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(54) **SYSTEM AND METHOD FOR AUTOMATED SMART NOTES USING AGENT ASSIST WITHIN A CLOUD-BASED CONTACT CENTER**

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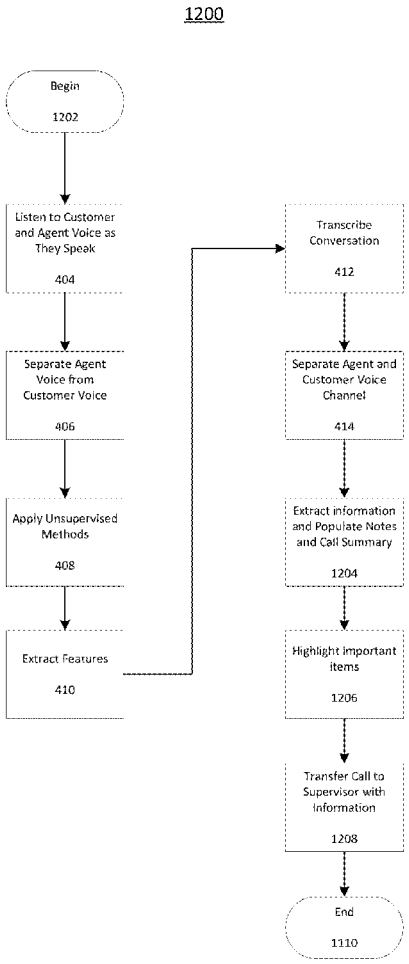
(57) **ABSTRACT**

Methods to reduce agent effort and improve customer experience quality through artificial intelligence. The Agent Assist tool provides contact centers with an innovative tool designed to reduce agent effort, improve quality and reduce costs by minimizing search and data entry tasks The Agent Assist tool is natively built and fully unified within the agent interface while keeping all data internally protected from third-party sharing.



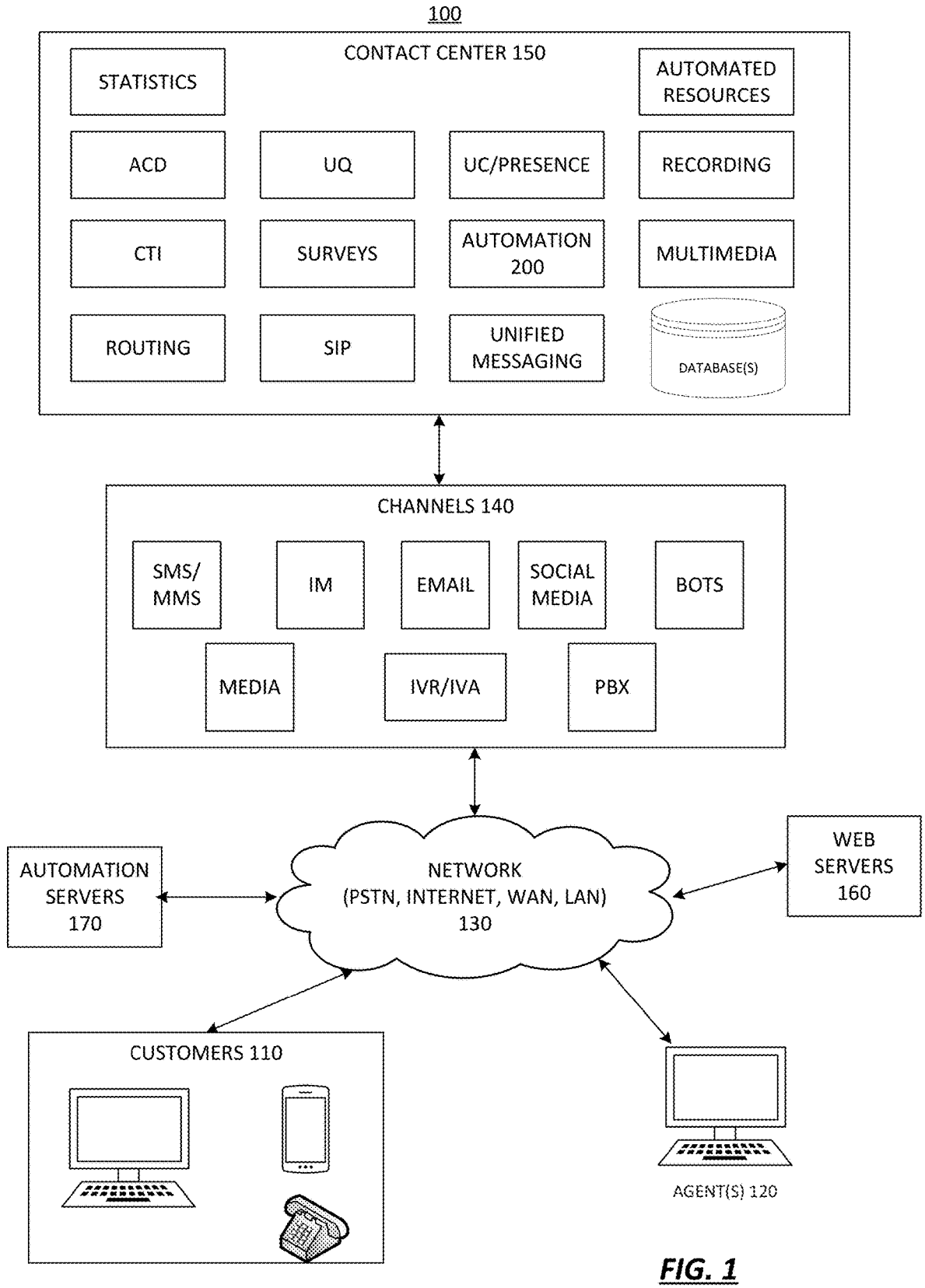

100
CONTACT CENTER 150
STATISTICS
AUTOMATED RESOURCES
ACD
UQ
UC/PRESENCE
RECORDING
CTI
SURVEYS
AUTOMATION 200
MULTIMEDIA
ROUTING
SIP
UNIFIED MESSAGING
DATABASE(S)
CHANNELS 140
SMS/ MMS
IM
EMAIL
SOCIAL MEDIA
BOTS
MEDIA
IVR/IVA
PBX
AUTOMATION SERVERS 170
NETWORK (PSTN, INTERNET, WAN, LAN) 130
WEB SERVERS 160
CUSTOMERS 110
AGENT(S) 120

FIG. 1

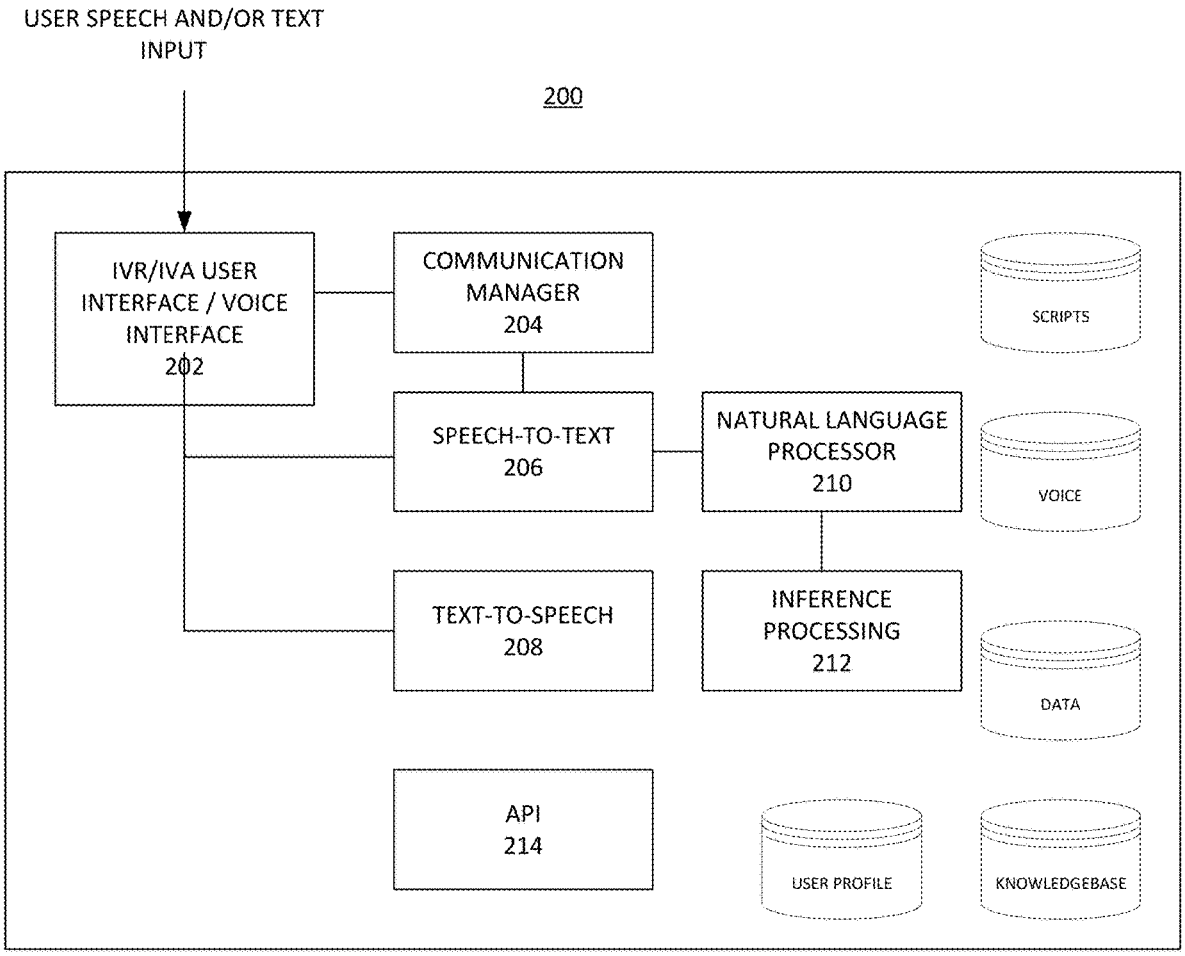

USER SPEECH AND/OR TEXT INPUT
200
IVR/IVA USER INTERFACE / VOICE INTERFACE 202
COMMUNICATION MANAGER 204
SPEECH-TO-TEXT 206
NATURAL LANGUAGE PROCESSOR 210
TEXT-TO-SPEECH 208
INFERENCE PROCESSING 212
API 214
SCRIPTS
VOICE
DATA
USER PROFILE
KNOWLEDGEBASE

FIG. 2

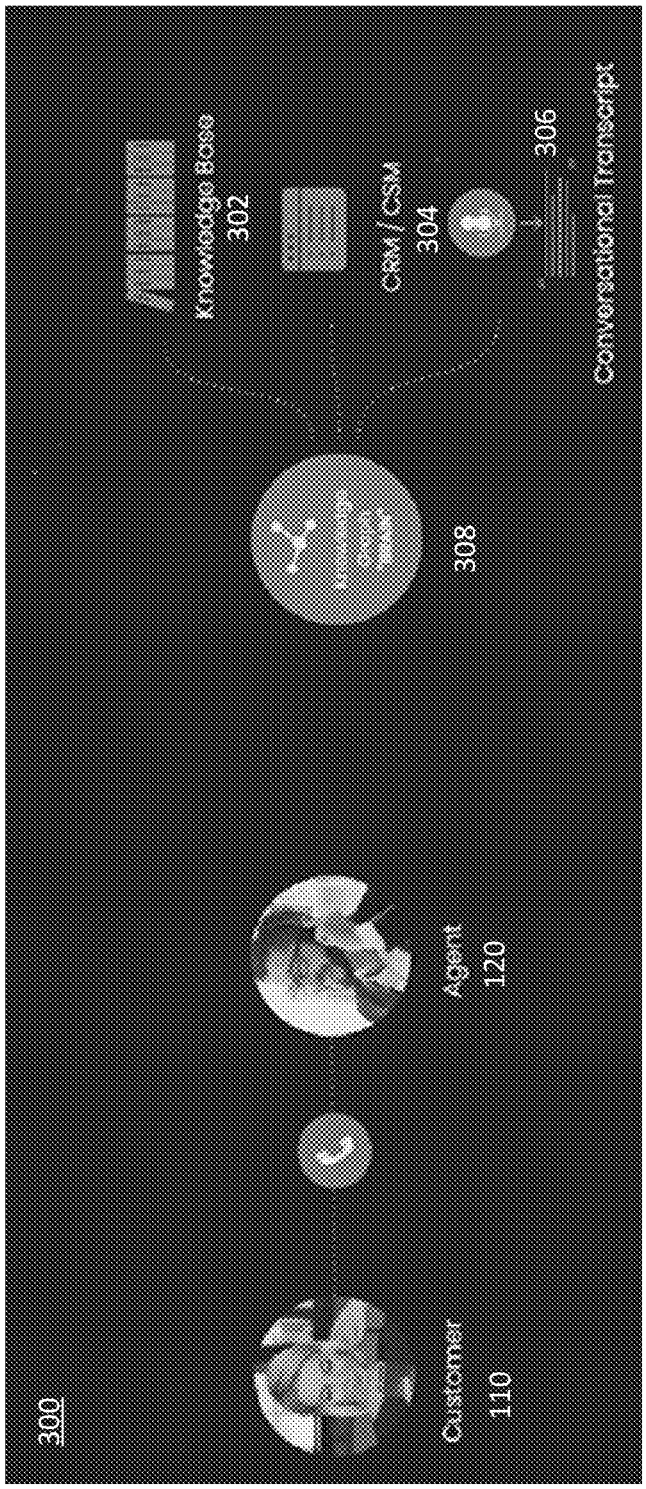

300
Customer
110
Agent
120
308
Knowledge Base
302
CRM / CSM
304
306
Conversational transcript

FIG. 3

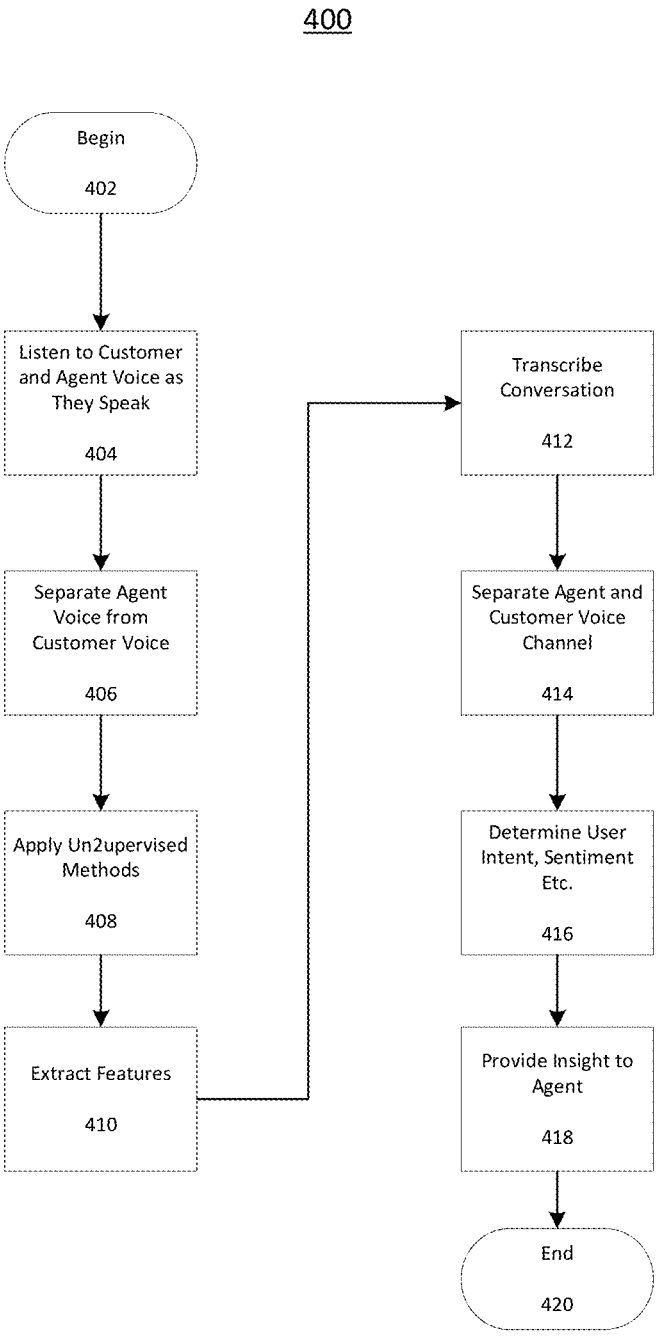

400
Begin
402
Listen to Customer and Agent Voice as They Speak
404
Separate Agent Voice from Customer Voice
406
Apply Un2upervised Methods
408
Extract Features
410
Transcribe Conversation
412
Separate Agent and Customer Voice Channel
414
Determine User Intent, Sentiment Etc.
416
Provide Insight to Agent
418
End
420

FIG. 4

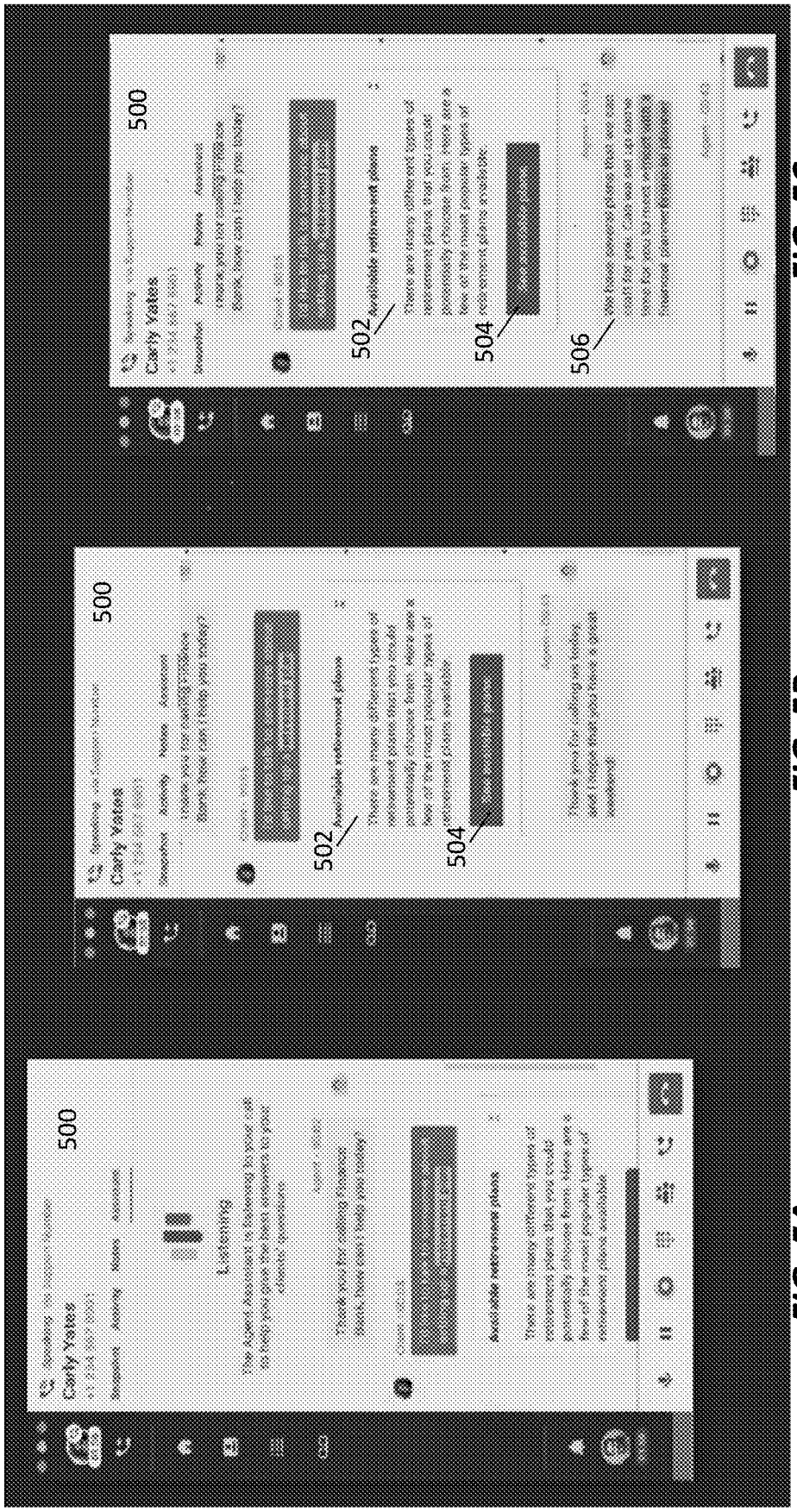


FIG. 5A

FIG. 5B

FIG. 5C

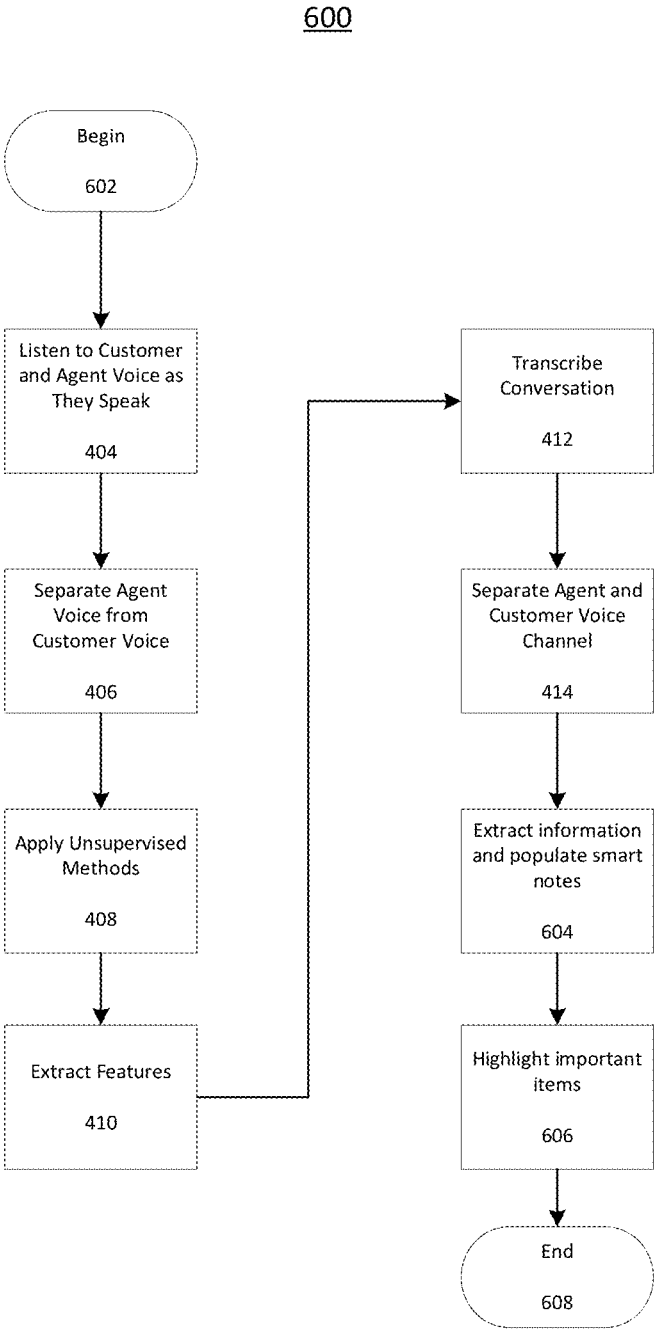

600
Begin
602
Listen to Customer and Agent Voice as They Speak
404
Separate Agent Voice from Customer Voice
406
Apply Unsupervised Methods
408
Extract Features
410
Transcribe Conversation
412
Separate Agent and Customer Voice Channel
414
Extract information and populate smart notes
604
Highlight important items
606
End
608

FIG. 6

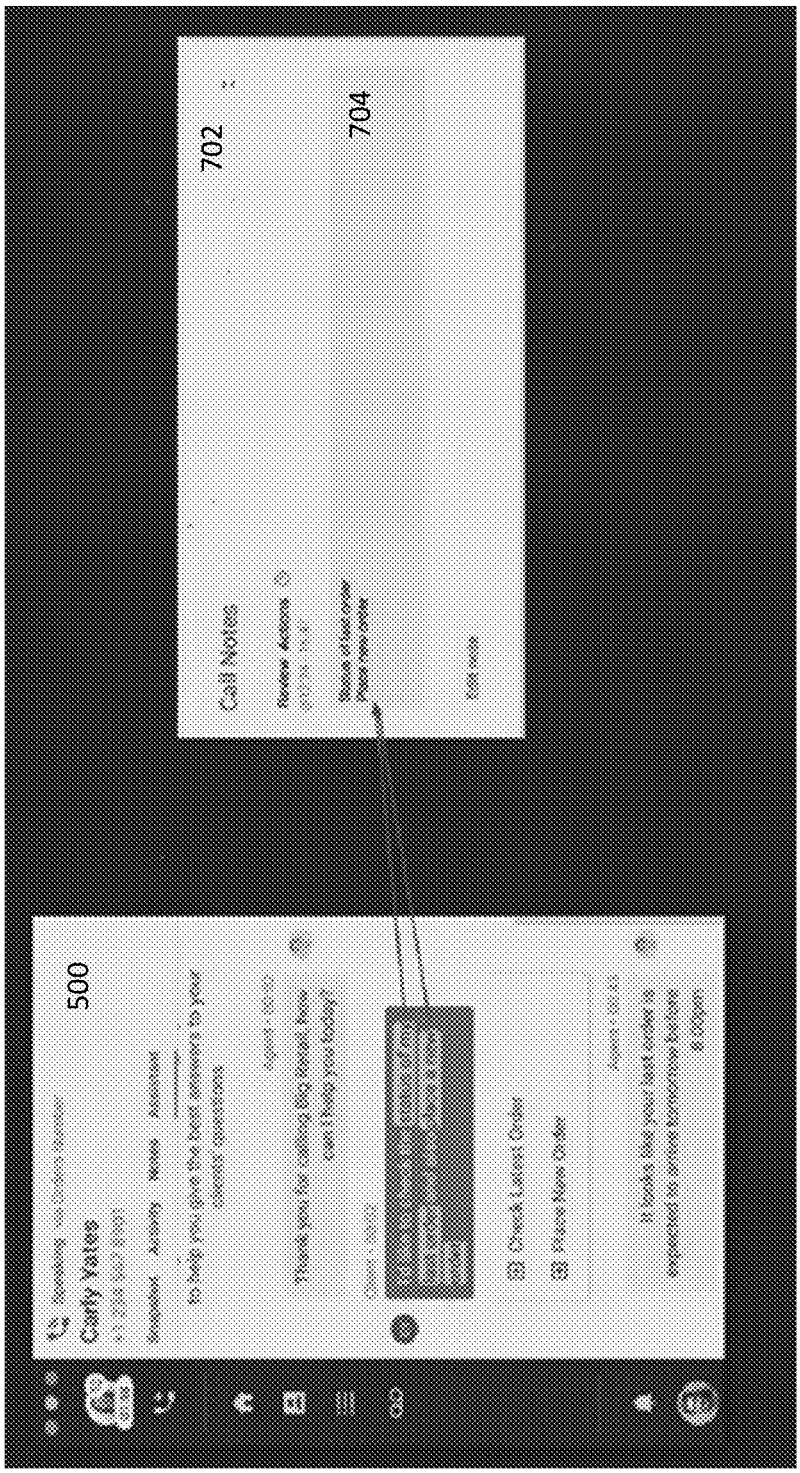


FIG. 7

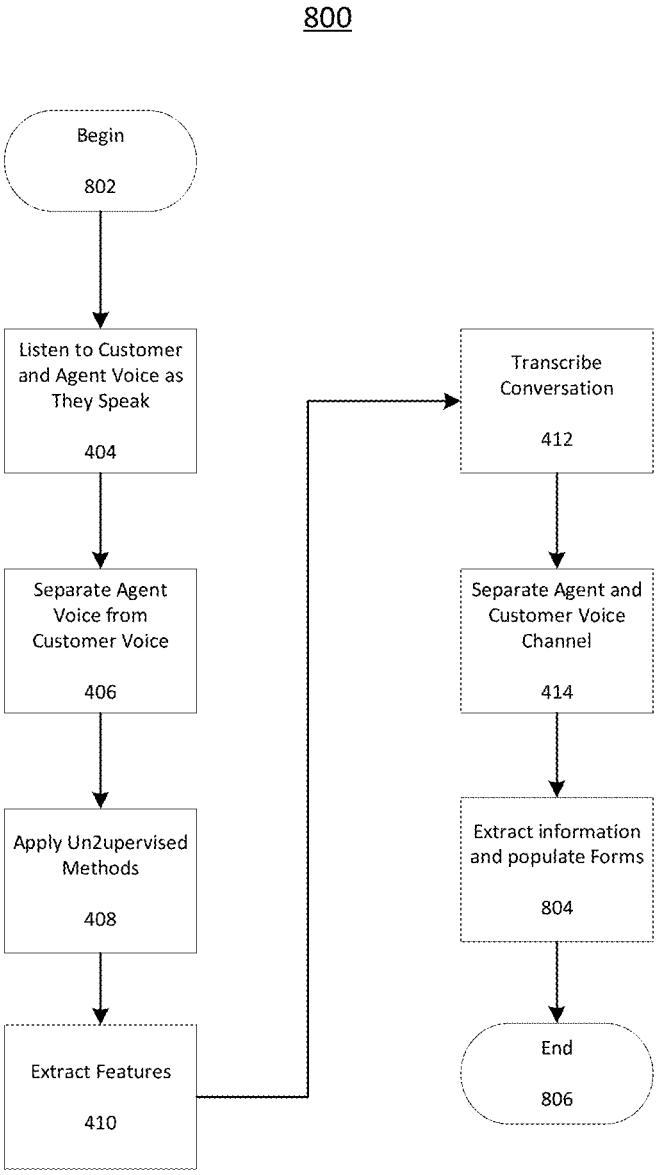

800
Begin
802
Listen to Customer and Agent Voice as They Speak
404
Separate Agent Voice from Customer Voice
406
Apply Un2upervised Methods
408
Extract Features
410
Transcribe Conversation
412
Separate Agent and Customer Voice Channel
414
Extract information and populate Forms
804
End
806

FIG. 8

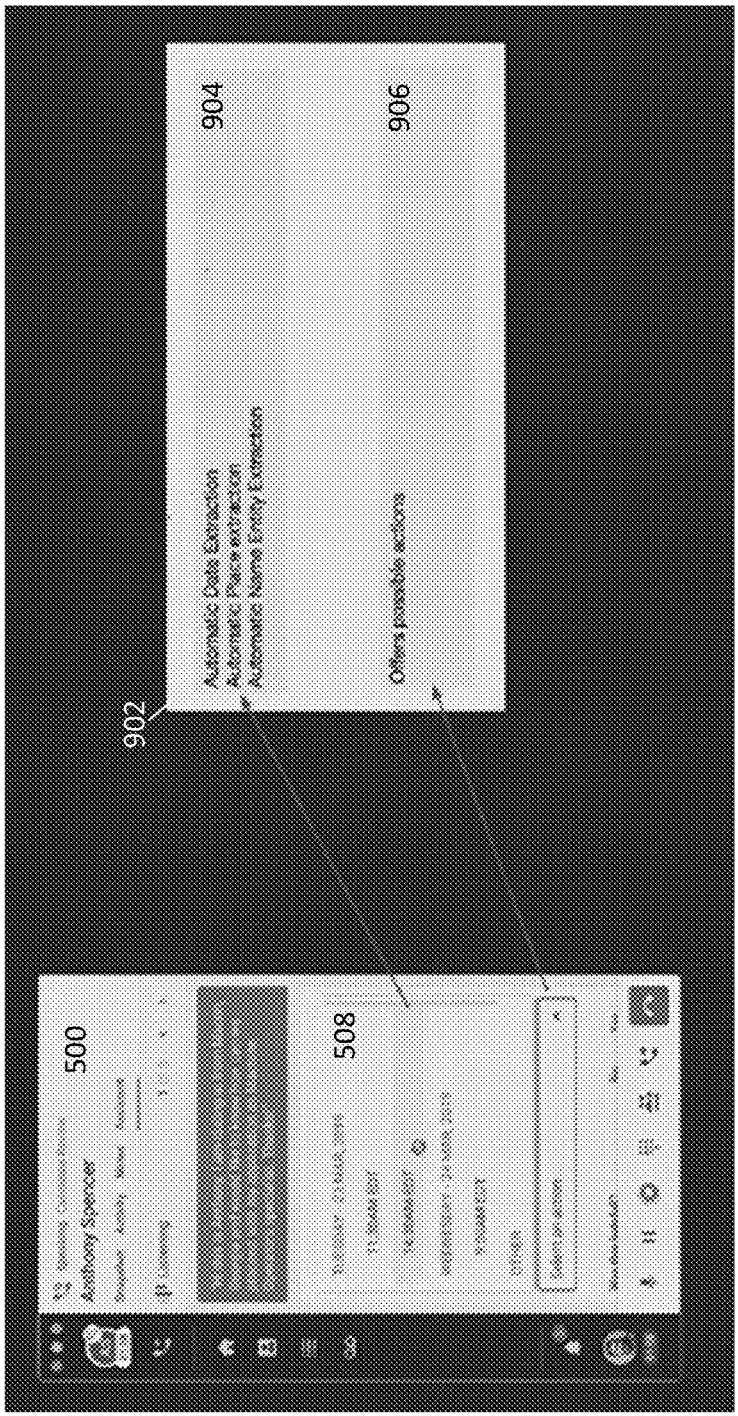

902
904
906
Automatic Data Extraction
Automatic Page segmentation
Automatic Named Entity Extraction
Offers possible actions
500
508

FIG. 9

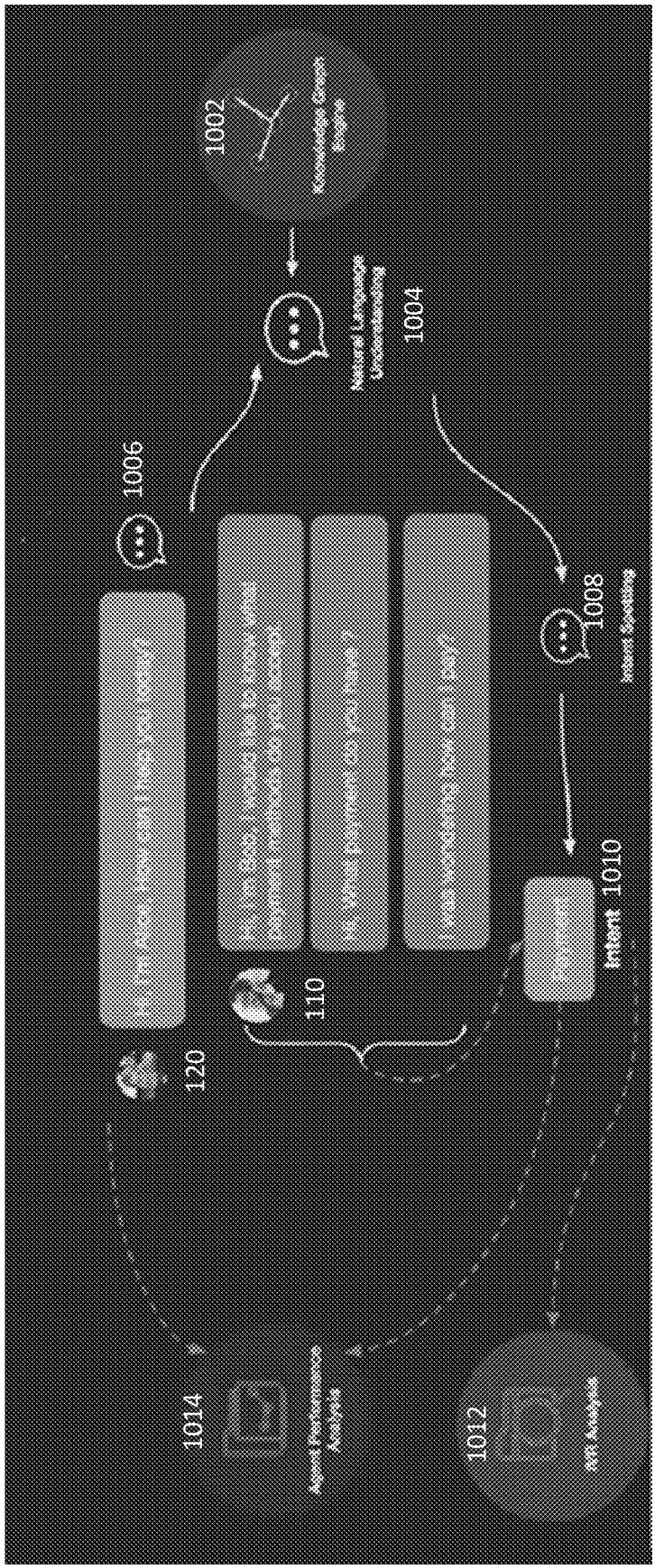


FIG. 10

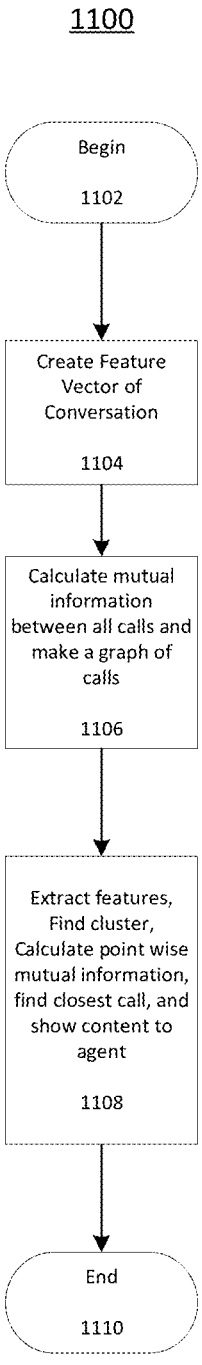

1100
Begin
1102
Create Feature Vector of Conversation
1104
Calculate mutual information between all calls and make a graph of calls
1106
Extract features, Find cluster, Calculate point wise mutual information, find closest call, and show content to agent
1108
End
1110

FIG. 11

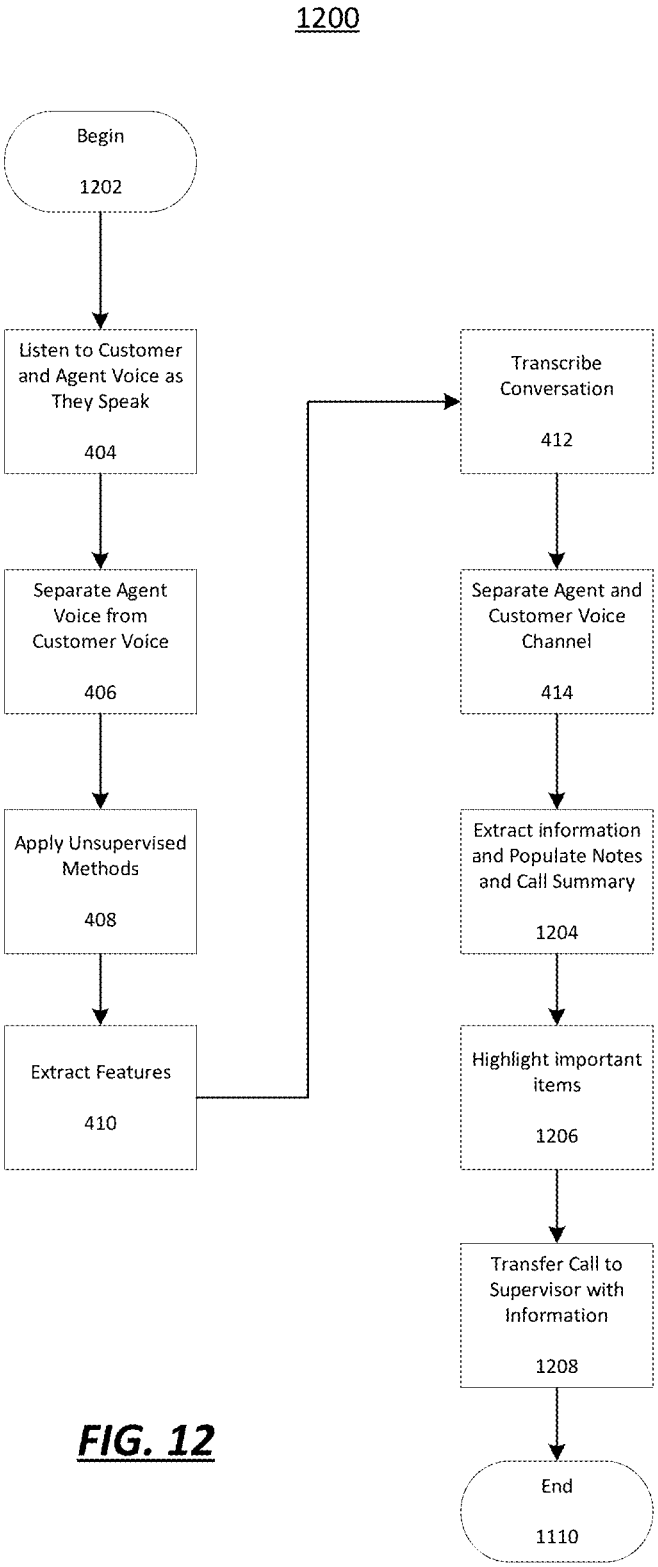

1200
Begin
1202
Listen to Customer and Agent Voice as They Speak
404
Separate Agent Voice from Customer Voice
406
Apply Unsupervised Methods
408
Extract Features
410
Transcribe Conversation
412
Separate Agent and Customer Voice Channel
414
Extract information and Populate Notes and Call Summary
1204
Highlight important items
1206
Transfer Call to Supervisor with Information
1208
End
1110

FIG. 12

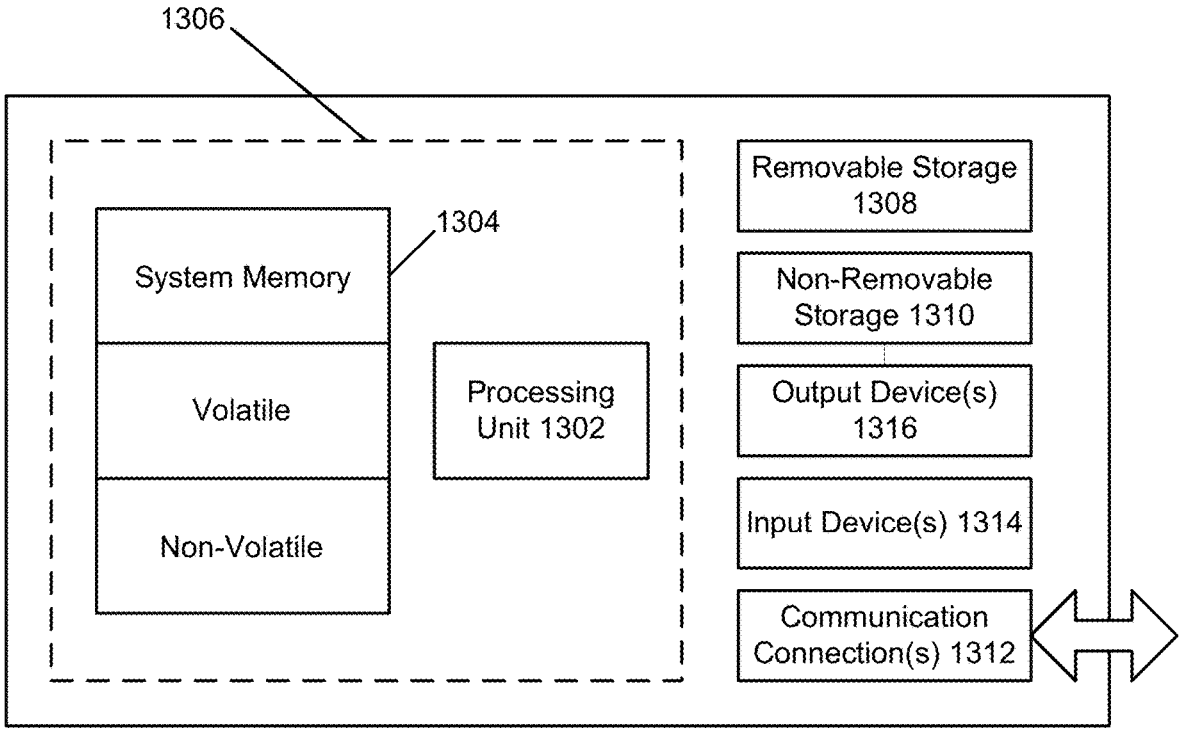

1306
1304
System Memory
Volatile
Non-Volatile
Processing Unit 1302
Removable Storage 1308
Non-Removable Storage 1310
Output Device(s) 1316
Input Device(s) 1314
Communication Connection(s) 1312
1300

FIG. 13

SYSTEM AND METHOD FOR AUTOMATED SMART NOTES USING AGENT ASSIST WITHIN A CLOUD-BASED CONTACT CENTER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/870,913, filed Jul. 5, 2019, entitled "SYSTEM AND METHOD FOR AUTOMATION WITHIN A CLOUD-BASED CONTACT CENTER," which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Today, contact centers are primarily on-premise software solutions. This requires an enterprise to make a substantial investment in hardware, installation and regular maintenance of such solutions. Using on-premise software, agents and supervisors are stationed in an on-site call center. In addition, a dedicated IT staff is required because on-site software may be too complicated for supervisors and agents to handle on their own. Another drawback of on-premise solutions is that such solutions cannot be easily enhanced to include capabilities to that meet the current demands of technology, such as automation. Thus, there is a need for a solution to enhance the agent experience to enhance the interactions with customers who interact with contact centers.

SUMMARY

[0003] Disclosed herein are systems and methods for providing a cloud-based contact center solution providing agent automation through the use of e.g., artificial intelligence and the like.

[0004] In accordance with an aspect, there is disclosed a method, comprising executing an automation infrastructure within a cloud-based contact center that includes a communication manager, speech-to-text converter, a natural language processor, and an inference processor exposed by application programming interfaces; and executing an agent assist functionality within the automation infrastructure that performs operations comprising: receiving a communication from a customer; displaying text associated with the communication in a first field of a unified user interface; automatically analyzing the text to determine key terms associated the communication; and automatically populating the key terms into a notes field of a call notes user interface. In accordance with another aspect, a cloud-based software platform is disclosed in which the example method above is performed.

[0005] Other systems, methods, features and/or advantages will be or may become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features and/or advantages be included within this description and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The components in the drawings are not necessarily to scale relative to each other. Like reference numerals designate corresponding parts throughout the several views.

[0007] FIG. **1** illustrates an example environment;

[0008] FIG. **2** illustrates example component that provide automation, routing and/or omnichannel functionalities within the context of the environment of FIG. **1**;

[0009] FIG. **3** illustrates a high-level overview of interactions, components and flow of Agent Assist in accordance with the present disclosure;

[0010] FIG. **4** illustrates an example operational flow in accordance with the present disclosure and provides additional details of the high-level overview shown in FIG. **3**;

[0011] FIGS. **5**A, **5**B and **5**C illustrate an example unified interface showing aspects of the operational flows of FIGS. **3** and **4**;

[0012] FIG. **6** illustrates an operational flow to analyze a conversation to create smart notes;

[0013] FIG. **7** illustrates an example smart notes user interface;

[0014] FIG. **8** illustrates an operational flow to analyze a conversation to pre-populate forms;

[0015] FIG. **9** illustrates an example automatic scheduling user interface;

[0016] FIG. **10** illustrates an overview of the real-time analytics aspect of Agent Assist;

[0017] FIG. **11** illustrates an example operational flow to classify agent conversations;

[0018] FIG. **12** illustrates an example operational flow of escalation assistance; and

[0019] FIG. **13** illustrates an example computing device.

DETAILED DESCRIPTION

[0020] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art. Methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present disclosure. While implementations will be described within a cloud-based contact center, it will become evident to those skilled in the art that the implementations are not limited thereto.

[0021] The present disclosure is generally directed to a cloud-based contact center and, more particularly, methods and systems for proving intelligent, automated services within a cloud-based contact center. With the rise of cloud-based computing, contact centers that take advantage of this infrastructure are able to quickly add new features and channels. Cloud-based contact centers improve the customer experience by leveraging application programming interfaces (APIs) and software development kits (SDKs) to allow the contact center to change in in response to an enterprise's needs. For example, communications channels may be easily added as the APIs and SDKs enable adding channels, such as SMS/MMS, social media, web, etc. Cloud-based contact centers provide a platform that enables frequent updates. Yet another advantage of cloud-based contact centers is increased reliability, as cloud-based contact centers may be strategically and geographically distributed around the world to optimally route calls to reduce latency and provide the highest quality experience. As such, customers are connected to agents faster and more efficiently.

Example Cloud-Based Contact Center Architecture

[0022] FIG. **1** is an example system architecture **100**, and illustrates example components, functional capabilities and optional modules that may be included in a cloud-based contact center infrastructure solution. Customers **110** inter-

act with a contact center **150** using voice, email, text, and web interfaces in order to communicate with agent(s) **120** through a network **130** and one or more channels **140**. The agent(s) **120** may be remote from the contact center **150** and handle communications with customers **110** on behalf of an enterprise or other entity. The agent(s) **120** may utilize devices, such as but not limited to, work stations, desktop computers, laptops, telephones, a mobile smartphone and/or a tablet. Similarly, customers **110** may communicate using a plurality of devices, including but not limited to, a telephone, a mobile smartphone, a tablet, a laptop, a desktop computer, or other. For example, telephone communication may traverse networks such as a public switched telephone networks (PSTN), Voice over Internet Protocol (VoIP) telephony (via the Internet), a Wide Area Network (WAN) or a Large Area Network. The network types are provided by way of example and are not intended to limit types of networks used for communications.

[0023] The contact center **150** may be cloud-based and distributed over a plurality of locations. The contact center **150** may include servers, databases, and other components. In particular, the contact center **150** may include, but is not limited to, a routing server, a SIP server, an outbound server, automated call distribution (ACD), a computer telephony integration server (CTI), an email server, an IM server, a social server, a SMS server, and one or more databases for routing, historical information and campaigns.

[0024] The routing server may serve as an adapter or interface between the switch and the remainder of the routing, monitoring, and other communication-handling components of the contact center. The routing server may be configured to process PSTN calls, VoIP calls, and the like. For example, the routing server may be configured with the CTI server software for interfacing with the switch/media gateway and contact center equipment. In other examples, the routing server may include the SIP server for processing SIP calls. The routing server may extract data about the customer interaction such as the caller's telephone number (often known as the automatic number identification (ANI) number), or the customer's internet protocol (IP) address, or email address, and communicate with other contact center components in processing the interaction.

[0025] The ACD is used by inbound, outbound and blended contact centers to manage the flow of interactions by routing and queuing them to the most appropriate agent. Within the CTI, software connects the ACD to a servicing application (e.g., customer service, CRM, sales, collections, etc.), and looks up or records information about the caller. CTI may display a customer's account information on the agent desktop when an interaction is delivered.

[0026] For inbound SIP messages, the routing server may use statistical data from the statistics server and a routing database to the route SIP request message. A response may be sent to the media server directing it to route the interaction to a target agent **120**. The routing database may include: customer relationship management (CRM) data; data pertaining to one or more social networks (including, but not limited to network graphs capturing social relationships within relevant social networks, or media updates made by members of relevant social networks); agent skills data; data extracted from third party data sources including cloud-based data sources such as CRM; or any other data that may be useful in making routing decisions.

[0027] Customers **110** may initiate inbound communications (e.g., telephony calls, emails, chats, video chats, social media posts, etc.) to the contact center **150** via an end user device. End user devices may be a communication device, such as, a telephone, wireless phone, smart phone, personal computer, electronic tablet, etc., to name some non-limiting examples. Customers **110** operating the end user devices may initiate, manage, and respond to telephone calls, emails, chats, text messaging, web-browsing sessions, and other multi-media transactions. Agent(s) **120** and customers **110** may communicate with each other and with other services over the network **130**. For example, a customer calling on telephone handset may connect through the PSTN and terminate on a private branch exchange (PBX). A video call originating from a tablet may connect through the network **130** terminate on the media server. The channels **140** are coupled to the communications network **130** for receiving and transmitting telephony calls between customers **110** and the contact center **150**. A media gateway may include a telephony switch or communication switch for routing within the contact center. The switch may be a hardware switching system or a soft switch implemented via software. For example, the media gateway may communicate with an automatic call distributor (ACD), a private branch exchange (PBX), an IP-based software switch and/or other switch to receive Internet-based interactions and/or telephone network-based interactions from a customer **110** and route those interactions to an agent **120**. More detail of these interactions is provided below.

[0028] As another example, a customer smartphone may connect via the WAN and terminate on an interactive voice response (IVR)/intelligent virtual agent (IVA) components. IVR are self-service voice tools that automate the handling of incoming and outgoing calls. Advanced IVRs use speech recognition technology to enable customers **110** to interact with them by speaking instead of pushing buttons on their phones. IVR applications may be used to collect data, schedule callbacks and transfer calls to live agents. IVA systems are more advanced and utilize artificial intelligence (AI), machine learning (ML), advanced speech technologies (e.g., natural language understanding (NLU)/natural language processing (NLP)/natural language generation (NLG)) to simulate live and unstructured cognitive conversations for voice, text and digital interactions. IVA systems may cover a variety of media channels in addition to voice, including, but not limited to social media, email, SMS/MMS, IM, etc. and they may communicate with their counterpart's application (not shown) within the contact center **150**. The IVA system may be configured with a script for querying customers on their needs. The IVA system may ask an open-ended questions such as, for example, "How can I help you?" and the customer **110** may speak or otherwise enter a reason for contacting the contact center **150**. The customer's response may then be used by a routing server to route the call or communication to an appropriate contact center resource.

[0029] In response, the routing server may find an appropriate agent **120** or automated resource to which an inbound customer communication is to be routed, for example, based on a routing strategy employed by the routing server, and further based on information about agent availability, skills, and other routing parameters provided, for example, by the statistics server. The routing server may query one or more databases, such as a customer database, which stores infor-

mation about existing clients, such as contact information, service level agreement requirements, nature of previous customer contacts and actions taken by contact center to resolve any customer issues, etc. The routing server may query the customer information from the customer database via an ANI or any other information collected by the IVA system.

[0030] Once an appropriate agent and/or automated resource is identified as being available to handle a communication, a connection may be made between the customer **110** and an agent device of the identified agent **120** and/or the automate resource. Collected information about the customer and/or the customer's historical information may also be provided to the agent device for aiding the agent in better servicing the communication. In this regard, each agent device may include a telephone adapted for regular telephone calls, VoIP calls, etc. The agent device may also include a computer for communicating with one or more servers of the contact center and performing data processing associated with contact center operations, and for interfacing with customers via voice and other multimedia communication mechanisms.

[0031] The contact center **150** may also include a multimedia/social media server for engaging in media interactions other than voice interactions with the end user devices and/or other web servers **160**. The media interactions may be related, for example, to email, vmail (voice mail through email), chat, video, text-messaging, web, social media, co-browsing, etc. In this regard, the multimedia/social media server may take the form of any IP router conventional in the art with specialized hardware and software for receiving, processing, and forwarding multi-media events.

[0032] The web servers **160** may include, for example, social media sites, such as, Facebook, Twitter, Instagram, etc. In this regard, the web servers **160** may be provided by third parties and/or maintained outside of the contact center **160** that communicate with the contact center **150** over the network **130**. The web servers **160** may also provide web pages for the enterprise that is being supported by the contact center **150**. End users may browse the web pages and get information about the enterprise's products and services. The web pages may also provide a mechanism for contacting the contact center, via, for example, web chat, voice call, email, WebRTC, etc.

[0033] The integration of real-time and non-real-time communication services may be performed by unified communications (UC)/presence sever. Real-time communication services include Internet Protocol (IP) telephony, call control, instant messaging (IM)/chat, presence information, real-time video and data sharing. Non-real-time applications include voicemail, email, SMS and fax services. The communications services are delivered over a variety of communications devices, including IP phones, personal computers (PCs), smartphones and tablets. Presence provides real-time status information about the availability of each person in the network, as well as their preferred method of communication (e.g., phone, email, chat and video).

[0034] Recording applications may be used to capture and play back audio and screen interactions between customers and agents. Recording systems should capture everything that happens during interactions and what agents do on their desktops. Surveying tools may provide the ability to create and deploy post-interaction customer feedback surveys in voice and digital channels. Typically, the IVR/IVA development environment is leveraged for survey development and deployment rules. Reporting/dashboards are tools used to track and manage the performance of agents, teams, departments, systems and processes within the contact center.

Automation

[0035] As shown in FIG. **1**, automated services may enhance the operation of the contact center **150**. In one aspect, the automated services may be implemented as an application running on a mobile device of a customer **110**, one or more cloud computing devices (generally labeled automation servers **170** connected to the end user device over the network **130**), one or more servers running in the contact center **150** (e.g., automation infrastructure **200**), or combinations thereof.

[0036] With respect to the cloud-based contact center, FIG. **2** illustrates an example automation infrastructure **200** implemented within the cloud-based contact center **150**. The automation infrastructure **200** may automatically collect information from a customer **110** user through, e.g., a user interface/voice interface **202**, where the collection of information may not require the involvement of a live agent. The user input may be provided as free speech or text (e.g., unstructured, natural language input). This information may be used by the automation infrastructure **200** for routing the customer **110** to an agent **120**, to automated resources in the contact center **150**, as well as gathering information from other sources to be provided to the agent **120**. In operation, the automation infrastructure **200** may parse the natural language user input using a natural language processing module **210** to infer the customer's intent using an intent inference module **212** in order to classify the intent. Where the user input is provided as speech, the speech is transcribed into text by a speech-to-text system **206** (e.g., a large vocabulary continuous speech recognition or LVCSR system) as part of the parsing by the natural language processing module **210**. The communication manager **204** monitors user inputs and presents notifications within the user interface/voice interface **202**. Responses by the automation infrastructure **200** to the customer **110** may be provided as speech using the text-to-speech system **208**.

[0037] The intent inference module automatically infers the customer's **110** intent from the text of the user input using artificial intelligence or machine learning techniques. These artificial intelligence techniques may include, for example, identifying one or more keywords from the user input and searching a database of potential intents (e.g., call reasons) corresponding to the given keywords. The database of potential intents and the keywords corresponding to the intents may be automatically mined from a collection of historical interaction recordings, in which a customer may provide a statement of the issue, and in which the intent is explicitly encoded by an agent.

[0038] Some aspects of the present disclosure relate to automatically navigating an IVR system of a contact center on behalf of a user using, for example, the loaded script. In some implementations of the present disclosure, the script includes a set of fields (or parameters) of data that are expected to be required by the contact center in order to resolve the issue specified by the customer's **110** intent. In some implementations of the present disclosure, some of the fields of data are automatically loaded from a stored user profile. These stored fields may include, for example, the

customer's **110** full name, address, customer account numbers, authentication information (e.g., answers to security questions) and the like.

[0039] Some aspects of the present disclosure relate to the automatic authentication of the customer **110** with the provider. For example, in some implementations of the present disclosure, the user profile may include authentication information that would typically be requested of users accessing customer support systems such as usernames, account identifying information, personal identification information (e.g., a social security number), and/or answers to security questions. As additional examples, the automation infrastructure **200** may have access to text messages and/or email messages sent to the customer's **110** account on the end user device in order to access one-time passwords sent to the customer **110**, and/or may have access to a one-time password (OTP) generator stored locally on the end user device. Accordingly, implementations of the present disclosure may be capable of automatically authenticating the customer **110** with the contact center prior to an interaction.

[0040] In some implementations of the present disclosure an application programming interface (API) is used to interact with the provider directly. The provider may define a protocol for making commonplace requests to their systems. This API may be implemented over a variety of standard protocols such as Simple Object Access Protocol (SOAP) using Extensible Markup Language (XML), a Representational State Transfer (REST) API with messages formatted using XML or JavaScript Object Notation (JSON), and the like. Accordingly, a customer experience automation system **200** according to one implementation of the present disclosure automatically generates a formatted message in accordance with an API define by the provider, where the message contains the information specified by the script in appropriate portions of the formatted message.

[0041] Some aspects of the present disclosure relate to systems and methods for automating and augmenting aspects of an interaction between the customer **110** and a live agent of the contact center. In an implementation, once a interaction, such as through a phone call, has been initiated with the agent **120**, metadata regarding the conversation is displayed to the customer **110** and/or agent **120** in the UI throughout the interaction. Information, such as call metadata, may be presented to the customer **110** through the UI **205** on the customer's **110** mobile device **105**. Examples of such information might include, but not be limited to, the provider, department call reason, agent name, and a photo of the agent.

[0042] According to some aspects of implementations of the present disclosure, both the customer **110** and the agent **120** can share relevant content with each other through the application (e.g., the application running on the end user device). The agent may share their screen with the customer **110** or push relevant material to the customer **110**.

[0043] In yet another implementation, the automation infrastructure **200** may also "listen" in on the conversation and automatically push relevant content from a knowledge base to the customer **110** and/or agent **120**. For example, the application may use a real-time transcription of the customer's input (e.g., speech) to query a knowledgebase to provide a solution to the agent **120**. The agent may share a document describing the solution with the customer **110**. The application may include several layers of intelligence where it gathers customer intelligence to learn everything it can about why the customer **110** is calling. Next, it may perform conversation intelligence, which is extracting more context about the customer's intent. Next, it may perform interaction intelligence to pull information from other sources about customer **100**. The automation infrastructure **200** may also perform contact center intelligence to implement WFM/WFO features of the contact center **150**.

Agent Assist Overview

[0044] Thus, in the context of FIGS. **1-2**, the present disclosure provides improvements by providing an innovative tool to reduce agent effort and improve customer experience quality through artificial intelligence (referred to herein as "Agent Assist"). Agent Assist is an innovative tool used within e.g., contact centers, designed to reduce agent effort, improve quality and reduce costs by minimizing search and data entry tasks Agent Assist is fully unified within the agent interface while keeping all data internally protected from third-party sharing. Agent Assist improve quality and reduce costs by minimizing search and data entry tasks through the use of AI capabilities. Agent Assist simplifies agent effort and improves Customer Satisfaction/Net Promoter Score CSAT/NPS.

[0045] Agent Assist is powered by artificial intelligence (AI) to provide real-time guidance for frontline employees to respond to customer needs quickly and accurately. For example, as a customer **110** states a need, agents **120** are provided answers or supporting information immediately to expedite the conversation and simplify tasks. Agent Assist determines why customers are calling and what their intent is. Similarly, IVR assist makes recommendations to a supervisor to optimize IVR for a better customer experience, for example, Agent Assist helps optimize IVR questions to match customers' reasons for calling and what their intent is.

[0046] By leveraging automated assistance and reducing agent-supervisor ad-hoc interactions, Agent Assist gives supervisors more time to focus on workforce engagement activities. Agent Assist reduces manual supervision and assistance. Agent Assist improves agent proficiency and accuracy. Agent Assist reduces short and long term training efforts through real-time error identification, eliminates busy work with smart note technology (the ability to systematically recognize and enter all key aspects of an interaction into the conversation notes); and improved handle time with in-app automations.

[0047] With reference to FIG. **3**, there is illustrated a high-level overview of interactions, components and flow of Agent Assist in accordance with the present disclosure. In operation, a customer **110** will contact the cloud-based contact center **150** through one or more of the channels **140**. as shown in FIG. **1**. The agent **120** to whom the customer **110** is routed may listen to the customer **110** while the same time the Agent Assist functionality pulls information using a knowledge graph engine **308**. The knowledge graph engine **312** gathers information from from one or more of a knowledgebase **302**, a customer relationship management (CRM) platform/a customer service management (CSM) platform **304**, and/or conversational transcripts **306** of other agent conversations to provide contextually relevant information to the agent. Additionally, information captured within the agent interface (see, FIGS. **5A-5C**, **7** and **13**) can be automatically added to account profiles or work item tickets, within the CRM, without any additional agent effort. Agent Assist is an intelligent advisory tool which supplies data-

driven real-time recommendations, next best actions and automations to aid agents in customer interactions and guide them to quality and outcome excellency. This may include making recommendations based on interactions, discussions and monitored KPIs. Agent Assist helps match agent skill to the reasons why customers are calling. In addition, information may be provided to the agent from third-party sources via the web servers **160** (e.g., knowledge bases of product manufacturers) or social media platforms.

[0048] With reference to FIG. **4**, there is illustrated an example operational flow **400** in accordance with the present disclosure, and provides additional details of the high-level overview shown in FIG. **3**. At **402**, the process begins wherein the system listens the customer and agent voices as they speak (S. **404**). For example, the automation infrastructure **200** may process the customer speech, as described with regard to FIG. **2**. At **406**, the agent voice is separated from the customer voice into their own respective channels. Once separated, at **408**, unsupervised methods may be used to automatically perform one or more of the following non-limiting processes: apply biometrics to authenticate the caller/customer, predict a caller gender, predict a caller age category, predict a caller accent, and/or predict caller other demographics. Optionally or alternatively, if speaker separation is not performed at **406**, then the system may distinguish between the customer and the agent by analyzing time that either the agent or the customer talks or listens, identify signature of agent voice or user voice, or apply non-supervised methods to separate user and agent voice in real-time.

[0049] The operational flow continues at **410**, wherein the customer voice and/or agent voice may be analyzed before transcription to extract one or more of the following non-limiting features:

[0050] Pain

[0051] Agony

[0052] Empathy

[0053] Being sarcastic

[0054] Speech speed

[0055] Tone

[0056] Frustration

[0057] Enthusiasm

[0058] Interest

[0059] Engagement

[0060] Understanding these features helps the agent **120** better understand the customer **110**. The agent **120** will be better able to understand the customer's problem or issues so a resolution can be more easily achieved.

[0061] At **412**, the conversation between the agent and the customer is transcribed in either real-time or post-call. This may be performed by the speech-to-text component of the automation infrastructure **200** and saved to a database. At **414**, the agent voice channel and the customer voice channel are separated. At **416**, the automation infrastructure **200** determines information about the customer and agent, such as, intent, entities (e.g., names, locations, times, etc.) sentiment, sentence phrases (e.g. verb, noun, adjective, etc.). At **418**, from the information determined at **416**, Agent Assist provides useful insight to the agent **120**. This information, as shown in FIG. **3**, may be information retrieved from the relevant CRM, the most relevant documents in the related knowledge base, and/or a relevant conversation and interaction that occurred in the past that was related to a similar topic or other feature of the interaction between the agent and the customer. Information pulled from the knowledgebase may be highlighted to the agent in a display, such as shown in FIGS. **5**A-**5**C, **7** and **13**.

[0062] Thus, in accordance with the operational flow of FIG. **4**, Agent Assist provides real-time guidance for front-line employees to respond to customer needs quickly and accurately. As a customer **110** states his or her need, agents **120** will be delivered answers or supporting information immediately to expedite the conversation and simplify agent effort. By delivering information from CRM **304** or knowledgebase **302** to the agent **120** in milliseconds, agent handling time will handle be reduced and customers will realize a time savings and ultimately a reduction in effort to interact with businesses.

[0063] FIGS. **5**A-**5**C illustrate an example unified interface **500** showing aspects of the operational flows of FIGS. **3** and **4**. In FIGS. **5**A-**5**C, the agent **120** is speaking on behalf of a financial institution. The agent **120** could be speaking on behalf of any entity for which the cloud-based contact center **150** serves. As shown in FIG. **5**A, the customer **110** is calling to ask questions about setting up a retirement plan. Because the context of the conversation is understood by the automation infrastructure **200** to be related to a financial institution, Agent Assist identifies that the term "retirement plan" is meaningful and highlights it to the agent. As shown in FIG. **5**B, Agent Assist provides a prompt **502** indicating to the agent **120** that there are many different types of retirement plans that the customer **110** can choose from. A button or other control **504** is provided such that the agent **120** can click a link to see more information. The link to the information may provide text, audio, video, messages, tweets, posts, etc. to the agent **120**. Agent Assist provides a segment and/or snippet in the text that is relevant to the customer's needs. In other implementations, Agent Assist provides a relevant interaction in the past (e.g., a similar call with a similar issue that agent **120** was able to address, etc.) or provide cross channel information (e.g., find a most relevant e-mail for a call, etc.). As shown in FIG. **5**C, Agent Assist may provide an option **506** to schedule a meeting or call between the customer **110** and a financial planner (i.e., a person with additional knowledge within the entity who may satisfy the customer's request to the agent **120**). Additional details of the scheduling operation are described below with reference to FIG. **8**.

Smart Notes

[0064] FIGS. **6** and **7** provide details about the smart notes feature of Agent Assist. The smart notes feature may be used by the agent **120** to summarize a conversation with the customer **120**, extract relevant portions of the interaction, etc. Important items in the smart notes may be highlighted using bold fonts or other. The process begins at **602** where operations **404**-**414** are performed. These may be performed in parallel with the other features described above. At **604**, information is extracted from the transcript and populated into the smart notes. As shown in FIG. **7**, a call notes user interface **702** is provided to the agent **120** with information from the call with the customer **110** pre-populated in an input field **704**. For example, in the context of a retailer, the phrases "status of my last order" and "place a new order" may be determined to be relevant information by the automation infrastructure **200**, and is populated into the call notes input field **704**. At **606**, important terms may be highlighted. At **608**, the process ends. As shown in FIG. **7**,

the call notes user interface **702** may provide an option for the user to edit and/or add notes.

[0065] In accordance with the operations performed in FIG. **6**, Agent Assist may analyze the conversation between the agent **120** and the customer **110** to create smart notes. This conversation could be a phone call, a text message, chat or video call, etc. Smart notes extracts the most relevant information from this conversation. For instance after a conversation, Agent Assist may determine that the discussion between the agent and the customer was about "canceling an old order " and " placing a new order." These would be extracted as Smart Notes and provide to the agent, who has an option to accept or modify the note, as show in FIG. **7**. To achieve the above, Agent Assist may separate the conversation between customer **110** and agent **120** to find words and phrases that are common between agents and customers, when a customer confirms a question, or when an agent confirms what customer says. For instance, the agent **120** may say, "Ok, so you would like to place a new order—correct?" In this case, the Smart Note would be a summary of the call about placing a new order.

Automatic Data Entry

[0066] In accordance with aspects of the disclosure, when Agent Assist detects the participants in a conversation it may automatically fill out any forms that pop-up after such conversations. With reference to FIG. **8**, the process begins at **802** where operations **404-414** are performed. These may be performed in parallel with the other features described above. At **804**, information is extracted to populate forms. As shown in FIG. **9**, in response to the customer indicating that he or she is calling to move forward on a job application, scheduling information may be presented to the agent in a field **508**. This information may populate into user interface (**902**) field **904** together with additional information in field **906** to schedule the call for an interview with the appropriate person. In another example, if the person says, "Hi my name is John? I like to return my iPhone 6," a form may pop up with some of the information such as Name: John and Phone: iPhone 6 prefilled into the form.

[0067] Such automated data entry includes but not limited to:

[0068] Date
[0069] Time
[0070] Day of the week
[0071] First name
[0072] Last name
[0073] Gender
[0074] Address
[0075] Object e.g., Samsung Galaxy
[0076] Type of the Object—e.g. Galaxy S9
[0077] Time of the day (e.g. morning, afternoon)

[0078] After the information is populated, the process ends at **806**.

Real-Time Analytics and Error Detection

[0079] With reference to FIG. **10**, Agent Assist may provide for real-time analytics and error detection by monitoring a conversation (i.e., a call, a text, an e-mail, video, chat, etc.) between the customer **110** and agent **120** in real-time to detect the following non-limiting categories::

[0080] Compliance—words that should not say in the conversation.
[0081] Competitors—if agent says the name of competitors.
[0082] A set of "do's and don'ts"—words that agent should not say.
[0083] If the agent is angry, curse etc.
[0084] If the agent is making fun of the caller.
[0085] If the agent talks too fast, too slow, or if there is a delay between words.
[0086] If the agent shows empathy.
[0087] If the agent violates any policy.
[0088] If the agent markets other products.
[0089] If the agent talks about personal issues.
[0090] If the agent is politically motivated.
[0091] If the agent promotes violence.

[0092] The process monitors the agent in real-time and expands upon the current state of the art, which is monitoring is at word level to monitor the transcript of the conversation and look for certain words or a variation of such words. For instance, if the agent is talking about pricing, the system may look for words such as "our pricing." "our price list," "do you want to know how much our product is," etc. As another example, the agent may say "our product is beating everybody else," which means the price is very affordable. Other examples such as these are possible.

Artificial Intelligence (AI) Processing/Learning

[0093] In accordance with the present disclosure, a layer of deep learning **1002** is applied to create a large set of all potential of sentences and instances (natural language understanding **1004**) where the agent:

[0094] Said X and meant A.
[0095] Said Y and meant A.
[0096] Said Z but did not mean A.
[0097] Said W and meant B.

[0098] This sets have several positive and negative examples around concepts, such as "cursing," "being frustrated," "rude attitude," "too pushy for sale," "soft attitude," as well as word level examples, such as "shut up." Deep learning **1002** does not need to extract features, rather deep learning takes a set of sentences and classes (class is positive/negative, good bad, cursing/not cursing). Deep learning **1002** learns and builds a model out of all of these examples. For example, audio files of conversations **1006** between agents **120** and customers **110** may be input to the deep learning module **1002**. Alternatively, transcribed words may be input to the deep learning module **1002**. Next, the system uses the learned model to listen to any conversation in real time and to identify the class such "cursing/not cursing." As soon as the system identifies a class, and if it is negative or positive, it can do the following:

[0099] Send an alert to manager
[0100] Make an indicator red on the screen
[0101] Send a note to the agent to be reviewed in real-time or after the call
[0102] Update some data files for reporting and visualization.

[0103] As part of the above, the natural language understanding **1004** may be used for intent spotting **1008** to determine intent **1010**, which may be used for IVR analysis **1012** and/or agent performance **1014**.

[0104] In this approach words are not important, rather the combination of all of words, the order of words and al potential variations of them have relevance. Deep learning **1002** considers all of the potential signals that could describe

and hint toward a class. This approach is also language agnostic. It does not matter what language agent or caller speaks as long as there are a set of words and a set of classes, deep learning **1002** will learn and the model can be applied to the same language. In addition to the above, metadata may be added to every call, such as the time of the call, the duration of the call, the number of times the agent talked over the caller could be added to the data, etc.

Listening to other Agents Conversation in Real-Time

[0105] As described above, Agent Assist may periodically perform the following to classify conversations of other agents. With reference to FIG. **11**, the process begins at **1102**. At **1104**, a feature vector of a conversation is created. Such feature vector(s) includes but are not limited to :

[0106] Time of the call

[0107] Duration of the call

[0108] Topic of the call

[0109] Frequency of words in the customer transcription (e.g. Ticket 2, Delay 4, etc.)

[0110] Frequency of words in the agent transcription (e.g. rebook 3, etc.)

[0111] Cluster conversations based on these features

[0112] At **1106**, for the conversation happening in within a predetermined period (e.g., one month), the following are performed:

[0113] Calculate the point wise mutual information between all of the calls in one cluster

[0114] Make a graph of all calls in which the strength of the link is the weight of the point wise mutual information.

[0115] At **1108**, for the current file:

[0116] Extract features

[0117] Find the cluster

[0118] Calculate the point wise mutual information

[0119] Find the closest call to the current call

[0120] Show the content of the call to the agent.

[0121] At **1110**, the process ends.

Learning Module

[0122] While the process **1100** analyzes calls, Agent Assist learns and improves by analyzing user clicks. As relevant conversations are presented to the agent (see, e.g., **306**), if the agent clicks on a conversation and spends time on it, then it means that the conversation is relevant. Further, if the conversation is located, e.g., third on the list, but the agent clicks on the first conversation and moves forward, Agent Assist does not make any assumptions about the conversation. Hence, the rank of the conversation may be of importance depending on the agent's actions. For the sake of simplicity, Agent Assist shows the top three conversations to the agent. If some conversations ranked equally, Agent Assist picks one based on heuristics, for instance any conversation that has not been picked recently will be picked.

Escalation Assistance

[0123] With reference to FIG. **12**, there is shown an example operational flow of escalation assistance, which may occur when agent cannot answer a customer question or when user is frustrated. With escalation assistance, agent can transfer the call to his or her supervisor, where the transfer will include a summary of the call, along highlights of important notes. In this case, the supervisor has insight into the context and reason for the transfer, and the caller does not need to repeat the case over again. The process begins at **1202** where operations **404-414** are performed. These may be performed in parallel with the other features described above. At **1204**, information extracted is from the transcript and populated into the smart notes with a call summary. At **1206**, notable items may be highlighted. At **1208**, the customer is transferred to the supervisor, where the supervisor is fully briefed on the reasons for the transfer. At **1210**, the process ends.

[0124] Thus, the present disclosure described an Agent Assist tool within a cloud-based contact center environment that is a conversational guide that proactively delivers real-time contextualized next best actions, in-app, to enhance the customer and agent experience. Talkdesk Agent Assist uses Al to empower agents with a personalized assistant that listens, learns and provides intelligent recommendations in every conversation to help resolve complex customer issues faster

General Purpose Computer Description

[0125] FIG. **13** shows an exemplary computing environment in which example embodiments and aspects may be implemented. The computing system environment is only one example of a suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality.

[0126] Numerous other general purpose or special purpose computing system environments or configurations may be used. Examples of well-known computing systems, environments, and/or configurations that may be suitable for use include, but are not limited to, personal computers, servers, handheld or laptop devices, multiprocessor systems, microprocessor-based systems, network personal computers (PCs), minicomputers, mainframe computers, embedded systems, distributed computing environments that include any of the above systems or devices, and the like.

[0127] Computer-executable instructions, such as program modules, being executed by a computer may be used. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Distributed computing environments may be used where tasks are performed by remote processing devices that are linked through a communications network or other data transmission medium. In a distributed computing environment, program modules and other data may be located in both local and remote computer storage media including memory storage devices.

[0128] With reference to FIG. **13**, an exemplary system for implementing aspects described herein includes a computing device, such as computing device **1300**. In its most basic configuration, computing device **1300** typically includes at least one processing unit **1302** and memory **1304**. Depending on the exact configuration and type of computing device, memory **1304** may be volatile (such as random access memory (RAM)), non-volatile (such as read-only memory (ROM), flash memory, etc.), or some combination of the two. This most basic configuration is illustrated in FIG. **13** by dashed line **1306**.

[0129] Computing device **1300** may have additional features/functionality. For example, computing device **1300**

may include additional storage (removable and/or non-removable) including, but not limited to, magnetic or optical disks or tape. Such additional storage is illustrated in FIG. **13** by removable storage **1308** and non-removable storage **1310**.

[0130] Computing device **1300** typically includes a variety of tangible computer readable media. Computer readable media can be any available tangible media that can be accessed by device **1300** and includes both volatile and non-volatile media, removable and non-removable media.

[0131] Tangible computer storage media include volatile and non-volatile, and removable and non-removable media implemented in any method or technology for storage of information such as computer readable instructions, data structures, program modules or other data. Memory **1304**, removable storage **1308**, and non-removable storage **1310** are all examples of computer storage media. Tangible computer storage media include, but are not limited to, RAM, ROM, electrically erasable program read-only memory (EEPROM), flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by computing device **1300**. Any such computer storage media may be part of computing device **1300**.

[0132] Computing device **1300** may contain communications connection(s) **1312** that allow the device to communicate with other devices. Computing device **1300** may also have input device(s) **1314** such as a keyboard, mouse, pen, voice input device, touch input device, etc. Output device(s) **1316** such as a display, speakers, printer, etc. may also be included. All these devices are well known in the art and need not be discussed at length here.

[0133] It should be understood that the various techniques described herein may be implemented in connection with hardware or software or, where appropriate, with a combination of both. Thus, the methods and apparatus of the presently disclosed subject matter, or certain aspects or portions thereof, may take the form of program code (i.e., instructions) embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, or any other machine-readable storage medium wherein, when the program code is loaded into and executed by a machine, such as a computer, the machine becomes an apparatus for practicing the presently disclosed subject matter. In the case of program code execution on programmable computers, the computing device generally includes a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), at least one input device, and at least one output device. One or more programs may implement or utilize the processes described in connection with the presently disclosed subject matter, e.g., through the use of an application programming interface (API), reusable controls, or the like. Such programs may be implemented in a high level procedural or object-oriented programming language to communicate with a computer system. However, the program(s) can be implemented in assembly or machine language, if desired. In any case, the language may be a compiled or interpreted language and it may be combined with hardware implementations.

[0134] Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

What is claimed:

1. A method, comprising:

executing an automation infrastructure within a cloud-based contact center that includes a communication manager, speech-to-text converter, a natural language processor, and an inference processor exposed by application programming interfaces; and

executing an agent assist functionality within the automation infrastructure that performs operations comprising:

receiving a communication from a customer;

displaying text associated with the communication in a first field of a unified user interface;

automatically analyzing the text to determine key terms associated the communication; and

automatically populating the key terms into a notes field of a call notes user interface.

2. The method of claim **1**, further comprising:

querying one of a knowledgebase, a customer relationship management (CRM) platform/a customer service management (CSM) platform, and a database of customer-agent transcripts using the key terms; and

displaying responsive results to the querying in a second field in the unified interface.

3. The method of claim **2**, further comprising automatically populating query results into the notes field of the call notes user interface.

4. The method of claim **3**, further comprising providing an editor in the call notes user interface to receive edits from the agent of the automatically populated key terms and query results.

5. The method of claim **3**, wherein the populated key terms and query results form a call summary.

6. The method of claim **1**, further comprising highlighting the key terms in the unified interface.

7. The method of claim **1**, further comprising:

receiving the communication as speech;

converting the speech to text; and

parsing the text for key terms.

8. The method of claim **1**, wherein the communication is a multi-channel communication and received as one of an SMS text, voice call, e-mail, chat, interactive voice response (IVR)/intelligent virtual agent (IVA) systems, and social media.

9. The method of claim **1**, further comprising providing an option to the agent to accept or reject the populating into the notes field of the call notes user interface.

10. The method of claim **1**, wherein the method is performed in real-time.

11. A cloud-based software platform comprising: one or more computer processors; and one or more computer-readable mediums storing instructions that, when executed by the one or more computer processors, cause the cloud-based software platform to perform operations comprising:

executing an automation infrastructure within a cloud-based contact center that includes a communication manager, speech-to-text converter, a natural language processor, and an inference processor exposed by application programming interfaces; and

executing an agent assist functionality within the automation infrastructure that performs operations comprising:

receiving a communication from a customer;

displaying text associated with the communication in a first field of a unified user interface;

automatically analyzing the text to determine key terms associated the communication; and

automatically populating the key terms into a notes field of a call notes user interface.

12. The cloud-based software platform of claim **11**, further comprising instructions to cause operations comprising:

querying one of a knowledgebase, a customer relationship management (CRM) platform/a customer service management (CSM) platform, and a database of customer-agent transcripts using the key terms; and

displaying responsive results to the querying in a second field in the unified interface.

13. The cloud-based software platform of claim **12**, further comprising instructions to cause operations comprising automatically populating query results into the notes field of the call notes user interface.

14. The cloud-based software platform of claim **13**, further comprising instructions to cause operations comprising providing an editor in the call notes user interface to receive edits from the agent of the automatically populated key terms and query results.

15. The cloud-based software platform of claim **13**, wherein the populated key terms and query results form a call summary.

16. The cloud-based software platform of claim **11**, further comprising instructions to cause operations comprising highlighting the key terms in the unified interface.

17. The cloud-based software platform of claim **11**, further comprising instructions to cause operations comprising:

receiving the communication as speech;

converting the speech to text; and

parsing the text for key terms.

18. The cloud-based software platform of claim **11**, wherein the communication is a multi-channel communication and received as one of an SMS text, voice call, e-mail, chat, interactive voice response (IVR)/intelligent virtual agent (IVA) systems, and social media.

19. The cloud-based software platform of claim **11**, further comprising instructions to cause operations comprising providing an option to the agent to accept or reject the populating into the notes field of the call notes user interface.

20. The cloud-based software platform of claim **11**, wherein the operation are performed in real-time.

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