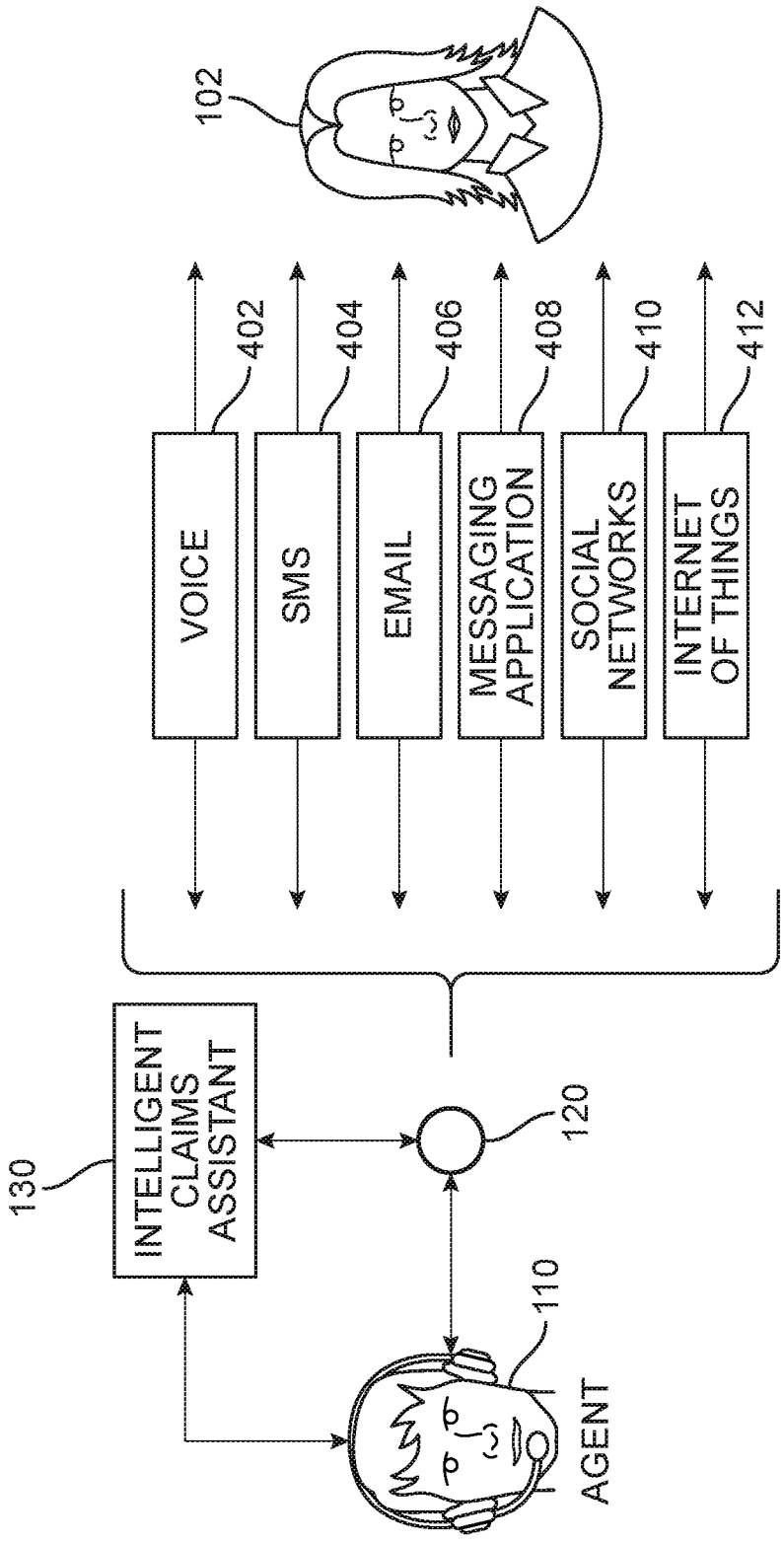

102
VOICE
SMS
EMAIL
MESSAGING APPLICATION
SOCIAL NETWORKS
INTERNET OF THINGS
402
404
406
408
410
412
INTELLIGENT CLAIMS ASSISTANT
130
120
110
AGENT

FIG. 4

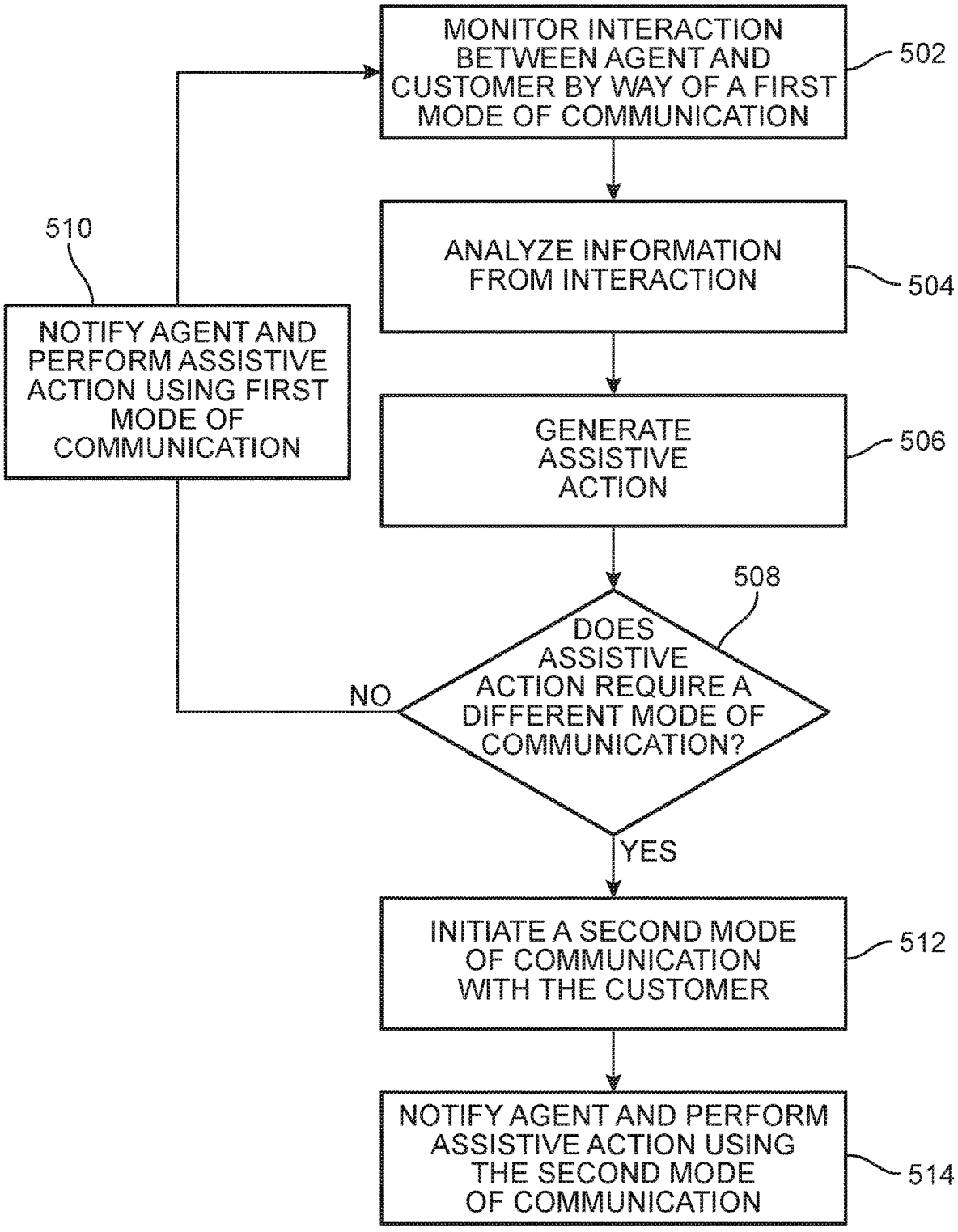

MONITOR INTERACTION BETWEEN AGENT AND CUSTOMER BY WAY OF A FIRST MODE OF COMMUNICATION
502
ANALYZE INFORMATION FROM INTERACTION
504
GENERATE ASSISTIVE ACTION
506
508
DOES ASSISTIVE ACTION REQUIRE A DIFFERENT MODE OF COMMUNICATION?
NO
YES
510
NOTIFY AGENT AND PERFORM ASSISTIVE ACTION USING FIRST MODE OF COMMUNICATION
INITIATE A SECOND MODE OF COMMUNICATION WITH THE CUSTOMER
512
NOTIFY AGENT AND PERFORM ASSISTIVE ACTION USING THE SECOND MODE OF COMMUNICATION
514

FIG. 5

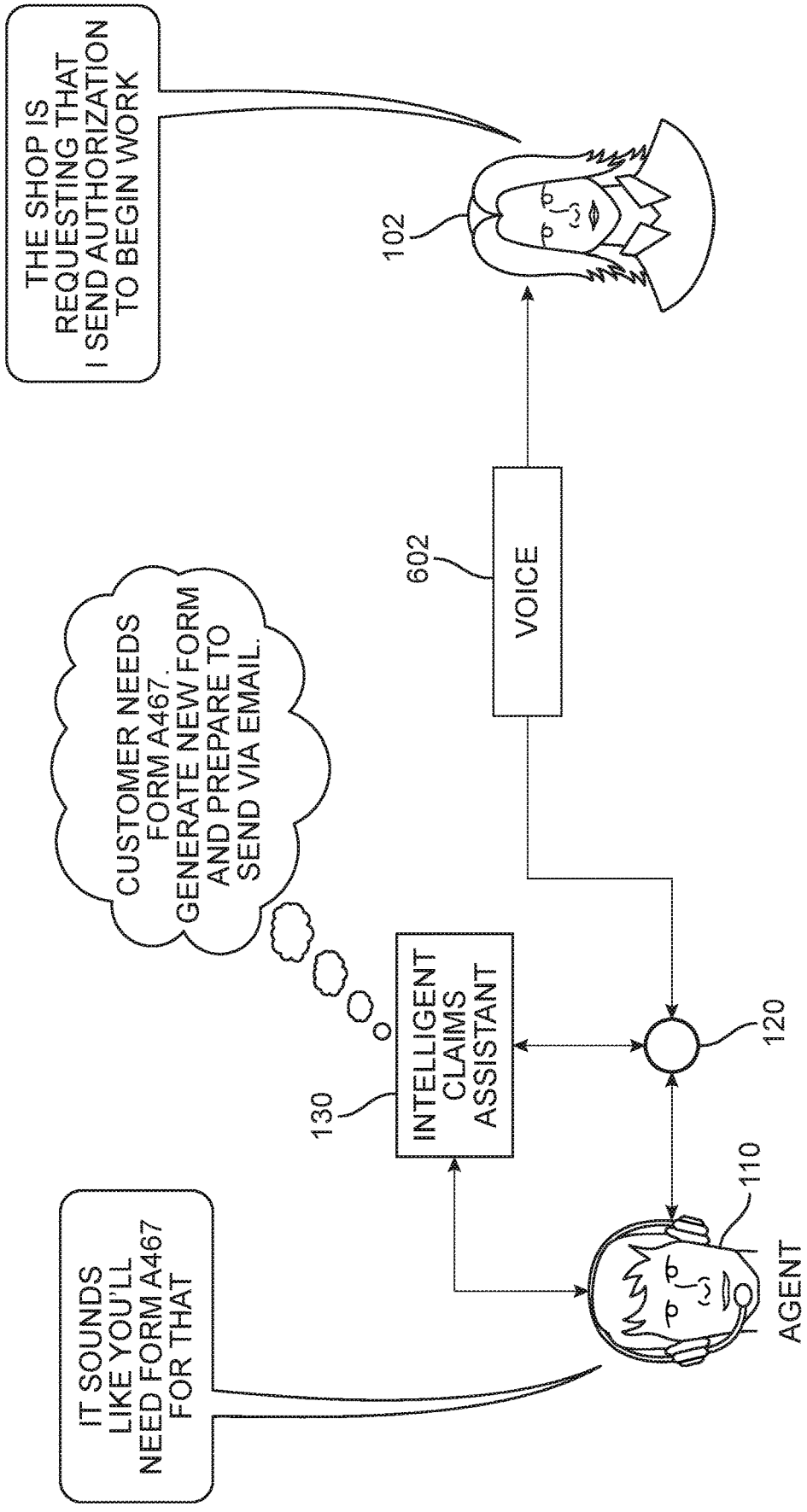

THE SHOP IS REQUESTING THAT I SEND AUTHORIZATION TO BEGIN WORK
102
602
VOICE
CUSTOMER NEEDS FORM A467. GENERATE NEW FORM AND PREPARE TO SEND VIA EMAIL.
130
INTELLIGENT CLAIMS ASSISTANT
120
110
AGENT
IT SOUNDS LIKE YOU'LL NEED FORM A467 FOR THAT

FIG. 6

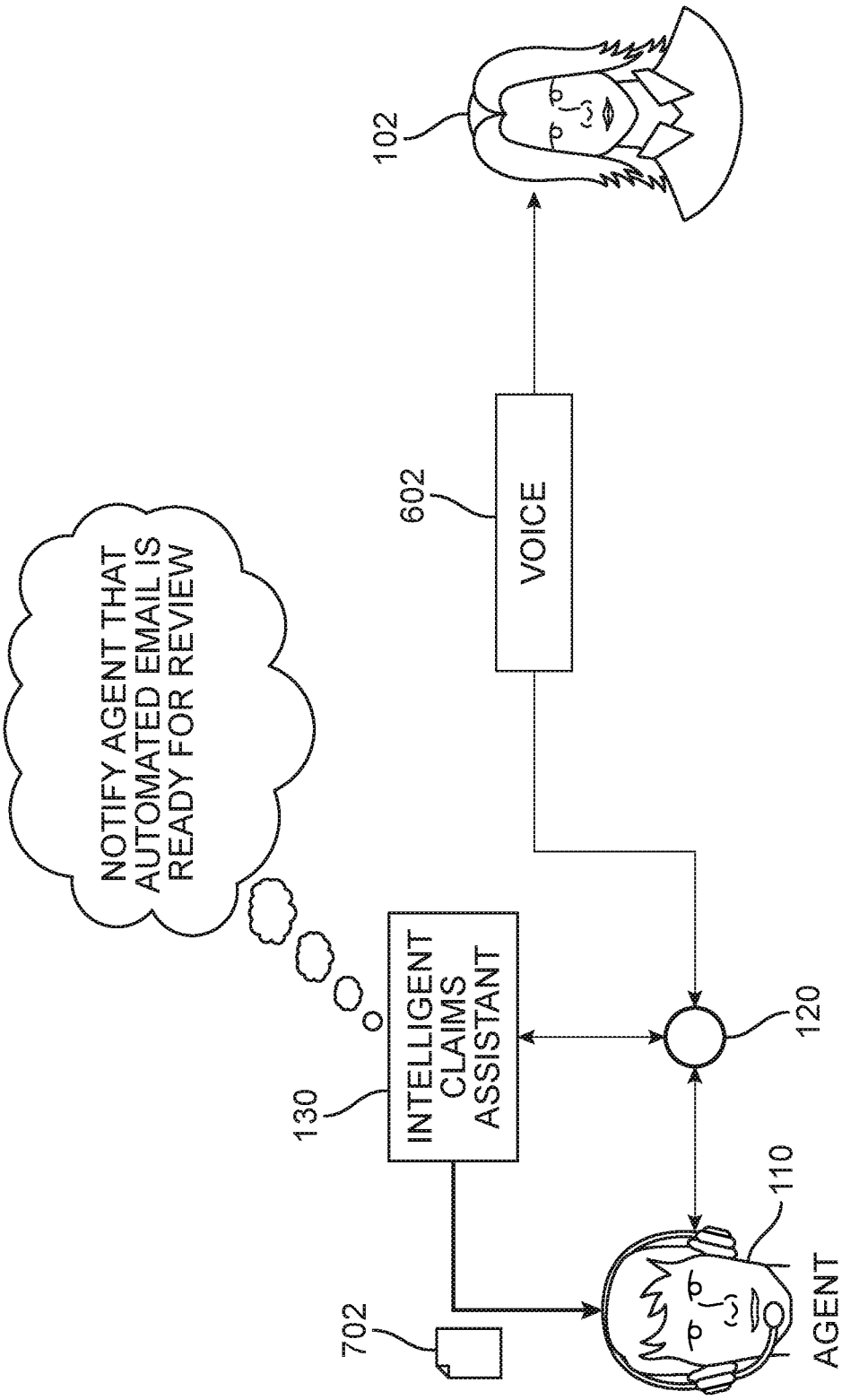

102
602
VOICE
NOTIFY AGENT THAT AUTOMATED EMAIL IS READY FOR REVIEW
130
INTELLIGENT CLAIMS ASSISTANT
120
110
AGENT
702

FIG. 7

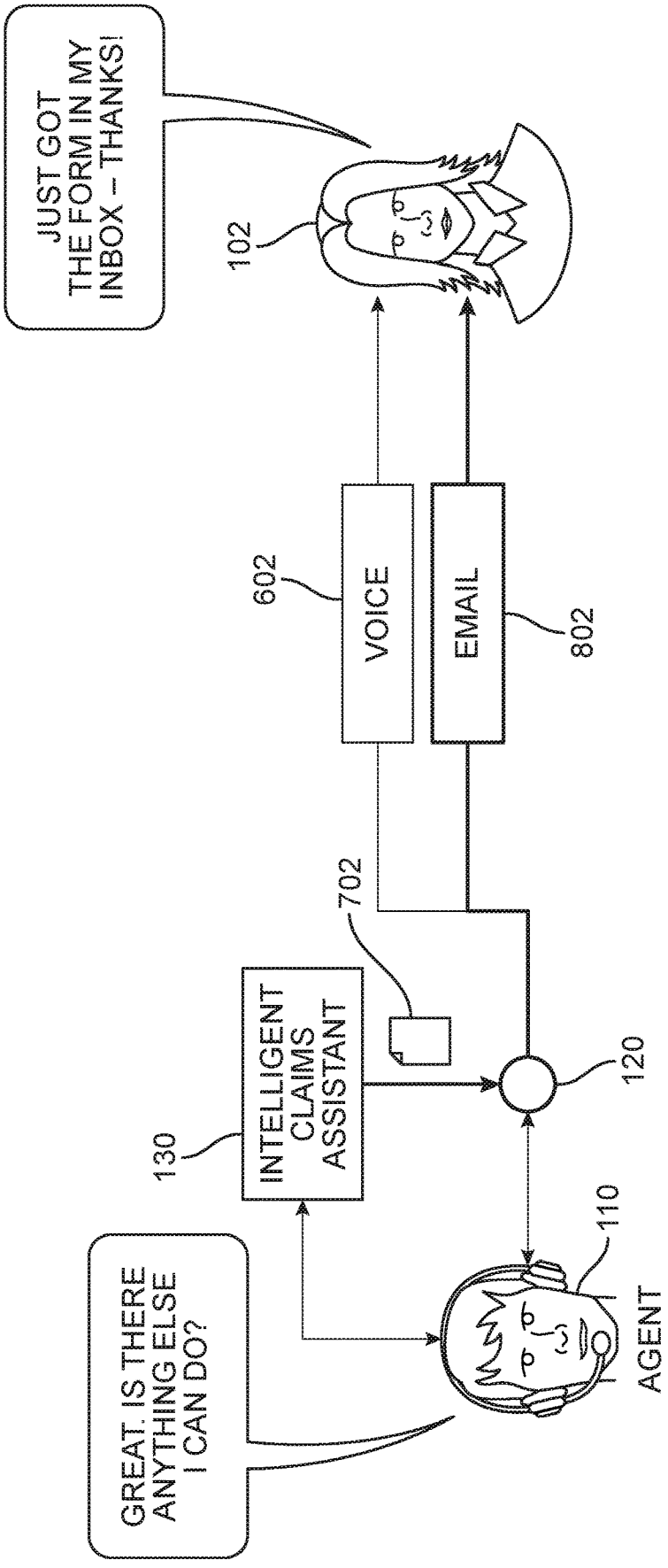

JUST GOT THE FORM IN MY INBOX – THANKS!
102
602
VOICE
EMAIL
802
702
INTELLIGENT CLAIMS ASSISTANT
130
120
110
AGENT
GREAT. IS THERE ANYTHING ELSE I CAN DO?

FIG. 8

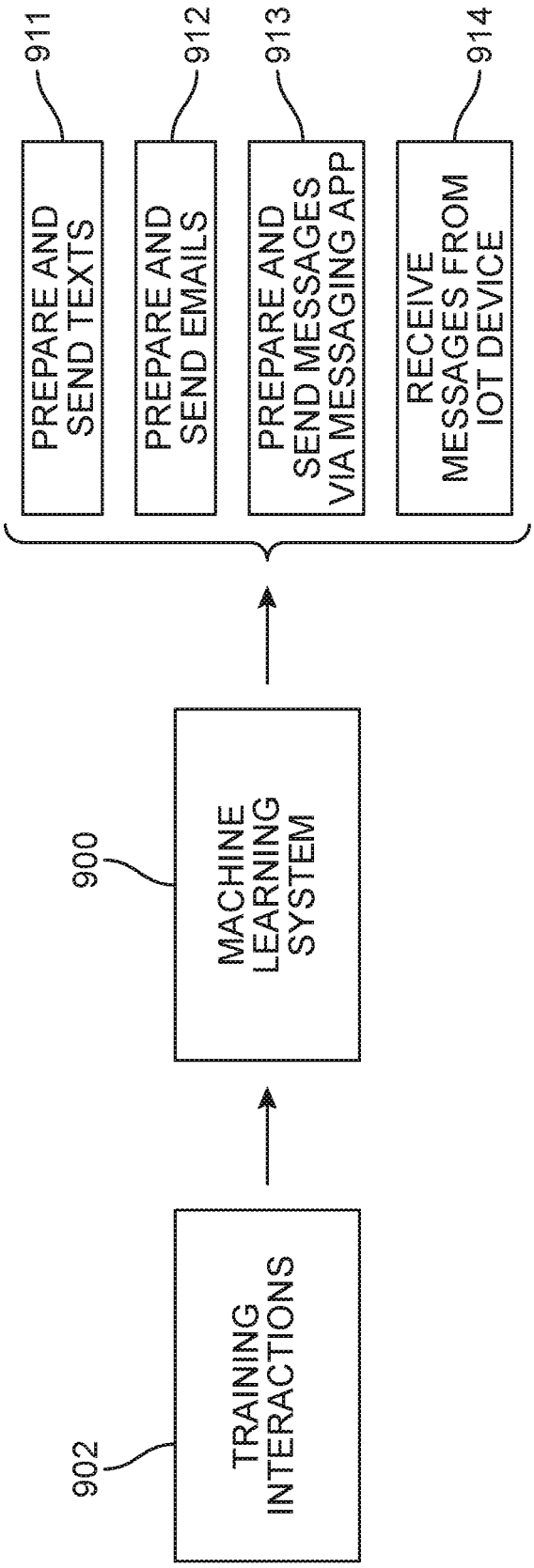

902
TRAINING INTERACTIONS
900
MACHINE LEARNING SYSTEM
911
PREPARE AND SEND TEXTS
912
PREPARE AND SEND EMAILS
913
PREPARE AND SEND MESSAGES VIA MESSAGING APP
914
RECEIVE MESSAGES FROM IOT DEVICE

FIG. 9

AI ASSISTANT FOR INTERACTING WITH CUSTOMERS ACROSS MULTIPLE COMMUNICATION MODES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Provisional Patent Application No. 62/741,752, filed Oct. 5, 2018, and title "AI Assistant for Interacting with Customers Across Multiple Communication Modes", which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

The present disclosure generally relates to a system and method for improving customer interactions, and in particular to an artificial intelligence assistant that can assist an agent in communicating with a customer over multiple different communication modes.

BACKGROUND

Customers often interact with one or more agents of a company to meet a desired need or goal. Customers can interact with sales agents to learn about and purchase one or more services or products. Customers may interact with agents to obtain answers to questions. In the field of insurance, customers may interact with agents as part of an insurance claim process. Moreover, different interactions may take place over different kinds of communication modes. Interactions can occur over the phone, by email or by text, for example.

Agents may use tools to facilitate customer interactions. Some of these tools may be provided as part of a customer relationship management (CMR) software package. However, CMR software and related tools are often customized for a particular task or communication mode. An agent may need to manually initiate one set of processes for interactions that take place over the phone, and another set of processes for interactions that take place through a chat-based service.

In addition, each customer interaction is treated as an individual event with little to no context. For each new interaction, access to information about previous interactions with the customer may be limited or completely unavailable. This may result in a sense of discontinuity and frustration for a customer who may need to re-explain something to different agents at different times, and may also prevent the company from observing a larger context within which customer information, including preferences and other trends, may be visible.

There is a need in the art for a system and method that addresses the shortcomings discussed above.

SUMMARY

In one aspect, a method of assisting an agent in interacting with a customer over multiple communication modes, the assistance being performed by an artificially intelligent assistant, includes the steps of monitoring the interaction between the agent and the customer, where the interaction occurs by a first communication mode. The method also includes analyzing information related to the interaction and generating an assistive action, the assistive action requiring the use of a second communication mode that is different than the first communication mode. The method also includes performing the assistive action, where part of performing the assistive action includes establishing communication with the customer through the second communication mode.

In another aspect, a method of assisting an agent in an interaction with a customer, the assistance being performed by an artificially intelligent assistant, includes the steps of monitoring the interaction between the agent and the customer and analyzing information related to the interaction and generating an assistive action. The method also includes notifying the agent about the assistive action and performing the assistive action.

In another aspect, a method of assisting an agent in an interaction with a customer, the assistance being performed by an artificially intelligent assistant, includes the steps of retrieving a first set of information about a previous interaction with the customer, monitoring a current customer interaction with an agent and extracting a second set of information related to the current customer interaction and analyzing the first set of information and a second set of information and generating an assistive action. The method also includes notifying the agent about the assistive action and performing the assistive action.

Other systems, methods, features, and advantages of the disclosure will be, or will become, apparent to one of ordinary skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description and this summary, be within the scope of the disclosure, and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like reference numerals designate corresponding parts throughout the different views.

FIG. **1** is a schematic view of an embodiment of a claim management system for interacting with a customer;

FIG. **2** is a schematic view of a process for assisting an agent in an interaction with a customer, according to an embodiment;

FIG. **3** is a schematic view of a process for assisting an agent in an interaction with a customer, according to another embodiment;

FIG. **4** is a schematic view of components of a claim management system and multiple communication modes between the claim management system and a customer, according to an embodiment;

FIG. **5** is a schematic view of a process for assisting an agent in an interaction with a customer, where the process includes selecting another communication mode, according to an embodiment;

FIGS. **6-8** are schematics view of steps in a process for assisting an agent by monitoring a phone call between the agent and a customer, and automatically generating an email to be sent to the customer, according to an embodiment; and

FIG. **9** is a schematic view of a machine learning system that can be trained to identify an appropriate communication mode for interacting with a customer, according to an embodiment.

DESCRIPTION OF EMBODIMENTS

The embodiments provide a system and method for assisting agents with customer interactions and/or for assis-

tant agents in working through customer driven processes such as insurance claim processes. In particular, the embodiments provide an artificially intelligent (AI) assistant that can monitor interactions between agents and customers, identify potential assistive actions that can help the agent with one or more tasks, and perform one or more actions. The AI assistant can reduce the response time required for an agent to complete a task during a customer interaction and thereby improve customer satisfaction. The AI assistant achieves this by leveraging information across different communication modes (and at different times) to provide agents with additional context and suggestions for further actions to meet identified customer goals. The AI assistant can also reduce response time and improve customer satisfaction by identifying times when an agent needs to communicate with a customer through a different communication mode and initiating actions to open and disseminate information to the customer through the different communication mode. Moreover, because the AI assistant may use information from previous interactions and/or other contextual information that is not immediately available to an agent during an interaction, the AI assistant can anticipate actions that an agent might otherwise not consider.

As used herein, the terms "artificial intelligence" and "machine learning" may be used to describe a variety of techniques in which an algorithm can learn to improve its performance on a task (for example, classifying images into different categories). The embodiments can make use of any known methods and systems in artificial intelligence and/or machine learning.

The following embodiments provide systems and methods for assisting with interactions between an agent and a customer. Though the embodiments depict these systems and methods in the specific context of processing insurance claims, it may be appreciated that these systems and methods can be applied to various other contexts as well. These other contexts include, but are not limited to: banking and financial services, consumer products, call centers, as well as other business sectors.

The term "agent" as used herein, refers to any representative of a company that provides products or services. For example, in the context of a company providing insurance, an agent could be an insurance agent, a claims adjuster or any other employee or contractor of the company. Agents could be human agents or virtual agents. In some cases, a company may employ a mix of human and virtual agents, each type of agent being devoted to different sets of tasks. The term "customer" as used herein, refers to any beneficiary of services (or products) from a company. It may be appreciated that any principles described below for assisting with interactions between an agent and a customer could also be applied to interactions between agents and third party vendors.

FIG. **1** is a schematic view of an embodiment of a claim management system **100** that facilitates interactions about insurance claims with a customer **102** over a network **104**. Claim management system **100** further includes an agent **110**. In this embodiment, agent **110** is a human agent. Agent **110** may communicate with customer **102** to help prepare a new insurance claim, answer questions about an existing claim or perform other tasks related to the insurance claim process. Although FIG. **1** depicts a single agent **110**, it may be appreciated that in other embodiments multiple agents may be involved in managing one or more insurance claims.

As discussed in further detail below, network **104** can comprise two or more different kinds of networks capable of facilitating communication over two more different kinds of communication modes. Communication modes may be routed through a communications gateway **120** (or portal) that provides the functionality for initiating, controlling and closing one or more communication modes between agent **110** and customer **102**. Communications gateway **120** can be made accessible to agent **110** and/or other systems or services associated with claim management system **100**.

Claim management system **100** may also include an intelligent claims assistant **130** (also referred to as simply "assistant **130**"). Intelligent claims assistant **130** may be an artificially intelligent (AI) assistant that can respond to actions by an agent and/or a customer. Assistant **130** may be a virtual assistant that runs on a computer system. The term "computer system" refers to the computing resources of a single computer, the partial computing resources of a single computer, a plurality of computers communicating with one another, or a network of remote servers. In an exemplary embodiment, assistant **130** runs on at least one server.

Assistant **130** may receive information from various sources, perform various kinds of analyses and/or store data. In the embodiment of FIG. **1**, assistant **130** comprises software running one or more computing devices **140** (for example, a server) that may be in communication with one or more databases **142**. Databases **142** could be co-located with computing device **140** or could be remote databases that are accessible by computing device **140** over a network. Databases **142** can include any kind of storage devices, including but not limited magnetic, optical, magneto-optical, and/or memory, including volatile memory and non-volatile memory.

Intelligent claims assistant **130** may send information to, and receive information from, communications gateway **120**. Additionally, intelligent claims assistant **130** can communicate directly with agent **110**, bypassing communications gateway **120**. For example, intelligent claims assistant **130** can send alerts and other messages to devices (for example, computers, tablets and cell phones) used by agent **110**. In one embodiment, assistant **130** could communicate with an agent **110** using a chat application, even as the agent **110** is communicating with customer **102**.

FIG. **2** is a schematic view of a process for providing assistance to an agent, where the assistance is provided within the context of an interaction between the agent and a customer. In one embodiment, the steps depicted in FIG. **2** may be performed by an AI assistant, for example, intelligent claims assistant **130**. In other embodiments, one or more steps could be accomplished by another system or entity, for example, an agent.

In step **202**, assistant **130** may monitor a current interaction between an agent and a customer. For example, in the present embodiment assistant **130** has access to communications passing through communications gateway **120**, as shown in FIG. **1**. Communication of various forms (for example, audible information and/or text-based information) between an agent and a customer may be received as inputs to assistant **130** for further processing. In some cases, information from the interaction could not only be analyzed in real-time, but could also be stored for future analysis. For example, information from an interaction could be stored in a database (for example, databases **142**) for later retrieval by assistant **130** or an associated system.

In some cases, the step of monitoring the interaction may further include steps of filtering or otherwise pre-processing the information to prepare the information for further analysis in later steps. In other cases, the step of monitoring the

interaction may only include receiving raw communications data (for example, raw audio data, raw ASCII data, as well as other kinds of data).

Next, in step **204**, assistant **130** may analyze the information gathered during step **202** to determine if assistance is needed. This step could include various kinds of analyses known in the art for processing spoken words or text to identify context and meaning. In addition to analyzing the content of the conversation between an agent and a customer, assistant **130** may also identify customer sentiment (for example, using sentiment analysis techniques known in machine learning), vocal patterns and other information that may provide further context for deciding when and what kind of assistance to provide. By understanding the context and meaning of various parts of the interaction, assistant **130** can try to identify potential needs of the customer or agent that may be fully or partially met by actions that assistant **130** can take.

During the interaction, assistant **130** may also retrieve customer records to provide still further context. For example, if the conversation is regarding an insurance claim, assistant **130** may pull information about any insurance policies linked to the customer. This information may be used to decide the type of assistance that would be most useful for the customer.

The embodiments can make use of any techniques already known in the field of natural language processing (NLP). These include any techniques in speech recognition and natural language understanding. As an example, methods for training an AI to identify appropriate responses to natural language inputs are known and may utilize advances in the field of deep learning. For example, AIs may incorporate long short-term memory (LTSM) recurrent neural networks for learning to identify important content within natural language data.

Using NLP techniques, an artificially intelligent assistant can be trained to identify points in an ongoing interaction where assistance may be useful, and to select the appropriate type of assistance. In some cases, an assistant can be further trained to select appropriate communication modes for accomplishing a given task, as discussed in further detail below. As a specific example, an AI assistant can be trained to output one of a set of possible assistive actions in response to given inputs (for example, inputs in the form of interaction information between an agent and customer). The output could be provided by a neural network or any other kind of machine learning model or collection of models.

If assistant **130** determines that assistance is not needed at step **206**, assistant **130** returns to step **202** to further monitor the interaction. If, during step **206**, assistant **130** determines that assistance is needed, assistant **130** proceeds to step **208**. At step **208**, assistant **130** may notify the agent that assistant **130** of a potential assistive action, and in some cases, may perform the action after receiving confirmation from the agent. In some embodiments, notifying the agent could be optional and assistant **130** may perform assistive actions immediately and autonomously without any input from the agent. In other embodiments, assistant **130** may only notify the agent of a suggested assistive action, and may leave it to the agent to perform the action. For example, an assistant could prepare a draft email message with information requested by a customer and place the draft email in the agent's draft email folder, so that the agent can send the letter themselves at a later time.

An interaction between an agent and a customer may be ongoing and is not limited to a particular duration or single communication session. As an example, customers and agents may communicate throughout the duration of vehicle repairs at a repair facility. Often, agents do not receive regular updates from the repair facility. Meanwhile, customer's may talk with the repair facility and pass along information they learn as notes in an online claim tracking system. An AI assistant could monitor the tracking system for these notes. When new notes appear, the AI assistant could retrieve the information and pass it along to the responsible agent by way of an email along with a reminder to take action. This process could greatly improve the efficiency of the claim process as information is being delivered to the agents overseeing the claims immediately, rather than waiting for agents to manually check for information at irregular intervals.

FIG. **3** is a process for providing assistance to an agent, according to another embodiment. The process depicted in FIG. **3** may include steps that are similar to the steps of the process show in FIG. **2**.

In step **302** and step **304**, assistant **130** may monitor an interaction and determine if assistance is needed as in step **202** and step **204** of the process depicted in FIG. **2**. If no assistance is needed at step **306**, assistant **130** may return to step **302** to continue monitoring the interaction. If assistance is needed, assistant **130** proceeds from step **306** to step **308**.

At step **308**, assistant **130** may retrieve information from a previous interaction with the customer. The previous interaction could be any interaction that takes place at an earlier time. Moreover, the previous interaction could be an earlier interaction with the same agent (for example, agent **110**), or with a different agent. Furthermore, the previous interaction could have occurred on the same type of communication mode or on a different type of communication mode.

Information from a previous interaction could include any kind of information including, but not limited to: personal information about the customer, financial information about the customer, information related to an insurance claim, information related to one or more of the customer's insurance policies, information about an insured item (for example, electronics, jewelry, automobiles, other kinds of vehicles, as well as houses and other kinds of property), transcripts of a portion or all of a previous interaction, third party information (for example, information about a body shop the customer has used to repair a vehicle), as well as possibly other kinds of information.

Information can be stored and/or retrieved from one or more databases (for example, database **142**) associated with assistant **130** and/or claim management system **100**. Assistant **130** can retrieve all information from previous interactions involving a customer, or assistant **130** may target particular kinds of information for retrieval based on the type of assistance that may be needed.

In step **310**, assistant **130** can analyze information from the current interaction (monitored in step **302**) and the previous interaction (retrieved in step **308**) to generate an assistive action.

Assistant **130** can also make use of general patterns and trends determined by analysis of previous interactions. These patterns and trends, once identified by assistant **130**, could be stored for later use and/or updating. As one example in the context of claim processing, assistant **130** could identify patterns in a customer's tendency to use a particular body shop (over other available options) for getting their vehicle fixed after accidents. During an insurance claim process, assistant **130** could alert agent **110** to this tendency so the agent can ensure the customer gets his or her car fixed at their preferred body shop. As another

example, analyzing trends in data retrieved over multiple customers, an assistant could determine that customers above a particular age (say, 40 years old) prefer using their own shops for vehicle repairs while younger customers prefer agents to simply tell them where to take their cars. Based on this general information, an assistant could provide suggestions to an agent about which shop the customer is likely to prefer, based on his or her age.

In step **312**, assistant **130** could notify the agent of the proposed assistive action and/or perform the assistive action as in step **208** of the process depicted in FIG. **2**.

FIG. **4** is a schematic view depicting various possible communication modes between a claim management system and a customer, according to an embodiment. As used herein, the term "communication mode" refers to a particular form of communication, such as audio based communication (i.e, a phone call), video based communication (i.e., a video call), and various modes of text based communication, as well as other modes of analog or digital communication. It may be appreciated that different modes of communication require different kinds of information to be transmitted, which may be associated with different kinds of data representations or data formats. Thus, the type of data (i.e., representation or format) used to transmit spoken words for a phone call will be different from the type of data used to transmit typed words via SMS messages.

Often, during an interaction with a customer, an agent may need to communicate with the customer using more than a single kind of communication mode. Conventional CMR tools are specific to a single kind of communication mode (for example, email), and so are not useful in situations where an agent must switch communication modes as part of completing a task. By contrast, the intelligent claims assistant of the present embodiments may be capable of performing assistive actions across various different communication modes.

In the embodiment shown in FIG. **4**, agent **110** may communicate with customer **102** through a voice communication mode **402** for phone calls, an SMS mode **404** for texts, an email communication mode **406** for emails, a messaging application mode **408** for application specific messaging, a social network mode **410** for posting and retrieving messages from social network sites, and an internet of things (IOT) mode **412** for sending and receiving messages from IOT connected devices (for example, smart thermostats and smart appliances). Though not listed, in some cases an agent may also communicate using a separate video mode. In some cases, voice and video modes may be integrated as a single communication mode.

To provide assistance in situations where an agent may need to communicate with a customer using two or more communication modes, an insurance claim assistant may include provisions for sending/receiving and interpreting information via various different communication modes. In the exemplary embodiment, assistant **130** may incorporate software for sending/receiving and interpreting information from any of the communication modes listed above and shown in FIG. **4**.

FIG. **5** is a schematic view of a process for assisting an agent with a customer interaction. More specifically, FIG. **5** depicts a process where an AI assistant identifies a new communication mode for interacting with a customer. In step **502**, assistant **130** monitors an interaction between an agent and a customer as in the processes of FIGS. **3-4**. In this case, the interaction occurs by way of a first communication mode. For example, the interaction may occur by way of a telephone conversation between the agent and the customer.

Next, in step **504** and step **506**, assistant **130** analyzes information from the interaction and generates an assistive action.

At step **508**, assistant **130** determines if the assistive action requires a new communication mode. If not, assistant **130** proceeds to step **510** to notify the agent and/or perform the assistive action by way of the first communication mode. If, during step **508**, assistant **130** determines that the assistive action requires a new communication mode then assistant **130** proceeds to step **512**.

At step **512**, assistant **130** initiates a second communication mode with the customer. For example, assistant **130** could compose an email or SMS text as the second communication mode. In another situation where agent **110** and customer **102** are communicating through text-based chat program (as the first communication mode), assistant **130** could initiate a phone call between agent **110** and customer **102** (as the second communication mode).

Following step **512**, at step **514**, assistant **130** may notify the agent of the proposed assistive action and/or perform the assistive action as in step **208** of the process depicted in FIG. **2**. For example, assistant **130** could send an email or text message that has been approved by agent **110**.

FIGS. **6-8** depict an example of a situation where an insurance claim assistant performs an assistive action including opening a new communication mode with a customer in response to information from the customer-agent interaction. Referring to FIG. **6**, agent **110** and customer **102** are interacting by way of a phone call (that is, a first communication mode **602**) about an ongoing insurance claim. Assistant **130** is monitoring their interaction (listening) in order to provide assistance. During the interaction customer **102** explains to agent **110** that the body shop where her vehicle is supposed to be fixed has requested authorization from the insurance company to begin work on the vehicle. In response, agent **110** mentions that the customer will need to provide the body shop with a particular form authorizing work. At this point, assistant **130**, which has been monitoring the phone conversation, identifies a potential assistive action that can be taken to improve the efficiency of interaction (that is, reduce response time for the agent to complete a task) and the customer's satisfaction level. Specifically, assistant **130** identifies the customer's need for a particular form, and further determines that it can take actions to pre-fill the form and prepare an email for sending the form to the customer. As part of this process, assistant **130** identifies the need to initiate a second communication mode (an email mode) with the customer.

In FIG. **7**, assistant **130** submits a draft email **702** to agent **110**, attaching the pre-filled form. In addition to sending the email for review (or populating the agent's inbox with an email draft), assistant **130** may also provide a separate notification to agent **110**. This notification could include a pop-up notification on a computer or other device that agent **110** is using while talking to customer **102**.

In FIG. **8**, following approval from agent **110**, assistant **130** may automatically send email **702**, including the attached form that the customer needs, to customer **102**. That is, agent **110** initiates an email communication mode (second communication mode **802**) with customer **102** and sends information to customer **102** by way of this second communication mode. In response, customer **102** acknowledges that she's received the form in her email inbox. Agent **110** then follows up to ask if there's anything else the customer needs.

In the process depicted in FIGS. **6-8**, assistant **130** provides seamless support that is invisible to the customer.

From the customer's point of view, the interaction is more efficient, as there is no waiting for the agent to find and fill out the requisite form. This may generally result in increased customer satisfaction with the insurance claim process.

An AI assistant may utilize one or more machine learning systems or models to generate assistive actions, including opening and utilizing new communication modes between an agent and a customer. As used herein, the term "machine learning system" refers to any collection of one or more machine learning algorithms. Some machine learning systems may incorporate various different kinds of algorithms, as different tasks may require different types of machine learning algorithms. Generally, a machine learning system will take input data and output one or more kinds of predicted values. The input data could take any form including image data, text data, audio data or various other kinds of data. The output predicted values could be numbers taking on discrete or continuous values. The predicted values could also be discrete classes (for example, a "damaged" class and an "undamaged" class). Numerical outputs could represent a probability that the input belongs to a various classes. Moreover, it may be appreciated that the same machine learning system can be used for training, testing and deployment, in some cases.

FIG. **9** is a schematic view of a machine learning system **900** that may be used to predict what type of new communication mode should be used to communicate information based on information from an interaction between an agent and a customer. More specifically, FIG. **9** depicts a training process for machine learning system **900**, though it may be appreciated that this same system can also be used for testing and deployment.

Referring to FIG. **9**, machine learning system **900** may be trained using training interactions **902**. Training interactions could be simulated interactions or historical interactions between agents and clients. Based on the information comprising the training interactions, machine learning system **900** outputs a likely assistive action associated with a particular communication mode. As examples, machine learning system **900** includes a first output **911**, a second output **912**, a third output **913**, and a fourth output **914**. First output **911** corresponds to an action where an assistant prepares and sends information in the form of SMS messages, or texts. Such a response may be appropriate when an agent needs to send a customer a small amount of information, such as a phone number for a body shop or a rental car company. Second output **912** corresponds to an action where an assistant prepares and sends emails. Such a response may be appropriate when an agent needs to send a large amount of information and/or needs to send forms or other files, such as pdf forms. Third output **913** corresponds to an action where an assistant prepares and sends messages via a particular messaging application. In contrast to SMS messages that are standardized, many third party companies provide proprietary messaging applications used by individuals and/or companies. Such a response may be appropriate when the assistant is aware of a customer's preference for communicating through a particular messaging application and/or if the messaging application is optimal for sending particular file types. Fourth output **914** corresponds to an action where an assistant receives information from an Internet of Things enabled device. Such a response may be appropriate when the assistant determines that an agent or customer needs information that is tracked by an IOT device in the customer's home or vehicle.

In some embodiments, various systems such as a machine learning system could be implemented on a centralized computer system. In some embodiments, a machine learning system could be provided through a cloud service.

The processes and methods of the embodiments described in this detailed description and shown in the figures can be implemented using any kind of computing system having one or more central processing units (CPUs) and/or graphics processing units (GPUs). The processes and methods of the embodiments could also be implemented using special purpose circuitry such as an application specific integrated circuit (ASIC). The processes and methods of the embodiments may also be implemented on computing systems including read only memory (ROM) and/or random access memory (RAM), which may be connected to one or more processing units. Examples of computing systems and devices include, but are not limited to: servers, cellular phones, smart phones, tablet computers, notebook computers, e-book readers, laptop or desktop computers, all-in-one computers, as well as various kinds of digital media players.

The processes and methods of the embodiments can be stored as instructions and/or data on non-transitory computer-readable media. Examples of media that can be used for storage include erasable programmable read-only memory (EPROM), electrically erasable programmable read-only memories (EEPROM), solid state drives, magnetic disks or tapes, optical disks, CD ROM disks and DVD-ROM disks.

The embodiments may utilize any kind of network for communication between separate computing systems. A network can comprise any combination of local area networks (LANs) and/or wide area networks (WANs), using both wired and wireless communication systems. A network may use various known communications technologies and/or protocols. Communication technologies can include, but are not limited to: Ethernet, 802.11, worldwide interoperability for microwave access (WiMAX), mobile broadband (such as CDMA, and LTE), digital subscriber line (DSL), cable internet access, satellite broadband, wireless ISP, fiber optic internet, as well as other wired and wireless technologies. Networking protocols used on a network may include transmission control protocol/Internet protocol (TCP/IP), multiprotocol label switching (MPLS), User Datagram Protocol (UDP), hypertext transport protocol (HTTP) and file transfer protocol (FTP) as well as other protocols.

Data exchanged over a network may be represented using technologies and/or formats including hypertext markup language (HTML), extensible markup language (XML), Atom, JavaScript Object Notation (JSON), YAML, as well as other data exchange formats. In addition, information transferred over a network can be encrypted using conventional encryption technologies such as secure sockets layer (SSL), transport layer security (TLS), and Internet Protocol security (Ipsec).

While various embodiments of the invention have been described, the description is intended to be exemplary, rather than limiting, and it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible that are within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents. Also, various modifications and changes may be made within the scope of the attached claims.

I claim:

1. A method of assisting an agent in interacting with a customer over multiple communication modes, the assistance being performed by an artificially intelligent assistant, comprising the steps of:

monitoring the interaction between the agent and the customer, the interaction occurring by a first communication mode;

analyzing information related to the interaction and generating an assistive action, the assistive action requiring the use of a second communication mode that is different than the first communication mode; and

performing the assistive action, wherein part of performing the assistive action includes establishing communication with the customer through the second communication mode;

wherein the assistive action includes automatically filling out a form based on the information related to the interaction occurring by the first communication mode;

wherein the form is automatically transmitted to the customer by the artificially intelligent assistant using the second communication mode;

the method further comprising:

analyzing information related to a plurality of interactions with the customer; and

identifying at least one pattern associated with the customer based on the information related to the plurality of interactions with the customer.

2. The method according to claim **1**, wherein the first communication mode is a phone call.

3. The method according to claim **2**, wherein the second communication mode is an email.

4. The method according to claim **2**, wherein the second communication mode is a short message service.

5. The method according to claim **2**, wherein the second communication mode is mediated by a chat application.

6. The method according to claim **1**, wherein the first communication mode is mediated by a chat application.

7. The method according to claim **6**, wherein the second communication mode is a phone call.

8. The method according to claim **6**, wherein the second communication mode is an email.

9. The method according to claim **1**, further comprising:

analyzing information related to a plurality of interactions with a plurality of customers; and

identifying at least one trend associated with the plurality of customers based on the information related to the plurality of interactions.

10. The method according to claim **1**, wherein analyzing information includes inputting the information into a machine learning model, and wherein the output of the machine learning model is used to generate the assistive action.

11. The method according to claim **1**, wherein the method includes a step of notifying the agent about the assistive action prior to performing the assistive action.

12. The method according to claim **1**, wherein the agent is a human agent.

13. A method of assisting an agent in an interaction with a customer, the assistance being performed by an artificially intelligent assistant, comprising the steps of:

analyzing information related to a plurality of interactions with the customer;

identifying at least one pattern associated with the customer based on the information related to the plurality of interactions with the customer;

retrieving a first set of information about a previous interaction with the customer from the plurality of interactions with the customer;

monitoring a current customer interaction with an agent and extracting a second set of information related to the current customer interaction;

analyzing the first set of information and the second set of information and generating an assistive action;

performing the assistive action;

wherein the current customer interaction occurs by a first communication mode;

wherein the assistive action includes automatically filling out a form based on at least one of the first set of information or the second set of information; and

wherein the form is automatically transmitted to the customer by the artificially intelligent assistant by a second communication mode that is different than the first communication mode.

14. The method according to claim **13**, wherein the previous interaction occurs between the customer and another agent.

15. The method according to claim **13**, wherein the previous interaction and the current interaction occur through different communication modes.

16. The method according to claim **15**, wherein performing the assistive action is preceded by a step of notifying the agent about the assistive action.

17. A system for assisting an agent in interacting with a customer over multiple communication modes, the system comprising:

a communication network configured to allow communication between an agent and a customer over multiple communication modes; and

an artificially intelligent assistant, wherein the artificially intelligent assistant is configured to:

monitor an interaction between the agent and the customer, the interaction occurring by a first communication mode;

analyze information related to the interaction and generate an assistive action, the assistive action requiring the use of a second communication mode that is different than the first communication mode;

perform the assistive action, wherein part of performing the assistive action includes establishing communication with the customer through the second communication mode;

wherein the assistive action includes automatically filling out a form based on the information related to the interaction occurring by the first communication mode;

wherein the form is automatically transmitted to the customer by the artificially intelligent assistant using the second communication mode;

wherein the artificially intelligent assistant is further configured to:

analyze information related to a plurality of interactions with the customer; and

identify at least one pattern associated with the customer based on the information related to the plurality of interactions with the customer.

18. The system according to claim **17**, wherein the first communication mode is a phone call and wherein the second communication mode is an email.

19. The system according to claim **17**, wherein the agent is a human agent.

20. The system according to claim **17**, wherein analyzing information includes inputting the information into a machine learning model, and wherein the output of the machine learning model is used to generate the assistive action.

21. The system according to claim **17**, wherein the artificially intelligent assistant is further configured to notify the agent about the assistive action prior to performing the assistive action.

22. The system according to claim 17, wherein the artificially intelligent assistant is further configured to:

analyze information related to a plurality of interactions with a plurality of customers; and

identify at least one trend associated with the plurality of customers based on the information related to the plurality of interactions.

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